# 6 plan implementation

This chapter identifies a strategy for moving from planning to implementation of the action plan recommendations. How readily this plan is used and implemented by watershed stakeholders is one indicator of its success. Improvement in watershed resources is another indicator. Successful plan implementation will require significant cooperation and coordination among watershed stakeholders to secure project funding and to efficiently and effectively move the action plan from paper to the watershed.

This chapter also relates some more technical details about the expected results of putting action recommendations in place and the cost of plan implementation. It also presents a plan for monitoring and evaluating plan implementation as a way to determine progress towards watershed goals and objectives.

## 6.1 PLAN IMPLEMENTATION STRATEGY

The Duck Creek watershed includes many stakeholders (see Table 6.1.1) that will have to coordinate efforts to implement many of the projects recommended in the action plan. Since no single municipality, district, resident, business, landowner, or organization has the financial or technical resources to accomplish the plan goals and objectives alone, working together will be essential to achieve meaningful results. Combining and coordinating resources, funding, effort, and leadership will be the most efficient and effective means of creating real improvement of watershed resources.

One important step in plan implementation will be the establishment of a committee or organization to step forward as a project leader to help organize and coordinate plan implementation. Responsibilities of this organization would also include administration, coordination of stakeholders to support individual watershed projects, and working with municipalities and other stakeholders to implement recommended policies and programs.

Throughout the watershed planning process, the Watershed Planning Committee has provided valuable input to the plan regarding watershed issues, resources, and priorities. This Planning Committee is encouraged to function as the stakeholder forum for the watershed until a separate organization or committe can be created. The Planning Committee can continue to hold regular meetings, organize watershed field trips, host educational workshops and forums, and bring watershed stakeholders and multiple units of government together to discuss watershed issues and opportunities. The Planning Committee may consider whether a formal staff position is needed to support the efforts of the Committee and to solicit volunteers for the position.

The Planning Committee, or an established watershed organization, is encouraged to work to generate additional stakeholder interest and involvement with watershed plan implementation and stewardship activities. As projects are initiated, and as the positive environmental, aesthetic, and community benefits come to light, projects and participation are expected to increase over time. There are tangible benefits to stakeholder participation in watershed activities, from positive media attention to improved quality of life for community residents. Increased involvement also can yield significant local, state, and federal funding opportunities to help share the cost of project implementation.

The watershed action plan contains a number of general and site specific recommendations and an identification of the parties responsible for leading and supporting the implementation of those recommendations. Some actions, such as the repair or stabilization of a municipal stormwater discharge point, can be added to municipal or drainage district capital improvement and maintenance plans, budgets, and schedules. This is a fairly quick and easy approach to implementing recommendations within the purview of specific jurisdictions.

In other cases, however, the action recommendation will require the involvement of multiple stakeholders for implementation, such as residents, a municipality, and a county, state, or federal agency to provide financial and technical support. Some actions require cross-jurisdictional coordination for issues, such as streambank stabilization, that span multiple jurisdictions or properties. The establishment of a green infrastructure corridor along the stream channel or ravine, or the preservation and restoration of a large

wetland complex are examples of projects that may require inter-jurisdictional cooperation and may require a longer time frame for implementation.

Other actions will require the cooperation of individual or groups of landowners, whether they are residents, homeowners associations, businesses, or institutions. These actions will often need a leader, or a single champion for the project, that can organize resources and keep the project moving forward. This champion may be the watershed organization, or a single entity such as a landowner or the municipality.

Actions that involve preservation of areas of land or water may also require the involvement of a local conservation organization. These groups can often provide technical or financial assistance for preservation efforts.

In some cases, actions recommend the adoption of new policies, plans, or standards that modify the form, intensity, or type of development or redevelopment in the watershed in a way that better protects watershed resources. These actions will require some effort on the part of municipalities to understand how plans and policies can be modified and to discuss and adopt new, or modify existing, policies, plans and standards. The first step in this effort is to understand how current development practices impact watershed resources and how they can be improved, followed by discussion and debate about possible modifications, and finally adopting policies and standards that have will have the desired outcome.

Implementation of this watershed plan and the improvement of watershed resources are ongoing, incremental, and long-term processes. Continuous research and investigation should be conducted to stay current with watershed conditions and resources. Likewise, this watershed plan should be updated regularly to accommodate changes in watershed conditions and resources and to reflect projects and plan implementation.

Clearly there is much to be done and there are many parties to coordinate. However, a dedicated and determined effort will benefit all watershed stakeholders and future generations of residents and visitors.

## 6.2 IMPAIRMENT REDUCTION TARGETS AND PROJECTIONS

The general and site specific recommendations in Chapter 5 have varying levels of effectiveness in reducing the identified impairments. The ability of each site specific action to reduce an impairment was assessed using a three-point scale as shown in Table 6.2.1.1. These effectiveness ratings are used in Table 6.4.5 where the estimated costs and effectiveness of each of the recommendations are listed.

In order to meet the requirements for a watershed-based plan, the plan must pay particular attention to water quality pollutants and impairments and measures for reducing the impairment. The high priority water quality pollutants for the Duck Creek Watershed include Total Suspended Solids / sedimentation, bacterial contamination (fecal coliform), nutrients (phosphorous), and aquatic life toxicity (total dissolved solids, chlorides, and salinity). Additional impairments addressed by the plan include degraded watershed aquatic habitat, an altered hydrology that does not support healthy watershed resources, loss and degradation of wetlands, natural area invasion by exotic species, and impacted or lack of stream buffers and riparian zones. These are the most important impairments needing to be addressed, for the reasons provided below.

Total Suspended Solids / sedimentation impair watershed resources when they settle out in streambeds, wetlands, and natural areas making them uninhabitable by some sensitive plant and animal species. The primary impact of high suspended solids concentrations in streams occurs when these solids settle in depositional areas of the stream system and cover the more desirable gravel substrates. Excessive levels of particulate material also create difficult conditions for gill breathing fish and some of their food sources, including macroinvertebrate organisms. Specifically, sediment is settling out in the low gradient stream reaches and degrading the quality of aquatic habitat. During flood events, the sediment load in the stream settles within the riparian corridor, where it degrades the quality of the riparian habitat. Reducing the flow of sediment into the stream channel, wetlands, and natural areas will help to repair these degraded systems by preventing further sedimentation and beginning the process of natural recovery.

High bacterial contamination causes a potential threat to

Table 6.1.1 Implementation Partners

| Acronym | Responsible Party | General Responsibility |
|---|---|---|
| QCWSPC / DC | Quad City Watershed Planning Committee-Duck Creek | Facilitate planning, funding, design of implementation of the Quad City Watershed Plan-Duck Creek |
| AI | Academic Institutions | Assist with implementation of education plan |
| BSRC | Bi-State Regional Commission | Planning and technical assistance, grant writing |
| CBL | Corporate Business and Landowners | Grounds management and maintenance, employee education |
| DWPCP/ SDDPW | Davenport Water Pollution Control Plant/Sewer Division of Davenport Public Works | Maintain sanitary sewer infrastructure |
| DH | Developers and Homebuilders | Land development, stormwater management system design and construction |
| FEMA | Federal Emergency Management Agency | National Funding Insurance Program, floodplain mapping and enforcement, and mitigation funding |
| GC | Golf Courses | Grounds management and maintenance, employee education |
| IAWC | Iowa American Water Company | Water monitoring |
| IDALS | Iowa Department of Agriculture and Land Stewardship | Technical and financial assistance |
| IDNR | Iowa Department of Natural Resources | Natural area preservation and management, research, technical and financial assistance |
| IDNR IOWATER | Iowa Department of Natural Resources (IOWATER) | Water monitoring |
| IDOT | Iowa Department of Transportation | Road and highway planning, construction and maintenance |
| IEPA | Iowa Environmental Protection Agency | Funding assistance and regulation |
| IRCD | Interstate Resource Conservation and Development (IRCD) | Provide natural resource management, technical and financial assistance |
| M | Municipalities of Davenport and Bettendorf | Land use development, technical and financial support, and drainage system management |
| NPO | Non Profit Organizations | Assist with implementaion of education plan, grant witting and submittal for watershed improvement projects and programs |
| PRL | Private and Residential Landowners | Land management and maintenance including stream channels and riparian corridors |
| SC | Scott County | Land use planning for unincorporated areas, natural resources, drainage system management |
| SCCD/B | Scott County Conservation Department and Board | Land and natural resource management |
| SCHD | Scott County Health Department | Monitor, manage, and provide technical support for water resources |
| NRCS / SWCD | Scott County Natural Resources Conservation District/Soil and Water Conservation District | Provide natural resource management, technical and financial assistance |
| SCPD | Scott County Planning and Development | Responsible land use planning and management in unincorporated areas |
| SCWC | Scott County Waste Commission | Environmentally sound waste disposal, education |
| USACE | United States Army Corps of Engineers | Water protection, regulation and restoration |
| USDA | United States Department of Agriculture | Agricultural and natural resource technical and financial assistance |
| USEPA | United States Environmental Protection Agency | Management, regulation and restoration of water resources |
| USFWS | United States Fish and Wildlife Service | Threatened and endangered species, technical and funding assistance for habitat restoration |

human health that pathogens associated with the bacteria present. This causes Duck Creek to be unsupportive of the uses for which it is designataed, namely, human contact. Reducing this contamination will help protect human health and restore the creek to a state that supports human contact and recreation.

Nutrient loads (phosphorous) can cause algae blooms that impair the habitat quality of water resources and block light from reaching desirable aquatic plants. When the algae dies, the decomposition process can deplete dissolved oxygen levels in the water, impairing the habitat quality for aquatic wildlife. Reducing the flow of phosphorous to watershed water resources can help to restore high quality aquatic habitat conditions necessary for a healthy diversity of species.

Aquatic life toxicity includes Total Dissolved Solids (TDS) such as salt (sodium chloride) used as road deicing material. Road salt can occur at toxic levels in the water column at intermittent times when the weather conditions demand its use. Chlorides are not removed by best management practices, does not decompose or readily change form, and can cause spikes in the water column, typically detected as increased conductivity, making the water uninhabitable by certain aquatic plants and animals. Reducing chloride loading to the stream will help maintain a consitent quality of water that supports healthy aquatic habitat.

Watershed habitat has been degraded and altered due to a number of causes. The lack of aquatic habitat characteristics, including pools and riffles and healthy substrates, means that aquatic species do not have sufficient cover and sources of food. Other habitat alterations that degrade conditions for aquatic organisms include streambank erosion and barriers to the movement of fish upstream and downstream, such as debris buildup or other obstructions. Alterations to watershed hydrology, creating flashy conditions, also impairs habitat because low flow conditions can mean that there is not enough water for aquatic species to live, and that dissolved oxygen levels fall below healthy levels due to the lack of flow and aeration. Restoring natural watershed hydrology, habitat characteristics, and streambank stability are important for recreating habitat conditions that support a healthy diversity of aquatic organisms.

Watershed wetlands have been drained, filled, and degraded, which impairs their ability to absorb and filter stormwater, to improve water quality, and to support wildlife that depend on high quality wetlands. Restoring the remaining wetlands and recreating some former wetlands, is important to replace water storage and retention areas and to improve water quality by restoring their water filtering capacity.

Watershed wetlands and natural areas have been invaded by exotic and invasive species, which crowd out native species and degrade habitat necessary to support threatened and endangered species. Removal and control of exotic and invasive species, including the reintroduction of natural management mechanisms such as prescribed fire, is important to restore the quality and function of watershed wetlands and natural areas.

Natural stream buffers and riparian zones have been removed, converted to turf grass or other uses, or otherwise degraded to a state that does not help filter runoff and improve water quality, stabilize streambanks, nor support a healthy stream system habitat.

For these impairments, the intent of the action plan recommendations is to reduce the impairment to an acceptable level. The ‘acceptable level’ for some pollutants is set by the Iowa Department of Natural Resources. However, standards only exist for one of these impairments, bacterial contamination, which is set at a concentration of 235 organisms (CFU) per 100ml of water sample. For other impairments, reduction targets are set according to professional opinion.

Setting impairment reduction targets and estimating the improvement expected by implementing plan recommendations are important for assessing the effectiveness of watershed plan recommendations for determining whether watershed impairments are being addressed. Targets and reduction estimates also satisfy one of the nine required watershed-based plan elements established by the US Environmental Protection Agency.

