Mackinaw River Project

Mackinaw River Subwatershed Management Plan
Mud Creek

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Component #1
Mission Statement

We intend to preserve and enhance the natural resources of the Mackinaw River watershed through education, good management practices and voluntary cooperation while respecting property owner rights.

This mission statement was written and adopted by the Mackinaw River Project (MRP) Planning Team in 1996. Restoration is a strong component of enhancement and is included in the goals, objectives, and strategies of this subwatershed plan.

Component #2
Watershed Description

The Mud Creek is located primarily in Tazewell County, Illinois. This subwatershed contains 29,744 acres (15% of Tazewell County). The drainage area is 46.6 square miles, or 4% of the Mackinaw River basin. (IDNR, Mackinaw River Area Assessment, Vol. 1, pg. 3-1) The Illinois EPA watershed identifier is ILDKG01.

The watershed delineation encompasses the Tazewell County hydrologic unit area 07130004-070, Section 13. (see Map) There are no major lakes in this watershed. The subwatershed is almost entirely private access, with the only public access to the waterbody at county and state highway bridges.

Component #3
Watershed Activities

The Executive Committee for the Mackinaw River Project has chosen the Mud Creek subwatershed as a section 319 subwatershed priority area with the Illinois EPA for 1998 and 1999. Funding received as a subwatershed priority area will be directed towards landowner cost share for continued application of conservation practices within the three subwatershed priority areas, and the entire Mackinaw River watershed. Mud Creek is a Targeted Watershed Approach subwatershed area (Illinois EPA) with a non priority for Multiple Program Interests (Illinois Water Quality Report, Volume II, 1994-1995).

The Illinois EPA has been the primary funding source for the planning phase of the Mackinaw River Project through the section 319 program for nonpoint source pollution, since 1994. This funding has been used for project staff through The Nature Conservancy, and the facilitation of a community based process to write the Mackinaw River Watershed Management Plan. Extensive community outreach and education has been done within the entire Mackinaw River watershed (see details on these activities below), and watershed management planning tools such as a watershed management planning handbook, and a project video have been produced to help other watershed planning efforts within Illinois. The funding from the Illinois EPA has also been used to establish fifteen demonstrations of best management practices within the Mackinaw River watershed, so that watershed residents can tour the types of conservation practices recommended in the watershed management plan.

The entire Mackinaw River watershed was designated by the United States Department of Agriculture (USDA) as an interim Environmental Quality Incentive Program (EQIP) priority area in 1996, and an EQIP priority area for 1997 and 1998. Approximately $337,000 was allocated to the Mackinaw River watershed and made available for conservation practice cost share with landowners. Over 300 EQIP landowner applications were received, and over 100 conservation practices were funded with the 1997 money. In 1998, USDA allocated $167,000 to the Mackinaw River watershed through EQIP. The number of conservation practices funded with this money is not yet available (Schuler, 1998). An application for redesignation as an EQIP priority area has been submitted to USDA for 1999 (Myer, 1998).

The Mud Creek subwatershed has qualified for the Illinois Department of Natural Resources (IDNR) C2000 funding from 1996 to present and is part of a larger Ecosystem Partnership priority area for the entire Mackinaw River watershed. The Mackinaw River Ecosystem Partnership received over $250,000 in 1997 and the money was made available to cost share over fifteen conservation practices with private landowners. In 1998, the Mackinaw River Ecosystem Partnership received $90,000 in funding to construct five more conservation projects. In the Mud Creek subwatershed. Agricultural landowners have been able to access additional C2000 funding through the Conservation Practice Program (CPP) administered by the Tazewell Soil and Water Conservation District (SWCD) office. The USDA Conservation Reserve Enhancement Program (CREP) priority area in Illinois includes the entire Mackinaw River watershed and the sign up for this program has just started. Information concerning landowner participation is not yet available. There have been five Conservation Reserve Program (CRP) sign ups since 1995. Two of the sign ups have been continuous; the other three sign ups have been concentrated (Myer, 1998). Information concerning the success of these sign up periods will need to be obtained from the Tazewell County SWCD in 1998.

Based on the division into Conservation Priority Zone by The Nature Conservancy, the Mud Creek subwatershed is considered to be in a Zone A, which has a high priority for restoration. Additional activities in the Mud Creek subwatershed area have included:

Date	Activity	Success	Reasons for Success
2/96	SWCD Annual Meeting	yes	Landowner awareness
3/97	CRP Informational Meeting	yes	Interest in cost-share programs
96-97	CRP sign-ups	yes	Interest in cost-share programs
97-98	CRP and EQIP sign-ups	yes	Interest in cost-share programs
98	Mackinaw River Project (MRP) riparian enhancement project sign-up	not yet complete	

Component #4
Watershed Resource Inventory

Waterbodies

Mud Creek is a fourth order tributary of the Mackinaw River. Its headwaters arise in Woodford County approximately 3 miles northeast of the village of Deer Creek, and it flows southward for 18 miles until it reaches the Mackinaw River just south of Rt. 9 between the towns of Deer Creek and Tremont. Two smaller tributaries, Deer Creek and Willow Creek flow into Mud Creek.

Mud Creek is considered a perennial stream with a continuous flow during the year, with the level fluctuating based on the amount of seasonal rainfall. Based on Illinois EPA data from 1987 (site DKG-01), it had a water quality index of 65.1, which indicates moderate water quality problems (Short, 1987).