Table 6.2.1.1 Three Point Scale for Impairment Reduction Effectiveness (for Table 6.4.5)

| Rank | Description of Potential Effectiveness | Range of Effectiveness |
|---|---|---|
| ++ | Fully effective | 67-100% |
| + | Partially effective | 34-66% |
| o | Minimially effective | 0-33% |

Table 6.2.1.2 Watershed Impairment Reduction Targets and Projections

| Impairment | Cause | Degree / Basis of Impairment | Impairment Reduction Target | Estimated Impairment Reduction (from Table 6.2.1.3) |
|---|---|---|---|---|
| Water Quality | Total suspended solids / sedimentation | Assumed typical urban runoff water quality impairment; 28,782,654 lb/yr of TSS loading (based on non-point source pollution loading model) | 75% | 55% |
| Water Quality | Bacterial contamination | Aggregate E. coli samples exceed state standard approximately 100% of the time. | 25% | 50% |
| Water Quality | Nutrients (phosphorous) | Assumed typical urban runoff water quality impairment; 11 of 33 (33%) Iowater sites exceed 0.15mg/L P; 30,150 lb/yr of phosphorous loading (based on non-point source pollution loading model) | 50% | 45% |
| Water Quality | Aquatic life toxicity (salinity / chlorides / total dissolved solids) | Assumed typical urban runoff water quality impairment; 29 of 33 (88%) of Iowater sites exceed 30mg/L chloride | 25% | 50% |
| Habitat degradation and alteration | Lack of habitat characteristics | Observed and assumed typical urban watershed impairment | 25% | 37% |
| Habitat degradation and alteration | Hydrologic disturbance / flow alterations | Observed and assumed typical urban watershed impairment | 50% | 50% |
| Habitat degradation and alteration | Wetland loss / degradatioin | Analysis of hydric soils and current wetland locations | 50% | 32% |
| Habitat degradation and alteration | Exotic and invasive species | Observed and assumed typical urban watershed impairment | 25% | 24% |
| Habitat degradation and alteration | Loss / degradation of natural buffer / streamside alterations | Observed and assumed typical urban watershed impairment | 75% | 49% |

### 6.2.1 IMPAIRMENT REDUCTION TARGETS AND ESTIMATES

Impairment Reduction Targets (shown in Table 6.2.1.1) are based on professional opinion of feasibility and indicate the potential reduction of the indicated impairment based on full (100%) implementation of the recommended action. For example, if all of the recommended actions intended to address sediment / Total Suspended Solids were to be fully implemented, then 75% of the sediment / Total Suspended Solids impairment, or problem, can reasonably be expected to be addressed. In other words, even under the best conditions, the entire sediment / Total Suspended Solids problem could not be addressed because there will always be some erosion and runoff of sediment from the urban landscape into the stream. Nonetheless, a 75% reduction in Total Suspended Solids / sediment loading would be a successful achievement for watershed improvement.

The watershed impairment reduction estimates, shown in Table 6.2.1.2, are based on typical pollutant loading and flow rates for urban and rural land uses and for stream and riparian corridors. Table 6.2.1.3 shows the estimated percentage of each impairment that is due to these three land use types. The table also displays the percentage of each impairment that is addressed by the general and site specific action plan recommendations. The percentages of impairment addressed for the general recommendations are the middle range values of the three-point scale in Table 6.2.1.1. The product of these two figures for the three impairment sources (stream/riparian, urban, and rural) results in an estmated impairment reduction for the entire watershed. These figures are general estimates of the total improvement in watershed resources that could be achieved if all of the site specific and 75% of the general recommendations were to be implemented.

## 6.3 PLAN IMPLEMENTATION COST ESTIMATE AND SCHEDULE

Implementation of this plan will require the development of partnerships with local, state, and federal organizations for implementation, technical assistance, and funding. These efforts require the investment of a significant amount of time and resources and, especially, funding. Table 6.3.1 summarizes the estimated amount of funding required for initial and ongoing implementation of the practices recommended in the action plan. Initial costs indicate cost for installation and/ or establishment; annual costs indicate cost for ongoing management and maintenance.

There are numerous sources of funds available to help support projects or provide cost-share to match other sources of funds. A list of numerous local, regional and state funding sources, and the types of projects funded under the various programs, is provided in Chapter 7 of the plan. Most of the programs require a local match of funds or in-kind services. Although these funding sources can provide a good source of revenue, significant local investment of time and financial resources will be required to implement this plan. If fully implemented, however, the quality of the watershed lakes, stream reaches, and wetlands could be significantly improved.

Tables 6.4.1 through 3.4.5 present summaries of the plan implementation details for recommendation priority, schedule, ease of implementation, and technical effort required. More detailed plan implementation cost, scheduling, effectiveness, and implementation responsibilities can be found in Table 6.4.5.

## 6.4 PLAN IMPLEMENTATION TABLES

The implementation plan Table 6.4.5 relates technical details (cost, priority, area, schedule, etc.) about the action plan recommendations presented in Chapter 5. Some of the recommendations are listed multiple times in this table so that details could be established for each separate part of those recommendations that contain multiple parts. For example, a recommendation to restore wetlands and a stream buffer would be broken up into two rows for detailing, one for wetland restoration and the other for establishing a stream buffer. The part being detailed within each row

Table 6.2.1.3 Watershed Impairment Reduction Estimates

| | Water quality | | | | Habitat degradation and alteration | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total suspended solids / sedimentation | Bacteria | Nutrients (phosphorous) | Aquatic life toxicity (salinity / chlorides / total dissolved solids) | Lack of habitat characteristics | Hydrologic disturbance / flow alterations | Wetland loss / degradatioin | Exotic and invasive species | Loss / degradation of natural buffer / streamside alterations |
| % of impairment due to stream / riparian area | 44% | 25% | 21% | 0% | 80% | 0% | 20% | 50% | 80% |
| % of stream / riparian / ravine area impairment addressed by site specific recommendations | 60% | 18% | 29% | 39% | 43% | 42% | 24% | 31% | 41% |
| % of impairment due to urban areas | 30% | 50% | 67% | 99% | 10% | 65% | 40% | 25% | 10% |
| % of urban area impairment addressed by general reccomendations | 50% | 50% | 50% | 50% | 17% | 50% | 17% | 17% | 83% |
| % of impairment due to rural / undeveloped areas | 26% | 25% | 12% | 1% | 10% | 35% | 40% | 25% | 10% |
| % of rural / undeveloped area impairment addressed by general recommendations | 50% | 50% | 50% | 17% | 17% | 50% | 50% | 17% | 83% |
| Total % of the impairment addressed | 55% | 50% | 45% | 50% | 37% | 50% | 32% | 24% | 49% |

Table 6.3.1 Plan Implementation Cost Estimate

| SMU | Initial Cost | Ongoing Cost |
|---|---|---|
| A | $4,510,500 | $409,800 |
| B | $1,734,500 | $207,800 |
| C | $3,000,000 | $147,600 |
| D | $6,846,500 | $771,450 |
| E | $7,691,520 | $917,400 |
| F | $5,289,125 | $476,575 |
| G | $12,474,000 | $880,100 |
| Total | $41,546,145 | $3,810,725 |

Table 6.4.1 Plan Implementation Priorities

| Implementation Term | Number of Actions |
|---|---|
| Priority 1A | 9 |
| Priority 1B | 15 |
| Priority 1C | 14 |
| Priority 1D | 12 |
| Priority 1 | 8 |
| Priority 2 | 23 |
| Priority 3 | 31 |

Table 6.4.2 Plan Implementation Schedule

| Implementation Term | Number of Actions |
|---|---|
| Short | 46 |
| Medium | 46 |
| Long | 36 |

Table 6.4.3 Recommendation Ease of Implementation

| Implementation Term | Number of Actions |
|---|---|
| Easy | 23 |
| Moderate | 34 |
| Difficult | 71 |

Table 6.4.4 Plan Implementation Technical Effort Required

| Implementation Term | Number of Actions |
|---|---|
| Low | 29 |
| Moderate | 63 |
| High | 36 |

is indicated with bold lettering. Table 6.4.5 includes the following information:

- Jurisdiction: in whose jurisdiction does the recommendation fall? B=Bettendorf; D=Davenport; SC=Scott County.

- ID#: Recommendation identification number that corresponds to the Action Plan recommendation descriptions presented in Chapter 5 and on the Subwatershed Management Unit maps.

- Goals Addressed: Letters indicate which of the six watershed plan goals the recommendation is intended to address. A=watershed planning, implementation, and coordination; B=water quality; C=stream restoration and management; D=stormwater management; E=natural resources and habitat; F=watershed education and stewardship.

- Priority: priority refers to the rank importance of the action. A "1" indicates high priority and "3" indicates lower priority. The priority "1" recommendations have been further ranked by the Watershed Planning Committee, with "1A" indicating the highest ranking, "1B" the second highest, and so on. Recommendations with a "1" priority with no ranking letter are considered the lowest priority of the priority "1" recommendations. Within the tables, a green cell indicate priority "1" recommendations, yellow indicates priority "2" recommendations, and red indicates priority "3" recommendations.

- Time frame: indicator of when the action recommendation is intended to be implemented: Short (1-5 years), Medium (5-10 years), or Long (10+ years).

- Ease of Implementation: indicator of how difficult the recommended action is to implement, with "1" indicating a fairly simple action and "3" more complex or difficult action to implement.

- Status: this blank box is to be filled in by implementation organization as recommendations get underway.

- Quantity and Unit: the area needing to be addressed by the recommendation and how that area is measured, by the acre, linear foot, or as a single item.

- Unit Cost: the initial and annual (ongoing) cost per acre, linear foot, or other unit.

- Estimated Cost: the total initial and annual (ongoing) cost for the quantity indicated.

- Implementation Responsibility: indicates the lead party that will most likely be responsible for implementing the action recommendation as well as any supporting parties.

- Technical Effort Required: the complexity / level of technical assistance necessary to implement the recommendation, with "1" indicating low technical effort required and "3" high technical effort required.

- Impairments (shown in the last 9 column headings of the table and beginning with "Water Quality" or "Habitat Degradation"): these column headings are the nine watershed impairments that the watershed plan is intended to address.

- Impairment Reduction Effectiveness: the symbols in these cells represent best estimates and / or ranges of the potential effectiveness of each of the recommendations in addressing the listed impairment as follows (see Table 6.2.1.1.):

"o" = the recommendation minimally addresses (0-33%) the listed impairment;

"+" = the recommendation moderately addresses (34-66%) the listed impairment;

"++" = the recommendation significantly addresses the listed impairment (67-100%).

These estimates are based on professional opinion and on a variety of studies examining the potential effectiveness of different actions and best management practices. For example, streambank stabilization recommendations have "++" in the column for "Water Quality: TSS / sediment" because proper stabilization can significantly reduce the erosion of soil and stream banks into the stream. However, streambank stabilization recommendations have a "o" in the column for "Habitat Degradation: Wetland loss / degradation" because stabilizing streambanks has a minimal, if any, positive impact on wetlands because the stabilization occurs in streams, not wetlands.

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Table 6.4.5 Watershed Plan Implementation Tables

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU A** | | | | | | | |
| Bet, Dav | A1 | Retrofit Residential Neighborhoods with Stormwater BMPs: Implement rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1A | 5-10 yrs | 3 | 2 | | |
| Bet | A2 | Filter and Infiltrate Runoff from Commercial and Industrial Land Uses: Existing commercial and industrial areas with large roofs and parking lots are generally located downstream of State Street. The runoff from these impervious areas should be treated before being discharged to Duck Creek using BMPs such as bioretention and permeable paving that are readily integrated into existing developed areas with little area available for detention and other more land intensive BMPs. These BMPs are described in the BMP Toolbox. In areas of outdoor material storage and/or industrial processes, site specific runoff management plans should be prepared to prevent release of industrial materials. | B, D | 1A | 10+ yrs | 3 | 3 | | |
| -- | A3 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Bet | A3a | Restore as woodland the wooded bluff and riparian buffer that parallels Duck Creek from Devil's Glen Road upstream to I-74, particularly the more generous buffer area (averaging greater than 250' in width) that extends from Devil's Glen Road upstream to 18th Street. **Riparian buffer restoration area approximately 16,000 linear feet (3 miles) by 100 feet wide.** | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| Bet | A3a | Restore as woodland the wooded bluff and riparian buffer that parallels Duck Creek from Devil's Glen Road upstream to I-74, particularly the more generous buffer area (averaging approximately 250 feet in width) that extends from Devil's Glen Road upstream to 23rd Street. **Wooded area outside buffer is approximately 1 mile by 250 feet (30 acres.)** | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Bet | A3b | Restore the large green infrastructure hub formed by Middle Road Park and the Palmer Hills Golf Course north of Duck Creek (between DW3 and DW4). Where feasible, **restore wetlands in areas of hydric soils (approximately 4 acre area around and including the detention pond north of Duck Creek, and 9 acre wooded area along Duck Creek)** and install a minimum 100 foot restored riparian buffer along Duck Creek (5000 feet long by 100 feet wide) and tributary drainages such as that flowing through Palmer Hills Golf Course (3000 feet long * 25 feet wide). Integrate natural landscape systems into the golf course rough and along water features to help reduce the impact of management practices and chemicals. | B, C, D, E | 1B | 10+ yrs | 3 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Bet, Dav | + | o | ++ | + | o | ++ | o | o | o |
| | varies | feet / acres | varies | varies | varies | varies | CBL, Bet | ++ | o | o | ++ | o | + | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 16,000 | feet | $100 | $5 | $1,600,000 | $80,000 | Landowners, Bet | + | o | o | o | ++ | o | o | ++ | ++ |
| | 30 | acres | $8,000 | $1,700 | $240,000 | $51,000 | Landowners, Bet | + | o | o | o | ++ | o | o | ++ | ++ |
| | 13 | acres | $5,000 | $1,500 | $65,000 | $19,500 | Bet, Golf Course | o | o | + | o | + | + | ++ | + | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU A** | | | | | | | |
| Bet | A3b | Restore the large green infrastructure hub formed by Middle Road Park and the Palmer Hills Golf Course north of Duck Creek (between DW3 and DW4). Where feasible, restore wetlands in areas of hydric soils (4 acre area around / including the detention pond, 9 acre wooded area along Duck Creek) and **install a minimum 100 foot restored riparian buffer along Duck Creek (5000 feet by 100 feet wide)** and tributary drainages such as that flowing through Palmer Hills Golf Course (3000 feet by 25 feet wide). Integrate natural landscape systems into the golf course rough and along water features to help reduce the impact of management practices and chemicals. | B, C, D, E | 1B | 5-10 yrs | 2 | 2 | | |
| Bet | A3b | Restore the large green infrastructure hub formed by Middle Road Park and the Palmer Hills Golf Course north of Duck Creek (between DW3 and DW4). Where feasible, restore wetlands in areas of hydric soils (4 acre area around / including the detention pond, 9 acre wooded area along Duck Creek) and **install a** minimum 100 foot **restored riparian buffer along** Duck Creek (5000 feet by 100 feet wide) and **tributary drainages such as that flowing through Palmer Hills Golf Course (3000 feet by 25 feet wide)**. Integrate natural landscape systems into the golf course rough and along water features to help reduce the impact of management practices and chemicals. | B, C, D, E | 1B | 5-10 yrs | 2 | 2 | | |
| Bet | A3b | Restore the large green infrastructure hub formed by Middle Road Park and the Palmer Hills Golf Course north of Duck Creek (between DW3 and DW4). Where feasible, restore wetlands in areas of hydric soils (4 acre area around / including the detention pond, 9 acre wooded area along Duck Creek) and install a minimum 100 foot restored riparian buffer along Duck Creek (5000 feet by 100 feet wide)) and tributary drainages such as that flowing through Palmer Hills Golf Course (3000 feet by 25 feet wide). **Integrate natural landscape systems (5% of 110 acre golf course, or approximately 5 acres) into the golf course rough and along water features to help reduce the impact of management practices and chemicals**. | B, C, D, E | 1B | 0-5 yrs | 1 | 1 | | |
| Dav | A3c | Within the Duck Creek Park and Golf Course, restore and expand wetlands along and near Duck Creek and a **minimum 100 foot native riparian buffer (5000 feet by 200 feet)**. At a minimum, the remnant wetland near DW7, on the right bank of Duck Creek, should be preserved, restored, and expanded into surrounding areas of open space and hydric soils. Manage and restore remnant woodlands along Duck Creek Park Road, Fernwood Avenue, and Fairhaven Road. | B, C, D, E | 1C | 5-10 yrs | 2 | 2 | | |
| Dav | A3c | Within the Duck Creek Park and Golf Course, **restore and expand wetlands along and near Duck Creek (approximately 10 acres)** and a minimum 100 foot native riparian buffer. At a minimum, the remnant wetland near DW7, on the right bank of Duck Creek, should be preserved, restored, and expanded into surrounding areas of open space and hydric soils. Manage and restore remnant woodlands along Duck Creek Park Road, Fernwood Avenue, and Fairhaven Road. | B, C, D, E | 1C | 10+ yrs | 3 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 5000 | feet | $100 | $5 | $500,000 | $25,000 | Bet, Golf Course | + | o | o | o | ++ | o | o | ++ | ++ |
| | 3000 | feet | $25 | $0 | $75,000 | $300 | Bet, Golf Course | + | o | o | o | ++ | o | o | ++ | ++ |
| | 5 | acres | $2,500 | $500 | $12,500 | $2,500 | Golf Course | + | o | ++ | o | o | o | o | o | ++ |
| | 5000 | feet | $100 | $5 | $500,000 | $25,000 | Dav | + | o | o | o | ++ | o | o | ++ | ++ |
| | 10 | acres | $5,000 | $1,500 | $50,000 | $15,000 | Dav | o | o | + | o | + | + | ++ | + | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU A** | | | | | | | |
| Dav | A3c | Within the Duck Creek Park and Golf Course, restore and expand wetlands along and near Duck Creek and a minimum 100 foot native riparian buffer. At a minimum, the remnant wetland near DW7, on the right bank of Duck Creek, should be preserved, restored, and expanded into surrounding areas of open space and hydric soils. **Manage and restore remnant woodlands along Duck Creek Park Road, Fernwood Avenue, and Fairhaven Road (approximately 1500 feet by 1000 foot area, or 35 acres).** | B, C, D, E | 1C | 5-10 yrs | 2 | 2 | | |
| Dav | A3d | Work with the Duck Creek Golf Course to implement management programs to limit nutrient and other chemical applications to only what is needed to maintain play areas, possibly including Integrated Pest Management practices. | B | 1C | 0-5 yrs | 1 | 1 | | |
| Bet, Dav | A4 | Address Residential Stormwater Discharges to Duck Creek: Investigate storm sewers that may be discharging from the residential areas above the bluff edge on the right bank (looking downstream) of Duck Creek. Retrofit neighborhoods as described in recommendation 1 above, and stabilize storm sewer outfalls that may be causing erosion of the steep terrain. | C, D | 1C | 0-5 yrs | 1 | 1 | | |
| Bet, Dav | A5 | Restore Poor Stream Habitat: Restore aquatic and riparian habitat near DW7 and DW8 (approximately 1 mile), where silt and muck substrates dominate the channel bottom within Duck Creek Golf Course and few instream habitat features were observed. Where appropriate, install artificial riffles and instream cover such as rocks and root wads to create habitat. Preserve meandering, pool / riffle structures, and cobble and gravel substrates along the highest quality reaches within the watershed from DW6 to DW2 by restoring upstream hydrology and stabilizing streambanks to reduce erosion and sedimentation. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| -- | A6 | Implement Riparian Commercial-Industrial Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Bet | A6a | The Duck Creek main stem between State Street and the Mississippi River confluence. 3000 feet. | B, C, D, E | 1C | 10+ yrs | 3 | 2 | | |
| Bet | A6b | Industrial and commercial properties adjacent to Duck Creek between Kimberly Road and I-74. 1200 feet. | B, C, D, E | 1 | 10+ yrs | 3 | 2 | | |
| | | **SMU B** | | | | | | | |
| Bet, Dav | B1 | Retrofit Residential Neighborhoods with Stormwater BMPs: Implement rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1A | 5-10 yrs | 3 | 2 | | |

| | Quantity | Unit | Unit Cost | | Estimated Cost | | Implementation Responsibility | Impairment Reduction Effectiveness | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial ($) | Annual ($) | Initial ($) | Annual ($) | | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
| | 35 | acres | $8,000 | $1,700 | $280,000 | $59,500 | Dav | + | o | o | o | ++ | + | o | ++ | o |
| | NA | NA | NA | NA | NA | NA | Golf Course | o | o | ++ | ++ | o | o | o | o | o |
| | varies | each | $1,000 | $150 | NA | NA | PRL, Bet, Dav | + | o | o | o | o | o | o | o | o |
| | 5280 | feet | $225 | $25 | $1,188,000 | $132,000 | Bet, Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | varies | varies | varies | varies | CBL, Bet | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | CBL, Bet | ++ | o | o | ++ | o | + | o | o | + |
| | | | | | | | | | | | | | | | | |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Bet, Dav | + | o | ++ | + | o | ++ | o | o | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU B** | | | | | | | |
| -- | B2 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Bet | B2a | The concentration of green space comprised of the Palmer Hills Golf Course and Middle Road Park west of the golf course should be restored. Where feasible, restore wetlands in areas of hydric soils and install a minimum 100' restored riparian buffer along Duck Creek and tributary drainages such as that flowing through Palmer Hills Golf Course. Integrate natural landscape systems into the golf course rough and along water features to help reduce the impact of management practices and chemicals. Naturalize the golf course ponds with a native riparian buffer. Work with the Golf Course to implement nutrient and pesticide management programs to limit applications of these materials to only what is needed to maintain play areas. | see A3b | see A3b | see A3b | see A3b | see A3b | | |
| Bet | B2b | The forested area within Hollowview Park (DW3), which exhibited the highest vegetative quality observed within the Duck Creek system. Thin the forest canopy, control invasive species, and nurture the recovery of this area with appropriate management, such as the use of controlled burning. Forested area is approximately 200 feet by 2000 feet (9 acres). | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Bet | B2c | Restore a native riparian buffer and replace turf grass with deep-rooted native species between DW4 and I-74. A 100 foot buffer area is recommended, though in many areas along this reach 25 feet may be sufficient due to the park recreational uses and trail. Approximate area is 7500 feet long by 25 wide (an average recommended width). | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| Bet | B2d | Manage and restore parts of Devil's Glen Park (DW2) as woodland and restore a native riparian buffer where mown turf grass now exists. Area is approximately 1000 feet by 1000 feet. | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Bet | B2e | Preserve and restore the small, forested green infrastructure hub that buffers a small tributary in the far eastern edge of this SMU east of Devil's Glen Park. This area should be preserved and connected to Devil's Glen Park along the tributary stream corridor. Approximate area is 3000 feet by 400 feet, | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Bet | B2f | Establish a naturalized stream corridor on either side of Stafford Creek at Bettendorf High School. | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| -- | B3 | Install Bioengineering Practices to Stabilize Stream Banks: | -- | -- | -- | -- | -- | -- | |
| Bet | B3a | Severe erosion and 6-10 foot cut banks near DW3 | B, C | 2 | 5-10 yrs | 3 | 3 | | |

| | Quantity | Unit | Unit Cost | | Estimated Cost | | Implementation Responsibility | Impairment Reduction Effectiveness | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial ($) | Annual ($) | Initial ($) | Annual ($) | | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b | see A3b |
| | 9 | acres | $8,000 | $1,700 | $72,000 | $15,300 | Bet, IADNR | + | o | o | o | ++ | + | o | ++ | o |
| | 7500 | feet | $25 | $0 | $187,500 | $750 | Bet | + | o | o | o | ++ | o | o | ++ | ++ |
| | 23 | acres | $8,000 | $1,700 | $184,000 | $39,100 | Bet | + | o | o | o | ++ | + | o | ++ | o |
| | 27 | acres | $8,000 | $1,700 | $216,000 | $45,900 | Landowners, Bet | + | o | o | o | ++ | + | o | ++ | o |
| | 1200 | feet | $100 | $5 | $120,000 | $6,000 | Bet, Bettendorf High School | + | o | o | o | ++ | o | o | ++ | ++ |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 100 | feet | $150 | $2 | $15,000 | $150 | Bet | ++ | o | o | o | + | o | o | o | ++ |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU B** | | | | | | | |
| Bet, Dav | B3b | Moderate erosion near DW6 and DW7 | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Bet | B3c | Mild to moderate erosion at DW3.1 and DW5. | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Bet | B4 | Restore Poor Stream Habitat: Restore aquatic and riparian habitat near DW5, where few instream habitat features were observed. Where appropriate, install artificial riffles and instream cover such as rocks and root wads following Iowa DNR guidelines. | C, E | 1D | 0-5 yrs | 3 | 3 | | |
| -- | B5 | Implement Riparian Residential Land Use Recommendations for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Bet, Dav | B5a | Along the majority of Stafford Creek upstream of Middle Road. 16,400 feet. | B, C, D | 1B | 0-5 yrs | 1 | 1 | | |
| Bet | B5b | Along the majority of the smaller drainages within the SMU. 8500 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |
| Bet | B5c | Along Duck Creek between DW4, DW5, and DW6, where the turf grass riparian corridor and runoff from surrounding residential areas and streets contributes urban non point source pollutants to the creek. 4000 feet. | B, C, D | 1C | 0-5 yrs | 1 | 1 | | |
| Bet | B6 | Implement Riparian Commercial-Industrial Land Use Recommendations Contained in the General Recommendations for Duck Creek along one of the west branches of Stafford Creek upstream of Middle Road. 1200 feet. | B, C, D | 1C | 10+ yrs | 3 | 2 | | |
| | | **SMU C** | | | | | | | |
| -- | C1 | Utilize Stormwater BMPs and Low Impact Design Principles for New and Existing Development: | -- | -- | -- | -- | -- | -- | |
| Dav | C1a | Retrofit residential neighborhoods with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1C | 5-10 yrs | 3 | 2 | | |
| Dav | C1b | Utilize low impact development principles and practices when urbanizing the undeveloped portions of the watershed. | B, D | 1B | 0-5 yrs | 3 | 3 | | |
| Bet, Dav | C2 | Install Stormwater BMPs in Commercial Areas: incorporate stormwater BMPs within the concentrated commercial and office land uses along I-74, Elmore Avenue, Utica Ridge Road, and East 53rd Street to capture, slow, filter, and infiltrate stormwater runoff before reaching Pheasant Creek. Also retrofit existing detention ponds to improve water quality. | B, D | 1A | 10+ yrs | 3 | 3 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 200 | feet | $100 | $2 | $20,000 | $300 | Bet, Dav | ++ | o | o | o | + | o | o | o | ++ |
| | 200 | feet | $100 | $2 | $20,000 | $300 | Bet | ++ | o | o | o | + | o | o | o | ++ |
| | 4000 | feet | $225 | $25 | $900,000 | $100,000 | Bet, IADNR | + | o | o | o | ++ | o | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Bet, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Bet | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Bet | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | CBL, Bet | ++ | o | o | ++ | o | + | o | o | o |
| | | | | | | | | | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Dav | + | o | ++ | + | o | ++ | o | o | o |
| | varies | feet / acres | varies | varies | varies | varies | DH, Landowners, Dav | + | o | + | o | + | ++ | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | CBL, Bet, Dav | ++ | o | o | ++ | o | + | o | o | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU C** | | | | | | | |
| Bet, Dav | C3 | Filter Highway Runoff: capture, filter, and infiltrate road runoff from Interstate 74 before reaching Pheasant Creek through naturalization of the open drainageways along the highway corridor. | B, D | 1D | 10+ yrs | 3 | 3 | | |
| -- | C4 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Dav | C4a | Restore the riparian corridor along the entire, publicly-owned reach of Duck Creek, from Jersey Ridge Road to East Kimberly Road. Upstream of Duck Creek Golf Course, this restoration will likely consist primarily of a riparian buffer. | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| Dav | C4b | Within the Duck Creek Golf Course, restore and expand wetlands along and near Duck Creek and a minimum 100' native riparian buffer. | see A3c | see A3c | see A3c | see A3c | see A3c | | |
| Dav | C4c | The partially- forested riparian buffer along the banks of Pheasant Creek and Hanlin Creek, from West Kimberly Road upstream, past East 46th St., to approximately East 49th St. should be restored as a green infrastructure corridor. | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| Dav | C5 | Install Bioengineering Practices to Stabilize Stream Banks: stabilize severe erosion at DW7 and DW8 and inspect Pheasant Creek and Hanlin Creek for areas of severe erosion. | B, C, E | 2 | 5-10 yrs | 3 | 3 | | |
| Bet, Dav | C6 | Restore Poor Stream Habitat: Restore the entire reach of Duck Creek following Iowa DNR guidelines, including installing artificial riffles and instream cover and habitat features such as root wads, rocks, and boulders. As far as possible, preserve the riffles and locations of gravel / cobble substrate observed near DW7. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| -- | C7 | Implement Riparian Residential Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | C7a | Hanlin Creek upstream of Lorton Avenue and East 49th Street. 10,000 feet. | B, C, D | 1D | 0-5 yrs | 1 | 1 | | |
| Dav | C7b | Pheasant Creek from the Duck Creek Golf Course upstream to West Kimberly Road. 2500 feet. | B, C, D | 1D | 0-5 yrs | 1 | 1 | | |
| Dav | C7c | The entire length of the unnamed western tributary. 5000 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |
| Dav | C7d | Reaches of Pheasant Creek adjacent to new residential development south of Jersey Ridge Road and East 67th Street. 3000 feet. | B, C, D | 1C | 0-5 yrs | 1 | 1 | | |

| | Quantity | Unit | Unit Cost | | Estimated Cost | | Implementation Responsibility | Impairment Reduction Effectiveness | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial ($) | Annual ($) | Initial ($) | Annual ($) | | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
| | varies | feet / acres | varies | varies | varies | varies | IADOT | + | o | o | ++ | o | + | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 7200 | feet | $100 | $5 | $720,000 | $36,000 | Dav | + | o | o | o | ++ | o | o | ++ | ++ |
| | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c | see A3c |
| | 7500 | feet | $100 | $5 | $750,000 | $37,500 | Dav, Landowners | + | o | o | o | ++ | o | o | ++ | ++ |
| | 200 | feet | $150 | $2 | $30,000 | $300 | Dav | ++ | o | o | o | + | o | o | o | ++ |
| | 9300 | feet | $225 | $25 | $1,500,000 | $73,800 | Bet, Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU C** | | | | | | | |
| Dav | C8 | Implement Riparian Commercial-Industrial Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: the main stem of Pheasant Creek upstream from Kimberly Road to approximately East 39th St., and from East 46th St. to East 49th St. 7500 feet. | B, C, D | 1 | 10+ yrs | 3 | 2 | | |
| | | **SMU D** | | | | | | | |
| -- | D1 | Utilize Stormwater BMPs and Low Impact Design Principles for New and Existing Development: | -- | -- | -- | -- | -- | -- | |
| Dav | D1a | Retrofit residential neighborhoods with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1A | 5-10 yrs | 3 | 2 | | |
| Dav | D1b | Utilize low impact development principles and practices when urbanizing the undeveloped portions of the watershed, a significant portion of which is planned for future residential and commercial development. It is critical to use conservation design / Low Impact Development techniques and BMPs in new development to prevent increases in flooding, stream bank erosion, and water quality degradation. | B, D | 1B | 0-5 yrs | 3 | 3 | | |
| Dav, SC | D1c | Implement agricultural land use recommendations on agricultural land. | B, D | 1B | 0-5 yrs | 2 | 2 | | |
| Dav | D2 | Protect Goose Creek from High Runoff: install stormwater BMPs to reduce the rate and volume of stormwater discharged from Davenport Municipal Airport impervious surfaces to reduce the impact on the headwaters of Goose Creek's stream banks and channel. | B, C, D | 1D | 10+ yrs | 3 | 3 | | |
| -- | D3 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Dav | D3a | Restore the small wetland near DW10. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | D3b | The forested riparian buffer along the banks near DW10 should be thinned to allow more sunlight to reach the forest floor. | B, C, D, E | 2 | 5-10 yrs | 2 | 2 | | |
| Dav | D3c | Investigate the potential to recreate and restore wetlands in the area of the hydric soils near the confluence of Duck Creek and Goose Creek (DW9 in Eastern Avenue Park). | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | D3d | Restore wetlands within the hydric soils in the upper reaches of Goose Creek, north and west of Appomattox Road and West 61st Street. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | | | | | | | | | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Dav | + | o | ++ | + | o | ++ | o | o | o |
| | varies | feet / acres | varies | varies | varies | varies | DH, Landowners, Dav | + | o | + | o | + | ++ | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | Landowners, Dav, SC, NRCS / SWCD | ++ | + | ++ | o | o | + | o | o | ++ |
| | varies | feet / acres | varies | varies | varies | varies | Dav | + | o | o | ++ | o | ++ | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 2 | acres | $5,000 | $1,500 | $10,000 | $3,000 | Dav | + | o | o | o | ++ | + | o | ++ | o |
| | 5 | acres | $8,000 | $1,700 | $40,000 | $8,500 | Dav | + | o | o | o | ++ | + | o | ++ | o |
| | 4 | acres | $5,000 | $1,500 | $20,000 | $6,000 | Dav | o | o | + | o | + | + | ++ | + | o |
| | 25 | acres | $5,000 | $1,500 | $125,000 | $37,500 | Landowners, Dav | o | o | + | o | + | + | ++ | + | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU D** | | | | | | | |
| Dav | D3e | Restore the wetlands and woodlands along Goose Creek between East 39th Street and East 46th Street within the Pine Hill Cemetery, and the corridor extending upstream to East 53rd Street. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | D3f | Preserve and restore a green infrastructure hub in the area bordered by Tremont Avenue on the east, East 53rd Street on the south, East 59th Street on the north, and North Brady Street on the west. | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | D4 | Install Bioengineering Practices to Stabilize Stream Banks: stabilize bank erosion at DW9, DW11 and DW11.1, as well as the large stream bank blowout near the pedestrian bridge downstream of DW10. | B, C, E | 2 | 5-10 yrs | 3 | 3 | | |
| -- | D5 | Restore Poor Stream Habitat: Restore the entire reach of Duck Creek following Iowa DNR guidelines, including installing artificial riffles and instream cover and habitat features such as root wads, rocks, and boulders. As far as possible, preserve the meandering, gravel bars, and the connection between the floodplain and the stream at DW9 and DW11. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| Dav | D5a | Remove large woody debris obstructions from Candlelight Creek upstream of West 53rd Street (DW11.1). | C, E | 2 | 0-5 yrs | 2 | 1 | | |
| Dav | D5b | Consider daylighting and restoring Candlelight Creek reaches that pass under the Northpark Mall and Lujack's Lexus properties near Kimberly Road and Northwest Boulevard. This is a long term recommendation that should only be considered if these properties are repurposed in the future. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| Dav | D6 | Restore the Landscape: restore the area northeast of the I-80 and Highway 61 intersection to prairie or other natural landscape. | E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | D7 | Stabilize Gully Erosion: use bioengineering to stabilize gully erosion along the right bank near DW10 and DW11 before additional erosion creates deeper and wider gullies that will be more difficult and costly to repair. | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Dav | D8 | Repair Stormwater Infrastructure: repair or replace the broken stormwater outfall pipe at DW9.2 and stabilize the streambank to prevent further erosion and infrastructure damage. | B, C, D | 3 | 0-5 yrs | 3 | 2 | | |
| -- | D9 | Implement Riparian Residential Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 7000 | feet | $100 | $5 | $700,000 | $35,000 | Dav, Landowners | o | o | + | o | + | + | ++ | + | o |
| | 50 | acres | $7,500 | $1,700 | $375,000 | $85,000 | Dav, Landowners | + | o | o | o | ++ | + | o | ++ | o |
| | 400 | feet | $150 | $2 | $60,000 | $600 | Dav | ++ | o | o | o | + | o | o | o | ++ |
| | 11000 | feet | $225 | $25 | $2,475,000 | $275,000 | Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | 1 | each | $1,500 | $50 | $1,500 | $50 | Dav, IADNR | o | o | o | o | + | + | o | o | + |
| | 4400 | feet | $575 | $50 | $2,530,000 | $220,000 | Dav, IADNR | o | o | o | o | ++ | o | o | o | ++ |
| | 200 | acres | $2,500 | $500 | $500,000 | $100,000 | Landowners | + | o | o | o | + | o | + | o | + |
| | 2 | each | $2,000 | $150 | $4,000 | $300 | Dav | ++ | o | o | o | o | o | o | o | ++ |
| | 1 | each | $6,000 | $500 | $6,000 | $500 | Dav | ++ | o | o | o | o | o | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU D** | | | | | | | |
| Dav | D9a | The majority of Candlelight Creek upstream of West 46th Street. 5500 feet. | B, C, D | 1D | 0-5 yrs | 1 | 1 | | |
| Dav | D9b | Along Meadowview Lane and Appomattox on Goose Creek upstream and northwest of the Deere Creek confluence. 6300 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |
| -- | D10 | Implement Riparian Commercial-Industrial Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | D10a | East 35th Street (DW11) on the Duck Creek main stem. 2000 feet. | B, C, D | 1D | 10+ yrs | 3 | 2 | | |
| Dav | D10b | Goose Creek between East 33rd Street and East 39th Street. 2800 feet. | B, C, D | 1D | 10+ yrs | 3 | 2 | | |
| Dav | D10c | Goose Creek between East 46th Street to East 53rd Street (DW9.2). 2500 feet. | B, C, D | 1D | 10+ yrs | 3 | 2 | | |
| Dav | D10d | Goose Creek adjacent to the industrial land uses on West 76th Street. 1400 feet. | B, C, D | 1D | 10+ yrs | 3 | 2 | | |
| Dav | D10e | The right bank of Deere Creek from East 46th Street upstream to East 59th Street. 5500 feet. | B, C, D | 1D | 10+ yrs | 3 | 2 | | |
| Dav | D11 | Establish management and maintenance agreements for stormwater BMPs: work with North High School to manage and maintain the rain gardens and stormwater infiltration / detention ponds on high school property within the Candlelight Creek drainage. | B, D, F | 2 | 0-5 yrs | 2 | 1 | | |
| | | **SMU E** | | | | | | | |
| Dav | E1 | Retrofit Residential Neighborhoods with Stormwater BMPs: Implement rain gardens, vegetated swales, and naturalized detention (where feasible) and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1B | 5-10 yrs | 3 | 2 | | |
| -- | E2 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Dav | E2a | Restore wetlands within the complex of hydric and hydrologic soil group C and D soils, extending west along the Duck Creek main stem from Hickory Grove Road into SMU G (DW16 and DW15). The portion of this complex west of Fairmount Avenue is part of the US Army Corps of Engineers Duck Creek / Fairmount Park Wetland Restoration project to restore wetland, prairie, and stream restoration. This project should be prioritized for funding by the US Army Corps and the City of Davenport and implemented as soon as possible as a demonstration project. If designed and restored appropriately, this area may help to attenuate floodwater flows that are causing damage to the Duck Creek stream channel and riparian corridor. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 5500 | feet | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | 6300 | feet | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | 1 | each | NA | NA | NA | NA | Dav, North High School | + | o | + | + | o | o | o | o | o |
| | | | | | | | | | | | | | | | | |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Dav | + | o | ++ | + | o | ++ | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 15 | acres | $5,000 | $1,500 | $75,000 | $22,500 | Landowners, Dav, USACE, IADNR | + | o | o | o | ++ | + | o | ++ | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU E** | | | | | | | |
| Dav | E2b | Preserve and restore to prairie the undeveloped area south of Duck Creek and north of Heatherton Drive as a green infrastructure hub. | E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | E2c | Restore the small wetland near DW10. | see D3a | see D3a | see D3a | see D3a | see D3a | | |
| Dav | E2d | The forested riparian buffer along the banks near DW10 should be thinned to allow more sunlight to reach the forest floor. | see D3b | see D3b | see D3b | see D3b | see D3b | | |
| Dav | E2e | Restore the stream channel, **wetlands and woodlands** in the area of hydric soils downstream of the Duck Creek confluence with Goose Creek (DW9 in Eastern Avenue Park) along the northern edge of Oakdale Memorial Gardens. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | E2e | Restore the **stream channel**, wetlands and woodlands in the area of hydric soils downstream of the Duck Creek confluence with Goose Creek (DW9 in Eastern Avenue Park) along the northern edge of Oakdale Memorial Gardens. | B, C, D, E | 2 | 10+ yrs | 3 | 3 | | |
| Dav | E2f | Restore the **stream channel**, restore and expand the wetland, and restore the degraded natural area along Duck Creek to a complex of wetland, woodland, and prairie. The area is bordered by Marquette Street on the west, Gaines Street on the east, and West Central Park Avenue to the south. This area could also serve an educational function for the nearby schools. | B, C, D, E | 2 | 10+ yrs | 3 | 3 | | |
| Dav | E2f | Restore the stream channel, **restore and expand the wetland**, and restore the degraded natural area along Duck Creek to a complex of wetland, woodland, and prairie. The area is bordered by Marquette Street on the west, Gaines Street on the east, and West Central Park Avenue to the south. This area could also serve an educational function for the nearby schools. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | E2f | Restore the stream channel, restore and expand the wetland, and **restore the degraded natural area** along Duck Creek to a complex of wetland, woodland, and prairie. The area is bordered by Marquette Street on the west, Gaines Street on the east, and West Central Park Avenue to the south. This area could also serve an educational function for the nearby schools. | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 30 | acres | $7,500 | $1,700 | $225,000 | $51,000 | Landowners | + | o | o | o | ++ | + | o | ++ | o |
| | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a | see D3a |
| | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b | see D3b |
| | 5 | acres | $8,000 | $1,700 | $40,000 | $8,500 | Dav | o | o | + | o | + | + | ++ | + | o |
| | 1500 | feet | $225 | $25 | $337,500 | $37,500 | Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | 3200 | feet | $225 | $25 | $720,000 | $80,000 | Landowners, IADNR | + | o | o | o | ++ | o | o | o | + |
| | 5 | acres | $5,000 | $1,500 | $25,000 | $7,500 | Landowners | o | o | + | o | + | + | ++ | + | o |
| | 20 | acres | $7,500 | $1,700 | $150,000 | $34,000 | Landowners | o | o | + | o | + | + | ++ | + | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU E** | | | | | | | |
| Dav | E3 | Restore Poor Stream Habitat: Restore the entire reach of Duck Creek following Iowa DNR guidelines, including installing artificial riffles and instream cover and habitat features such as root wads, rocks, and boulders. As far as possible, preserve the following habitat features: minor meandering at DW9, DW12 and DW15; riffles and braiding at DW15 and DW16; and semi-natural floodplain connections at DW11 and DW16. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| Dav | E4 | Stabilize Erosion: Use bioengineering practices to stabilize **gully erosion** along the banks near DW10, DW11, DW12 and DW14 as well as the severe streambank slumping at DW 12 and near the footbridge downstream of DW10 before additional erosion creates deeper and wider gullies that will be more difficult, and costly, to repair. | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Dav | E4 | Stabilize Erosion: Use bioengineering practices to stabilize gully erosion along the banks near DW10, DW11, DW12 and DW14 as well as the **severe streambank slumping** at DW 12 and near the footbridge downstream of DW10 before additional erosion creates deeper and wider gullies that will be more difficult, and costly, to repair. | | 2 | 5-10 yrs | 3 | 3 | | |
| Dav | E5 | Remove Stream Sediment: remove built up sediment to help restore stream habitat behind the low head dam upstream of the pedestrian bridge in Marquette Creek Park (DW13). | C, E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | E6 | Repair Stormwater Infrastructure: repair or replace the broken stormwater outfall pipe at DW13 and stabilize the streambank to prevent further erosion and infrastructure damage. | B, C, D | 3 | 0-5 yrs | 3 | 2 | | |
| -- | E7 | Implement Riparian Residential Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | E7a | East 32nd Street and Valley Vista Road (DW10). 2500 feet. | B, C, D | 1A | 0-5 yrs | 1 | 1 | | |
| Dav | E7b | West George Washington Boulevard and North George Washington Boulevard along the Duck Creek main stem. 1200 feet. | B, C, D | 1A | 0-5 yrs | 1 | 1 | | |
| | | **SMU F** | | | | | | | |
| -- | F1 | Utilize Stormwater BMPs and Low Impact Design Principles for New and Existing Development: | -- | -- | -- | -- | -- | -- | |
| Dav | F1a | Retrofit residential neighborhoods with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1B | 5-10 yrs | 3 | 2 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 27000 | feet | $225 | $25 | $6,075,000 | $675,000 | Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | 4 | each | $2,000 | $150 | $8,000 | $600 | Dav | ++ | o | o | o | o | o | o | o | ++ |
| | 200 | feet | $150 | $2 | $30,000 | $300 | Dav | ++ | o | o | o | + | o | o | o | ++ |
| | 1 | each | $20 | $0 | $20 | $0 | Dav | ++ | o | o | o | ++ | ++ | o | o | o |
| | 1 | each | $6,000 | $500 | $6,000 | $500 | Dav | ++ | o | o | o | o | o | o | o | + |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | | | | | | | | | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Dav | + | o | ++ | + | o | ++ | - | o | o |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU F** | | | | | | | |
| Dav | F1b | Utilize low impact development principles and practices when urbanizing the undeveloped portions of the watershed, a significant portion of which is planned for future residential and commercial development. It is critical to use conservation design / Low Impact Development techniques and BMPs in new development to prevent increases in flooding, stream bank erosion, and water quality degradation. | B, D | 1A | 0-5 yrs | 3 | 3 | | |
| Dav | F1c | Implement agricultural land use recommendations on agricultural land. | B, D | 1B | 0-5 yrs | 2 | 2 | | |
| Dav | F2 | Restore and Manage Wetlands: restore wetlands within the complex of hydric soils extending west along the Duck Creek main stem from Hickory Grove Road into SMU G (DW16 and DW15). The portion of this complex west of Fairmount Avenue is part of the US Army Corps of Engineers Duck Creek / Fairmount Park Wetland Restoration project to restore wetland, prairie, and stream restoration. This project should be prioritized for funding by the US Army Corps and implemented as soon as possible as a demonstration project. If designed and restored appropriately, this area may help to attenuate floodwater flows that are causing damage to the Duck Creek stream channel and riparian corridor. | see E2a | see E2a | see E2a | see E2a | see E2a | | |
| -- | F3 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Dav | F3a | Along the Silver Creek system, which includes the large area north and west of Kimberly Road to approximately West 48th Street, which should be restored to wetland and prairie, and the corridor along the reach from West 49th Street north to I-80. | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | F3b | The publicly owned parcel bounded by North Marquette Street, West 43rd Street, and West 46th Street. | B, C, D, E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | F4 | Restore Poor Stream Habitat: Restore the entire reach of Duck Creek following Iowa DNR guidelines, including installing artificial riffles and instream cover and habitat features such as root wads, rocks, and boulders. As far as possible, preserve the following features: minor meandering at DW12 and DW15, riffles at DW16, braiding at DW15 and DW16, and a hydrologic floodplain connection at DW16. | C, E | 3 | 0-5 yrs | 3 | 3 | | |
| Dav | F5 | Stabilize Erosion: use bioengineering to stabilize the moderately severe gully erosion and **severe streambank slumping near DW12** and minor gully erosion near DW14 before additional erosion creates deeper and wider gullies that will be more difficult and costly, to repair. | B, C | 2 | 5-10 yrs | 3 | 3 | | |

| | Quantity | Unit | Unit Cost | | Estimated Cost | | Implementation Responsibility | Impairment Reduction Effectiveness | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial ($) | Annual ($) | Initial ($) | Annual ($) | | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
| | varies | feet / acres | varies | varies | varies | varies | DH, Landowners, Dav | + | o | + | o | + | ++ | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | Landowners, NRCS / SWCD, Dav | ++ | + | ++ | o | o | + | o | o | ++ |
| | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | 20000 | feet | $100 | $5 | $2,000,000 | $100,000 | Landowners, Dav | o | o | + | o | + | + | ++ | + | o |
| | 15 | acres | $7,500 | $1,700 | $9,691,520 | $1,017,400 | Dav | + | o | o | o | ++ | + | o | ++ | o |
| | 14000 | feet | $225 | $25 | $3,150,000 | $350,000 | Dav, IADNR | + | o | o | o | ++ | o | o | o | + |
| | 100 | feet | $150 | $2 | $15,000 | $150 | Dav | ++ | o | o | o | + | o | o | o | ++ |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU F** | | | | | | | |
| Dav | F5 | Stabilize Erosion: use bioengineering to stabilize the **moderately severe gully erosion** and severe streambank slumping near DW12 and **minor gully erosion near DW14** before additional erosion creates deeper and wider gullies that will be more difficult and costly, to repair. | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Dav | F6 | Remove Stream Sediment: remove built up sediment to help restore stream habitat behind the low head dam upstream of the pedestrian bridge in Marquette Creek Park (DW13). Also repair erosion around the sheet pile at the low head dam that could lead to failure of the dam. | C, E | 3 | 5-10 yrs | 2 | 2 | | |
| Dav | F7 | Repair Stormwater Infrastructure: repair or replace the broken stormwater outfall found along the creek (DW13). | B, C, D | 3 | 0-5 yrs | 3 | 2 | | |
| Dav | F8 | Inspect Infrastructure: investigate the utility pipe that traverses the stream at West Kimberly Road (DW14.1) for damage; strengthen and/or reinforce the pipe and surrounding structures to prevent damage in the future. | B, C | 3 | 0-5 yrs | 3 | 2 | | |
| -- | F9 | Implement Riparian Residential Land Use Recommendations Contained in the General Recommendations for Duck Creek for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | F9a | Near the area of North Elmwood, North Linwood, and West 36th Street. 2500 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |
| Dav | F9b | Near the intersection of West 49th Street and Hillandale Road. 3000 feet. | B, C, D | 1B | 0-5 yrs | 1 | 1 | | |
| Dav | F9c | Near the intersection of Leisure Boulevard and North Fairmount Street. 1000 feet. | B, C, D | 1B | 0-5 yrs | 1 | 1 | | |
| Dav | F9d | Along Silvercreek Drive. 6500 feet. | B, C, D | 1C | 0-5 yrs | 1 | 1 | | |
| Dav | F9e | Along an unnamed tributary. 3500 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |
| -- | F10 | Implement Riparian Commercial-Industrial Land Use Recommendations for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | F10a | Along I-80 west of the northwest blvd interchange (West 76th, West 73rd, W 83rd, and N Fairmount St). 5000 feet. | B, C, D | 1C | 10+ yrs | 3 | 2 | | |
| Dav | F10b | Along an unnamed tributary from West 35th Street upstream to West 41st Street. 2800 feet. | B, C, D | 1C | 10+ yrs | 3 | 2 | | |
| | | **SMU G** | | | | | | | |
| -- | G1 | Utilize Stormwater BMPs and Low Impact Design Principles for New and Existing Development: | -- | -- | -- | -- | -- | -- | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 2 | each | $2,000 | $150 | $4,000 | $300 | Dav | ++ | o | o | o | o | o | o | o | ++ |
| | 1 | each | $1,500 | $50 | $1,500 | $50 | Dav | ++ | o | o | o | ++ | ++ | o | o | o |
| | 1 | each | $6,000 | $500 | $6,000 | $500 | Dav | ++ | o | o | o | o | o | o | o | + |
| | 1 | each | $125 | $75 | $125 | $75 | Dav | o | o | o | o | o | + | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | CBL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | | | | | | | | | | | | | | | | |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU G** | | | | | | | |
| Dav | G1a | Retrofit residential neighborhoods with stormwater BMPs, such as rain gardens, vegetated swales, naturalized detention (where feasible), and other BMPs to help filter and infiltrate runoff and reduce the flow of urban non-point source pollutants to Duck Creek. | B, C, D | 1C | 5-10 yrs | 3 | 2 | | |
| Dav | G1b | Utilize low impact development principles and practices when urbanizing the undeveloped portions of the watershed, a significant portion (1500 acres) of which is planned for future residential and commercial development. It is critical to use conservation design / Low Impact Development techniques and BMPs in new development to prevent increases in flooding, stream bank erosion, and water quality degradation. | B, D | 1A | 0-5 yrs | 3 | 3 | | |
| Dav | G1c | Implement agricultural land use recommendations on agricultural land. | B, D | 1B | 0-5 yrs | 2 | 2 | | |
| -- | G2 | Preserve, Restore, and Manage the Following Semi-natural Areas Adjacent to the Duck Creek Stream System as Part of the Green Infrastructure System: | -- | -- | -- | -- | -- | -- | |
| Dav | G2a | Restore wetlands at DW16 within the complex of hydric and hydrologic soil group C and D soils extending west along the Duck Creek main stem from Hickory Grove Road (SMU E and SMU F) into SMU G. The portion of this complex west of Fairmount Avenue is part of the US Army Corps of Engineers Duck Creek / Fairmount Park Wetland Restoration project to restore wetland, prairie, and stream restoration. This project should be prioritized for funding by the US Army Corps and implemented as soon as possible as a demonstration project. If designed and restored appropriately, this area may help to attenuate floodwater flows that are causing damage to the Duck Creek stream channel and riparian corridor. | see E2a | see E2a | see E2a | see E2a | see E2a | | |
| Dav | G2b | Restore wetlands within the hydric soil area near DW18 along the Duck Creek main stem. | B, C, D, E | 3 | 10+ yrs | 3 | 2 | | |
| Dav | G2c | Restore the stream channel and wetlands within the hydric soils adjacent to an unnamed southern tributary within the Emeis Municipal Golf Course. | B, C, D, E | 2 | 10+ yrs | 3 | 2 | | |
| Dav | G2d | Continue to acquire Duck Creek corridor as the Davenport municipal boundary extends west. The Duck Creek parkway is a significant amenity for the City, provides opportunity for a naturalized corridor, and prevents development pressure within the Duck Creek floodplain. 8000 linear feet by 500 feet, or 920 acres. | E | 1B | 10+ yrs | 2 | 1 | | |
| Dav | G3 | Restore Poor Stream Habitat: Restore the entire reach of Duck Creek following Iowa DNR guidelines, including installing artificial riffles and instream cover and habitat features such as root wads, rocks, and boulders. As far as possible, preserve the intact riparian-floodplain connection, riffles, and some braiding at DW16. | C, E | 3 | 0-5 yrs | 3 | 3 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | varies | feet / acres | varies | varies | varies | varies | PRL, Dav | + | o | ++ | + | o | ++ | o | o | o |
| | varies | feet / acres | varies | varies | varies | varies | DH, Landowners, Dav | + | o | + | o | + | ++ | o | o | + |
| | varies | feet / acres | varies | varies | varies | varies | Landowners, Dav, NRCS / SWCD | ++ | + | ++ | o | o | + | o | o | ++ |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a | see E2a |
| | 60 | acres | $5,000 | $1,500 | $300,000 | $90,000 | Landowners | o | o | + | o | + | + | ++ | + | o |
| | 3 | acres | $5,000 | $1,500 | $15,000 | $4,500 | Golf Course | o | o | + | o | + | + | ++ | + | o |
| | 920 | feet | $10,000 | $500 | $9,200,000 | $460,000 | Dav | o | o | o | o | o | o | + | o | + |
| | 13000 | feet | $225 | $25 | $2,925,000 | $325,000 | Dav, IADNR | + | o | o | o | ++ | o | o | o | + |

Table 6.4.1 Watershed Plan Implementation Tables (continued)

| Jurisdiction | ID# (SMU+ID) | Specific Recommendations | Goals Addressed | Priority | Time frame | Ease of Implementation | Technical Effort Required | Status | |
|---|---|---|---|---|---|---|---|---|---|
| | | **SMU G** | | | | | | | |
| Dav | G4 | Stabilize Gully Erosion: Use bioengineering practices to stabilize gully erosion along the banks near DW17 and DW18 before additional erosion creates deeper and wider gullies that will be more difficult, and costly, to repair. | B, C | 2 | 5-10 yrs | 3 | 3 | | |
| Dav | G5 | Install Bioengineering Practices to Stabilize Stream Banks: stabilize bank erosion at DW17 and DW18. | B, C, E | 2 | 5-10 yrs | 3 | 3 | | |
| -- | G6 | Implement Riparian Residential Land Use Recommendations for the Following Areas: | -- | -- | -- | -- | -- | -- | |
| Dav | G6a | Along the unnamed southern tributary as it flows along Emerald Drive and past West Central Park Ave. 4500 feet. | B, C, D | 1D | 0-5 yrs | 1 | 1 | | |
| Dav | G6b | Along the unnamed southern tributary as it flows along Friendship Drive. 1500 feet. | B, C, D | 1 | 0-5 yrs | 1 | 1 | | |

| | Quantity | Unit | Initial ($) | Annual ($) | Initial ($) | Annual ($) | Implementation Responsibility | Water Quality: TSS / sediment (lb/yr) | Water Quality: Bacterial contamination | Water Quality: Nutrients (Phosphorous lb/yr) | Water Quality: Aquatic life toxicity | Habitat Degradation: Lack of habitat characteristics | Habitat Degradation: Hydrologic disturbance / flow alterations | Habitat Degradation: Wetland loss / degradation | Habitat Degradation: Exotic & invasive species | Habitat Degradation: Loss / degradation of buffer / streamside alterations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unit Cost | | Estimated Cost | | | Impairment Reduction Effectiveness | | | | | | | | |
| | 2 | each | $2,000 | $150 | $4,000 | $300 | Dav | ++ | o | o | o | o | o | o | o | ++ |
| | 200 | feet | $150 | $2 | $30,000 | $300 | Dav | ++ | o | o | o | + | o | o | o | ++ |
| | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |
| | varies | feet / acres | NA | NA | NA | NA | PRL, Dav | ++ | o | o | ++ | o | + | o | o | o |

## 6.5 PLAN MONITORING AND EVALUATION

### 6.5.1 MONITORING PLAN IMPLEMENTATION

Continued monitoring and analysis is critical for providing feedback on the progress of implementation of this Watershed Plan. The implementation and effectiveness of the watershed plan and recommendations, and an assessment of whether plan goals are being achieved, can be measured through a process called 'monitoring'. Simply, monitoring is observing and tracking watershed conditions and indicators for positive or negative changes that may be attributed to the implementation of the plan. These indicators can then be compared with water quality monitoring data to determine whether there is a correlation between them. If no discernible correlation can be made, and if satisfactory progress is not being made towards watershed goals, the watershed implementation team should consider whether recommended strategies are having the desired effect or should be modified accordingly.

Recommendations that are physical or structural in nature, such as streambank stabilization or riparian buffers, can be assessed in terms of reduced pollutant loads discharged into the watershed, improved biological and habitat health, and the degree of change in stormwater runoff volume and flow. The effectiveness of non-structural recommendations, however, such as education, policies and regulations, and coordination, can be difficult to measure due to long feedback time. Changes in behavior following the implementation of non-structural recommendations can be assessed by gathering feedback through meetings with implementation partners and tools such as surveys and focus groups, as suggested in Table 6.5.1 to 6.5.1.6.

This monitoring strategy is intended to help track and measure the implementation of recommendations made in this plan using a variety of indicators that are monitored regularly, typically on an annual basis or every three years. Progress on overall plan implementation should be reviewed using the milestones and indicators every five years and the plan should be updated as needed.

The monitoring plan includes a monitoring baseline, frequency of monitoring, short, medium, and long term milestones, responsible party, and mode of collection. There are also empty columns for implementers to track the number of actions taken, location of implementation, and percentage complete. The empty cells of the table (number of actions, and location of implementation) are to be filled in by the parties responsible for monitoring as identified in the table. *Number of actions* is the actual data collected, for example, the concentration of phosphorous or the # of floodproofed structures in the floodplain. *Location of implementation* refers to geographical location, such as where streambanks or wetlands were restored. *Percent complete* is a measure of progress toward the goal itself, where 100% would indicate the complete achievement of a goal.

Since water quality is one of the primary goals of this plan, stream and lake water quality impairments should be monitored by regularly collecting and testing water samples, either manually or using constant monitoring equipment. A regular sampling strategy should be initiated and new data should be added to existing data so that trends can be tracked. An expanded water quality monitoring protocol is essential to better locate and identify the causes and sources of impairment that have been identified in this plan.

Some of the impairments also can be monitored visually and anecdotally by those living along the stream and those involved in stream monitoring activities such as the Iowater program and other volunteer watershed monitoring activities. Visual and anecdotal monitoring should be done regularly (weekly in summer months and monthly in winter months is recommended) by trained volunteers. Specifically, increases in nutrient loading may be identified by the increase or presence of algal blooms. Acute aquatic life toxicity may be identified visually by watching for fish kills or other kills of aquatic species such as insects or plant species. Strange smells, slicks, or sheens on the water may also indicate the discharge of a problem pollutant.

## 6.5.2 EVALUATING PLAN PERFORMANCE

Watershed issues, opportunities, and conditions will change over time. This watershed plan should be evaluated and updated every five years to account for these changes. At each evaluation and update, completed projects can be removed from the plan and new projects should be added.

In addition to this 5-year update, plan implementation should be monitored annually by the Watershed Planning Committee or, if established, the watershed organization. At the time of the annual evaluation, the committee should assess the list of priorities and identify the top priority actions for the following year.

As projects are implemented, they should be recorded using Table 6.5.1 to 6.5.1.6, which track the implementation of actions against the watershed plan goals and objectives as a means of monitoring watershed plan implementation.

Table 6.5.1 Monitoring Plan for Issue 1: Watershed Planning, Implementation & Coordination

| Issue | Issue 1: Watershed Planning, Implementation & Coordination | Issue 1: Watershed Planning, Implementation & Coordination | Issue 1: Watershed Planning, Implementation & Coordination | Issue 1: Watershed Planning, Implementation & Coordination |
|---|---|---|---|---|
| Goal | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. |
| Objective | 1. Establish a watershed council with funding and administrative support to guide watershed plan implementation, provide technical assistance to watershed stakeholders, and coordinate multi-partner projects. | 2. Help communities and stakeholders secure project funding by disseminating information on funding sources and mechanisms for implementing watershed projects. | 3. Pursue cost-sharing arrangements between jurisdictions for watershed preservation/ improvement projects that have broad benefits and impacts. | 4. Adopt, strengthen, and enforce standards and guidelines intended to preserve and enhance watershed resources and reduce the impact of development on water resources. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | Establishment of lead organization with budget and executive committee; number of projects advanced/ undertaken under the auspices of the watershed council. | Number of communities and stakeholders receiving funding for watershed improvement projects; number of projects installed / undertaken. | Number of projects funded by multiple jurisdictions and/or stakeholders. | Number of communities that adopt, strengthen, and enforce standards and guidelines. |
| Frequency of Monitoring | Annual | Annual | Every 3 years | Every 3 years |
| Baseline (2007) | Watershed planning council (stakeholders group) is organized but not formalized; 0 projects initiated by council. | 0 communities; 0 projects | 0 projects | Baseline is current set of municipal ordinances and guidelines |
| Short Term Milestones (2008-2013) (1-5 years) | Watershed council and executive committee established and funded; 1 project / year initiated by council. | 2 communities have received funding within 5 years; 1 project funded per year | 1 project per year | 1 municipality has strengthened guidelines |
| Mid Term Milestones (2013-2018) (5-10 years) | Watershed council and executive committee established and funded; 3 projects / year initiated by council. | all communities have received funding within 10 years; 3 projects funded per year | 3 projects per year | All municipalities have strengthened guidelines |
| Long Term Milestones (2018+) (10+ years) | Watershed council and executive committee established and funded; 3 projects / year initiated by council. | all communities have received funding within 10 years; 5 projects funded per year | 3 projects per year | All municipalities have strengthened guidelines |
| Party Responsible for Monitoring | Watershed Planning Council, River Action | Watershed Planning Council | Municipalities, Watershed Planning Council | Municipalities, Watershed Planning Council |
| Mode of Collection | Internal audit / recordkeeping | Internal audit / recordkeeping; contact with municipalities and stakeholders | Internal audit / recordkeeping; contact with municipalities and stakeholders | Contact municipal officials and staff; review policies and regulations |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.1 Monitoring Plan for Issue 1: Watershed Planning, Implementation & Coordination (continued)

| Issue | Issue 1: Watershed Planning, Implementation & Coordination | Issue 1: Watershed Planning, Implementation & Coordination | Issue 1: Watershed Planning, Implementation & Coordination |
|---|---|---|---|
| Goal | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. | Goal A: Improve coordination and decision-making between public, private, and non-profit stakeholders to implement the watershed plan recommendations and improve watershed resources. |
| Objective | 5. Watershed municipalities coordinate land use planning and watershed plan implementation activities. | 6. Local public agencies incorporate watershed improvement best management practices into ongoing management, maintenance, and infrastructure projects (e.g., streets, drainage system, etc.) | 7. Develop and implement a plan to monitor watershed conditions, resources and trends (hydrologic, biologic, and water quality) and implementation of plan recommendations. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | Number of communities participating in cross-jurisdictional coordination and projects. | Number of communities adding watershed improvement practices to ongoing activities, plans, and budgets. | Established monitoring program; record of watershed monitoring data; number of recommendations implemented. |
| Frequency of Monitoring | Every 3 years | Every 3 years | Annual |
| Baseline (2007) | Baseline assumed to be 0 municipalities; 0 projects | Baseline assumed to be 0 municipalities | Very little data exists for biological measures; water quality and hydrologic data has been collected consistently for Duck Creek, not for Rock River Ravines; 0 watershed plan recommendations implemented. |
| Short Term Milestones (2008-2013) (1-5 years) | 2 cross-jurisdictional projects | 1 municipality | Annual data collection program established; 3 years of consistently collected biological, hydrologic, and water quality data; 1 watershed recommendation implemented within each SMU |
| Mid Term Milestones (2013-2018) (5-10 years) | 5 cross-jurisdictional projects | All municipalities | 8 years of consistently collected biological, hydrologic, and water quality data; 2 watershed recommendations implemented within each SMU |
| Long Term Milestones (2018+) (10+ years) | 10 cross-jurisdictional projects | All municipalities | Ongoing annual data collection program established; 5 watershed recommendations implemented within each SMU |
| Party Responsible for Monitoring | Municipalities, Watershed Planning Council | Municipalities, Watershed Planning Council | Watershed Planning Council |
| Mode of Collection | Contact municipal officials and staff; internal audit / recordkeeping | Contact municipal officials and staff; review policies and regulations | Review monitoring databases; internal audit / recordkeeping |
| Number of Actions | | | |
| Location of Implementation | | | |
| Percent Complete | | | |

Table 6.5.2 Monitoring Plan for Issue 2: Water Quality

| Issue | Issue 2: Water Quality | Issue 2: Water Quality | Issue 2: Water Quality | Issue 2: Water Quality |
|---|---|---|---|---|
| Goal | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. |
| Objective | 1. All watershed streams meet or exceed state water quality standards. | 2. Reduce non-point source pollution loading from existing and new development (streets, parking lots, turf grass lawns, and other impervious surfaces) by controlling inputs and using on-site best management practices. | 3. Prevent erosion and flow of chemical pollutants and nutrients (fertilizers, pesticides, organic waste) from farmland, golf courses, parks, and yards into streams. | 4. Prevent dumping of inappropriate substances (e.g., yard waste) within the stream channel, riparian corridor, and stormsewer network. |
| Impairments Addressed | Water Quality | Water Quality | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | E. coli < 235 organisms (CFU) / 100ml; phosphorous < 0.05 mg/L; chloride <30 mg/L; total suspended solids (no standard); toxic substances (no standard) | Water quality monitoring data; linear feet / acres of BMPs installed; linear feet of retrofitted drainage swale or other drainage infrastructure for water quality improvement. | Acres / linear feet of BMPs installed and/or implemented across the landscape and along the stream channel; water quality monitoring data. | Number of dumping occurrences detected during rapid stream inventory; dumping reports received by municipalities. |
| Frequency of Monitoring | Annual | Annual | Annual | Annual |
| Baseline (2007) | E. coli concentrations exceed state standard ~100% of the time; 11 of 33 (33%) Iowater sites exceed 0.15mg/L P; 29 of 33 (88%) of Iowater sites exceed 30mg/L chloride. | Water quality baseline established in objective B1; 0 acres / 0 lf of BMPs installed | TSS (baseline needs to be established); water quality baseline established in objective B1; 0 acres / 0 lf of BMPs installed | Baseline needs to be established through comprehensive stream survey |
| Short Term Milestones (2008-2013) (1-5 years) | 25% improvement over baseline. E. coli concentrations exceed state standard <75% of the time; 8 of 33 (24%) Iowater sites exceed 0.15mg/L P; 22 of 33 (67%) of Iowater sites exceed 30mg/L chloride. | Water quality milestones established in objective B1; 1 acre / 1000 lf of BMPs installed within each SMU | TSS improvement by 25% over initial 2-year average; water quality milestones established in objective B1; 1 acre / 1000 lf of BMPs installed within each SMU | Total of ten or fewer surveyed incidents or reports of dumping per SMU |
| Mid Term Milestones (2013-2018) (5-10 years) | 50% improvement over baseline. E. coli concentrations exceed state standard ~50% of the time; 6 of 33 (18%) Iowater sites exceed 0.15mg/L P; 15 of 33 (45%) of Iowater sites exceed 30mg/L chloride. | Water quality milestones established in objective B1; 3 acres / 2000 lf of BMPs installed within each SMU | TSS improvement by 50% over initial 2-year average; water quality milestones established in objective B1; 3 acres / 2000 lf of BMPs installed within each SMU | Total of five or fewer surveyed incidents or reports of dumping per SMU |
| Long Term Milestones (2018+) (10+ years) | 90% improvement over baseline. E. coli concentrations exceed state standard ~10% of the time; 1 of 33 (3%) Iowater sites exceed 0.15mg/L P; 3 of 33 (9%) of Iowater sites exceed 30mg/L chloride. | Water quality milestones established in objective B1; 5 acres / 5000 lf of BMPs installed within each SMU | TSS improvement by 90% over initial 2-year average; water quality milestones established in objective B1; 5 acres / 5000 lf of BMPs installed within each SMU | Total of two or fewer surveyed incidents or reports of dumping per SMU |
| Party Responsible for Monitoring | Iowa DNR; Partners for Scott County Watersheds | Iowa DNR; Partners for Scott County Watersheds; Municipality, Landowner | Iowa DNR; municipalities; Landowner | Watershed Planning Council should establish the stream survey; municipalities |
| Mode of Collection | Physical / chemical sampling and / or lab analysis using accepted state protocols | Landowner contact and anecdotal reporting; contact municipal officials and staff | Physical / chemical sampling and / or lab analysis using accepted state protocols; municipal and landowner contact / reports and anecdotal reporting | Comprehensive stream survey; contact municipalities |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.2 Monitoring Plan for Issue 2: Water Quality (continued)

| Issue | Issue 2: Water Quality | Issue 2: Water Quality | Issue 2: Water Quality | Issue 2: Water Quality |
|---|---|---|---|---|
| Goal | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. | Goal B: Improve water quality in streams by reducing pollutants in stormwater runoff and addressing modified hydrology. |
| Objective | 4. Reduce bacterial contamination by identifying and controlling contributing sources. | 5. Improve infiltration and reduce stormwater flows to improve hydrologic and baseflow conditions. . | 6. Reduce the frequency of Combined Sewer Overflows by eliminating or remediating the combined system or reducing stormwater flows so that overflows are minimized. | 7. Reduce or modify the use / application of road salt and other chemicals for snow and ice management to reduce the impact of chlorides and toxic substances on water quality. |
| Impairments Addressed | Water Quality | Water Quality; Habitat Degradation and Alteration | Water Quality | Water Quality |
| Indicators | Water quality sampling / E. coli data. | Streamflow monitoring data. | Number of combined sewer overflow events per year. | water quality data for chlorides; long-term tracking of salt use road maintenance authorities; number of road maintenance agencies educated regarding de-icing practices. |
| Frequency of Monitoring | Annual | Annual | Annual | Annual |
| Baseline (2007) | E. coli concentrations exceed state standard ~100% of the time | Streamflow baseline needs to be established | Baseline # of overflows per year needs to be established | 29 of 33 (88%) of Iowater sites exceed 30mg/L chloride. |
| Short Term Milestones (2008-2013) (1-5 years) | 25% improvement over baseline. E. coli concentrations exceed state standard <75% of the time | 10% greater stability in baseflow over previous 5 year period | 10% reduction in overflow events over previous 5 year average | 25% improvement over baseline. 22 of 33 (67%) of Iowater sites exceed 30mg/L chloride. |
| Mid Term Milestones (2013-2018) (5-10 years) | 50% improvement over baseline. E. coli concentrations exceed state standard ~50% of the time | 20% greater stability in baseflow over previous 5 year period | 50% reduction in overflow events over previous 5 year average | 50% improvement over baseline. 15 of 33 (45%) of Iowater sites exceed 30mg/L chloride. |
| Long Term Milestones (2018+) (10+ years) | 90% improvement over baseline. E. coli concentrations exceed state standard ~10% of the time | 30% greater stability in baseflow over previous 5 year period | 90% reduction in overflow events over previous 5 year average | 90% improvement over baseline. 3 of 33 (9%) of Iowater sites exceed 30mg/L chloride. |
| Party Responsible for Monitoring | Iowa DNR | Iowa DNR; USGS; municipalities | Municipalities | Iowa DNR; Partners for Scott County Watersheds; road maintenance authorities; watershed council |
| Mode of Collection | Physical / chemical sampling and / or lab analysis using accepted state protocols | Streamflow monitoring data | Internal audit / recordkeeping | Physical / chemical sampling and / or lab analysis using accepted protocols; Internal audit / recordkeeping on salt usage; # of participants in educational seminars |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.3 Monitoring Plan for Issue 3: Stream Restoration & Management

| Issue | Issue 3: Stream Restoration & Management | Issue 3: Stream Restoration & Management | Issue 3: Stream Restoration & Management | Issue 3: Stream Restoration & Management |
|---|---|---|---|---|
| Goal | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. |
| Objective | 1. Remediate detrimental stream channel conditions with restoration enhancements. | 2. Stabilize all moderately and severely eroded streambanks and headcutting using bioengineering stabilization methods. | 3. Develop and implement plans and establish partnerships to restore, manage, and maintain the riparian corridor. | 4. Reduce the erosive capacity of storm sewer outfalls being discharged into the stream channel. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality |
| Indicators | Number of sites with detrimental channel conditions addressed by restoration project. | Linear feet of streambanks with moderate or severe erosion stabilized; number of locations of headcutting addressed with grade control structures. | Number of management and restoration plans developed; number of SMUs being addressed by a management and maintenance program. | Number of erosion-inducing storm sewer outfalls, drain tile outfalls, and building drains addressed with erosion-reduction / energy-dissipation measures. |
| Frequency of Monitoring | Every 3 years | Every 3 years | Every 3 years | Every 3 years |
| Baseline (2007) | 0 channel restoration projects | 1 streambank / channel stabilization projects | No plans exist; 0 SMUs addressed by management and maintenance program | 0 point discharges addressed |
| Short Term Milestones (2008-2013) (1-5 years) | 1 channel restoration project completed within the watershed | 3 streambank / channel stabilization projects completed per watershed | 1 plan exists; 1 SMU addressed by management and maintenance program | 10% of problem point discharges addressed |
| Mid Term Milestones (2013-2018) (5-10 years) | 3 channel restoration projects completed within the watershed | 1 streambank / channel stabilization projects completed per SMU | 3 plans exist; 3 SMUs addressed by management and maintenance program | 50% of problem point discharges addressed |
| Long Term Milestones (2018+) (10+ years) | 1 channel restoration project completed per SMU | 3 streambank / channel stabilization projects completed per SMU | All SMUs addressed by management and maintenance plan and program | 90% of problem point discharges addressed |
| Party Responsible for Monitoring | Municipalities, Watershed Planning Council | Municipalities, Landowners, Watershed Planning Council | Municipalities, Watershed Planning Council | Municipalities, Watershed Planning Council |
| Mode of Collection | Visual / stream survey; homeowner / landowner contact and anecdotal reporting; municipal contact and records | Visual / stream survey; homeowner / landowner contact and anecdotal reporting; municipal contact and records | Internal audit / recordkeeping; contact public officials and staff; homeowner / landowner contact and anecdotal reporting | Visual / stream survey; contact public officials and staff; homeowner / landowner contact and anecdotal reporting |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.3 Monitoring Plan for Issue 3: Stream Restoration & Management (continued)

| Issue | Issue 3: Stream Restoration & Management | Issue 3: Stream Restoration & Management |
|---|---|---|
| Goal | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. | Goal C: Restore and manage the stream system to preserve and enhance stream and riparian health, function, and conveyance. |
| Objective | 5. Preserve and enhance a minimum 100 foot (average width) native riparian buffer / setback zone. | 6. Manage, maintain, and protect low head dams and/or sewer crossings, including removal of sediment buildup behind these structures. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | Linear feet / acres of riparian buffer restored | Number of structures managed |
| Frequency of Monitoring | Every 3 years | Every 3 years |
| Baseline (2007) | 0 lf / 0 acres of riparian buffer restored | 0 crossing structures inspected and maintained |
| Short Term Milestones (2008-2013) (1-5 years) | 1000 lf of riparian buffer restored per SMU | 50% of crossing structures inspected and maintained |
| Mid Term Milestones (2013-2018) (5-10 years) | 2000 lf of riparian buffer restored | 75% of crossing structures inspected and maintained |
| Long Term Milestones (2018+) (10+ years) | 5000 lf of riparian buffer restored per SMU | 90% of crossing structures inspected and maintained |
| Party Responsible for Monitoring | Landowners, Municipalities | Municipalities, Landowners |
| Mode of Collection | Visual / stream survey; contact public officials and staff; homeowner / landowner contact and anecdotal reporting | Internal audit / recordkeeping; homeowner / landowner contact and anecdotal reporting |
| Number of Actions | | |
| Location of Implementation | | |
| Percent Complete | | |

Table 6.5.4 Monitoring Plan for Issue 4: Stormwater Management

| Issue | issue 4: stormwater management | issue 4: stormwater management | issue 4: stormwater management | issue 4: stormwater management |
|---|---|---|---|---|
| Goal | Goal D: Plan, design, install, and retrofit stormwater management infrastructure with best management practices to reduce runoff rate and volume, improve water quality, restore watershed hydrology, and stabilize the stream systems. | Goal D: Plan, design, install, and retrofit stormwater management infrastructure with best management practices to reduce runoff rate and volume, improve water quality, restore watershed hydrology, and stabilize the stream systems. | Goal D: Plan, design, install, and retrofit stormwater management infrastructure with best management practices to reduce runoff rate and volume, improve water quality, restore watershed hydrology, and stabilize the stream systems. | Goal D: Plan, design, install, and retrofit stormwater management infrastructure with best management practices to reduce runoff rate and volume, improve water quality, restore watershed hydrology, and stabilize the stream systems. |
| Objective | 1. Reduce/ minimize the rate and volume of runoff from the developed, developing, and agricultural landscape by installing urban and agricultural BMPs. | 2. Retrofit existing stormwater management structures. | 3. Clear, repair, or replace blocked, damaged, and failing stormwater infrastructure . | 4. All new development incorporates conservation design and Low Impact Development (LID) practices. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality | Water Quality | Water Quality; Habitat Degradation and Alteration |
| Indicators | Streamflow monitoring data. | Number or acres of retrofitted detention basins; linear feet or acres of retrofitted swales. | Number of structures (culverts, outfalls, and headwalls) cleared, repaired, and replaced; number of blockages / debris jams removed. | Number of stormwater management plans demonstrating maintenance of pre-development hydrology |
| Frequency of Monitoring | Annual | Every 3 years | Every 3 years | Annual |
| Baseline (2007) | Streamflow baseline needs to be established | 0 detention basin retrofits; 0 lf of swale improved | 0 structures addressed; 0 debris obstructions cleared | 0 stormwater management plans maintain pre-development hydrology |
| Short Term Milestones (2008-2013) (1-5 years) | 10% greater stability in baseflow over previous 5 year period | 10% of detention basins retrofit; 1000 lf of swale improved | 10% of structures and 10% of debris obstructions cleared | 25% of stormwater management plans maintain pre-development hydrology |
| Mid Term Milestones (2013-2018) (5-10 years) | 20% greater stability in baseflow over previous 5 year period | 25% of detention basins retrofit; 2500 lf of swale improved | 25% of structures and 25% of debris obstructions cleared | 50% of stormwater management plans maintain pre-development hydrology |
| Long Term Milestones (2018+) (10+ years) | 30% greater stability in baseflow over previous 5 year period | 50% of detention basins retrofit; 5000 lf of swale improved | 90% of structures and 90% of debris obstructions cleared | 100% of stormwater management plans maintain pre-development hydrology |
| Party Responsible for Monitoring | Iowa DNR; USGS; municipalities | Municipality | Municipalities, Watershed Planning Council | Municipalities |
| Mode of Collection | Streamflow monitoring data | Internal audit / recordkeeping | Visual / stream survey; homeowner / landowner contact and anecdotal reporting; internal audit / recordkeeping | Internal audit / recordkeeping |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.4 Monitoring Plan for Issue 4: Stormwater Management (continued)

| Issue | issue 4: stormwater management |
|---|---|
| Goal | Goal D: Plan, design, install, and retrofit stormwater management infrastructure with best management practices to reduce runoff rate and volume, improve water quality, restore watershed hydrology, and stabilize the stream systems. |
| Objective | 5. Maintain riparian corridors, floodplains and wetlands as open and undeveloped. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration |
| Indicators | Number of building permits issues in floodplain or wetlands. |
| Frequency of Monitoring | Annual |
| Baseline (2007) | Baseline # of floodplain or wetland permits needs to be established |
| Short Term Milestones (2008-2013) (1-5 years) | 50% fewer permits issued |
| Mid Term Milestones (2013-2018) (5-10 years) | 0 permits issued |
| Long Term Milestones (2018+) (10+ years) | 0 new structures and 0 permits |
| Party Responsible for Monitoring | Municipalities, Watershed Planning Council |
| Mode of Collection | Contact municipal and agency officials and staff; internal audit / recordkeeping |
| Number of Actions | |
| Location of Implementation | |
| Percent Complete | |

Table 6.5.5 Monitoring Plan for Issue 5: Natural Resources & Habitat

| Issue | issue 5: natural resources & habitat | issue 5: natural resources & habitat | issue 5: natural resources & habitat |
|---|---|---|---|
| Goal | Goal E: Preserve, restore, and enhance a green infrastructure network of terrestrial and aquatic natural resources including streams, riparian corridors, wetlands, and upland resources. | Goal E: Preserve, restore, and enhance a green infrastructure network of terrestrial and aquatic natural resources including streams, riparian corridors, wetlands, and upland resources. | Goal E: Preserve, restore, and enhance a green infrastructure network of terrestrial and aquatic natural resources including streams, riparian corridors, wetlands, and upland resources. |
| Objective | 1. Identify, prioritize, preserve, restore, and manage important core and connecting green infrastructure elements and buffers to achieve multiple watershed benefits including recreation. | 2. Adopt and prioritize watershed plan recommendations in local land use plans, policies, and maps. | 3. Preserve and improve ecological and biological quality of aquatic and terrestrial natural resources. |
| Impairments Addressed | | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | Acres of natural and open lands / linear feet of stream channel and buffer preserved and restored. | Number of municipalities adopting elements into local land use plans, policies, and maps. | Biological survey data (Macroinvertebrate Biotic Index, Index of Biotic Integrity, and Floristic Quality Index scores), threatened and endangered species populations |
| Frequency of Monitoring | Every 3 years | Annual | Annual |
| Baseline (2007) | 0 acres of recommended green infrastructure preserved or restored | 0 municipalities have integrated watershed recommendations | Mean Coefficient of Conservation=1.5; Floristic Quality Index=7. |
| Short Term Milestones (2008-2013) (1-5 years) | 10 acres of recommended green infrastructure preserved or restored | 1 municipality | XX% improvement in biological indices. Mean Coefficient of Conservation=; Floristic Quality Index=. |
| Mid Term Milestones (2013-2018) (5-10 years) | 50 acres of recommended green infrastructure preserved or restored | 2 municipalities | XX% improvement in biological indices. Mean Coefficient of Conservation=; Floristic Quality Index=. |
| Long Term Milestones (2018+) (10+ years) | 100 acres of recommended green infrastructure preserved or restored | All municipalities | XX% improvement in biological indices. Mean Coefficient of Conservation=; Floristic Quality Index=. |
| Party Responsible for Monitoring | Municipality, County | Municipalities; Watershed Planning Council | Iowa DNR |
| Mode of Collection | Internal audit / recordkeeping; review public land records | Internal audit / recordkeeping; public official and staff contact | Physical sampling and natural area / wetland surveys using accepted state protocols and / or Floristic Quality Index |
| Number of Actions | | | |
| Location of Implementation | | | |
| Percent Complete | | | |

Table 6.5.6 Monitoring Plan for Issue 6: Watershed Education & Stewardship

| Issue | Issue 6: Watershed Education & stewardship | Issue 6: Watershed Education & stewardship | Issue 6: Watershed Education & stewardship | Issue 6: Watershed Education & stewardship |
|---|---|---|---|---|
| Goal | Goal F: Watershed residents, students, and communities have adequate knowledge, skills, resources, motivation, and stewardship opportunities to take action on implementing the watershed plan. | Goal F: Watershed residents, students, and communities have adequate knowledge, skills, resources, motivation, and stewardship opportunities to take action on implementing the watershed plan. | Goal F: Watershed residents, students, and communities have adequate knowledge, skills, resources, motivation, and stewardship opportunities to take action on implementing the watershed plan. | Goal F: Watershed residents, students, and communities have adequate knowledge, skills, resources, motivation, and stewardship opportunities to take action on implementing the watershed plan. |
| Objective | 1. Increase watershed stewardship opportunities and participation in management, monitoring, and restoration. | 2. Convey messages from the education plan with public relations, education, outreach and media vehicles. | 3. Provide technical assistance to watershed communities, the development community, residents and other stakeholders. | 4. Provide conservation and / low impact development (LID) guidelines and case studies to municipalities and the development community. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration | Water Quality; Habitat Degradation and Alteration |
| Indicators | Number of watershed stewardship events; number of participants in watershed stewardship activities. | Number of placements and mentions in local and regional media; number of presentations and number of audience members reached by presentations. | Technical and informational items distributed to target audiences; number of participants in technical workshops. | Number of local government officials and staff participating in LID workshops. |
| Frequency of Monitoring | Annual | Annual | Annual | Annual |
| Baseline (2007) | Baseline # of stewardship opportunities and participants needs to be established. | Baseline # of mentions and presentations needs to be established. | Baseline # needed for educational materials distributed and participants in technical workshops | 0 local government officials and staff participating in LID workshops |
| Short Term Milestones (2008-2013) (1-5 years) | 3 stewardship opportunities and 50 total participants per year | 5 mentions, 2 presentations, and 50 participants per year | 150 educational material packets distributed per year; 10 participants in technical workshops per year | 10 local government participants in LID workshops per year |
| Mid Term Milestones (2013-2018) (5-10 years) | 6 stewardship opportunities and 100 total participants per year | 10 mentions, 4 presentations, and 100 participants per year | 300 educational material packets distributed per year; 25 participants in technical workshops per year | 15 local government participants in LID workshops per year |
| Long Term Milestones (2018+) (10+ years) | 10 stewardship opportunities and 150 total participants per year | 15 mentions, 5 presentations, and 200 participants per year | 500 educational material packets distributed per year; 50 participants in technical workshops per year | 25 local government participants in LID workshops per year |
| Party Responsible for Monitoring | Watershed Planning Council | Watershed Planning Council | Watershed Planning Council | Municipalities, Watershed Planning Council |
| Priority | Watershed event reports; review volunteer and monitoring databases; internal audit / record keeping | Internal audit / recordkeeping; news clipping service | Watershed workshop / event reports; internal audit / recordkeeping | Watershed workshop / event reports; internal audit / recordkeeping |
| Mode of Collection | Contact municipal officials and staff; internal audit / recordkeeping; agency contact | Contact municipal officials and staff; review plans, policies and regulations; internal audit / recordkeeping | Review volunteer and monitoring databases; internal audit / recordkeeping | |
| Number of Actions | | | | |
| Location of Implementation | | | | |
| Percent Complete | | | | |

Table 6.5.6 Monitoring Plan for Issue 6: Watershed Education & Stewardship (continued)

| Issue | Issue 6: Watershed Education & stewardship |
|---|---|
| Goal | Goal F: Watershed residents, students, and communities have adequate knowledge, skills, resources, motivation, and stewardship opportunities to take action on implementing the watershed plan. |
| Objective | 5. Educate and involve students through watershed stewardship activities and watershed-based curricula. |
| Impairments Addressed | Water Quality; Habitat Degradation and Alteration |
| Indicators | Number of students participating in watershed stewardship activities; number of students reached by watershed-based curricula. |
| Frequency of Monitoring | Annual |
| Baseline (2007) | Baseline # of student participants; # reached by curricula needs to be established. |
| Short Term Milestones (2008-2013) (1-5 years) | 50 students participating in watershed activities; 100 students reached by watershed curricula |
| Mid Term Milestones (2013-2018) (5-10 years) | 100 students participating in watershed activities; 500 students reached by watershed curricula |
| Long Term Milestones (2018+) (10+ years) | 250 students participating in watershed activities; 1000 students reached by watershed curricula |
| Party Responsible for Monitoring | School Districts; Watersjed Planning Council |
| Priority | Internal audit / record keeping |
| Mode of Collection | Streamflow monitoring data |
| Number of Actions | |
| Location of Implementation | |
| Percent Complete | |