Biological and Chemical Data

The Mud Creek subwatershed received a Macroinvertebrate Biotic Index (MBI) rating of 7.7 (poor), an Actual Index of Biological Integrity (AIBI) rating of 44.7, and a Potential Index of Biological Integrity (PIBI) rating of 42.3 (Short, 1987). There are no trends to report, since this site (DKG-01) was not used in the 1994 Illinois EPA study. When Dr. Michael Retzer, Aquatic Ecologist for The Nature Conservancy, inventoried freshwater mussels at this site, none were found. There was a fish kill on Mud Creek in September of 1986, and the cause was determined to be agricultural related. It is uncertain if this incident also killed

significant numbers of macroinvertebrates and freshwater mussels. Further research needs to be conducted to determine water quality at this site and the factors affecting freshwater mussel populations and macroinvertebrates within this subwatershed.

There are only two small lakes located within the Mud Creek watershed. One is located just north of the village of Deer Creek (less than 30 acres), and the other (less than 20 acres) near 2800E and 1800N. Both of these lakes are located on private property. The number of farm ponds has been estimated as 25 ponds (Tazewell County NRCS, 1998).

The overall use of Mud Creek is to serve as a means to transport water drained from agricultural fields, and as a source for water for livestock. It is not used as a source of a public water supply. Recreational uses such as fishing, swimming, hunting, etc. would be limited only to those who own property along Mud Creek. There is no public access. This subwatershed does provide habitat for a variety of aquatic life forms.

The following chemical data was collected in 1987 at DKG-01. Water temp.: 8, Dissolved Oxygen:10, pH: 0, Phosphorus: 33, Total Suspended Solids: 84, Total Dissolved Solids:14, Toxic Metals:10, Toxic Ammonia:10. Total Water Quality Index (WQI) : 65.1 (values range from 0 (no problems) to 100 (severe problems). Elevated levels were found for the following: Fecal coliform: 30,000/100ml; Fecal strep: 700,008/100/ml; Nitrates: 3.7ml/l, Suspended solids: 262mg/l; Aluminum: 3369ug/l; Iron: 3958 ug/l, and Manganese: 691 ug/l. (Short, 1987).

Designated Use/Designated Use Support

According to the Illinois EPA Water Quality Report, in 1987 the Overall designated use was 01R (partial support/Minor impairment. For Aquatic Life it was rated 04R with partial support/Minor impairment (Illinois Water Quality Report, Volume II, 1994-1995).

Impairments

Within this subwatershed, causes of impairment listed by the Illinois Water Quality Report are as follows: 09S: nutrients, slight, 11M: siltation, moderate.

According to the Mackinaw River Planning Team, the following causes of impairment were identified as: sedimentation: an increase in velocity and volume of water resulting in increased erosion, nutrients: excess nitrogen, high levels of suspended solids and turbidity, high levels of fecal bacteria, altered hydrology, and a loss of riparian habitat

Source of Impairments

The sources for impairment in water quality are largely of rural/agricultural origin. The Illinois Water Quality Report lists the sources as agricultural (10M, Agriculture, Moderate). As there are no large urban areas within this subwatershed, and only one small rural village (Deer Creek), the potential sources of impairment from urban areas is minimal. According to the 1994 Illinois EPA Survey of the Mackinaw River Watershed, there are three sites identified in the Mud Creek subwatershed as having a high potential as a source for impairment: one is near the village of Deer Creek. One source has a moderate potential as a source for impairment, and two sites as have a slight potential as a source for impairment. (map, pg. 104) The Illinois EPA document, while implicating certain locations as sources of impairments, does not qualify the actual impact of these potential sources.

Agricultural practices that are considered sources of impairment are as follows:

- Row crop production
- Application of farming chemicals
- Livestock waste
- Rural septic systems
- Removal of streamside vegetation

Altered hydrologic regime sources of impairment are as follows:

- Increased flood flows, reduced base flows
- Increased drainage and loss of wetlands
- Stormwater runoff from impermeable surfaces

Urban sources of impairment are as follows:

- Stormwater runoff from roads and highways
- Secondary Sewage treatment facility in Deer Creek

The following list of causes and sources of impairments is found in the report "Assessment of the Water Quality, Fish, and Mussel Communities in the Mackinaw River, Illinois", by Dr. Michael Retzer.

Causes and Sources of Impairment in the Mud Creek Subwatershed (Retzer, 1997)

Causes	Sources
Sediment Increased total suspended solids Increased turbidity	Altered hydrology, Ag and urban stormwater runoff, high volumes and velocities of water entering the river after a storm event, loss of riparian cover and wetlands
Stormwater	Altered hydrology, Ag and urban stormwater runoff, increased flow from rural and urban impermeable surfaces, subsurface tiling
Increased water temperatures	Altered hydrology, reduced base flows due to subsurface tiling and loss of wetlands, loss of shade providing riparian cover
Fecal bacteria Fecal coliform, fecal streptococci	Human sewage and septic discharge

Groundwater

Aquifers in the Mackinaw River watershed are primarily sand and gravel, confined and separated by till or clay. Tills were deposited in layers by ancient glaciers, and are now named through geologic formations. The subwatershed of Mud Creek is considered a confined aquifer.

Water is drawn through wells from these sand and gravel deposits through wells at various depths providing both private and municipal water supplies. The village of Deer Creek obtains its public water supply from a sand and gravel aquifer with a well depth of 335 feet. There is a relatively low potential for contamination of groundwater.

The groundwater capture zone for the village of Deer Creek is not delineated. No re-charge area has been delineated. The village of Deer Creek has a wellhead protection area within 1,000 feet of the village well. Deer Creek is within a Priority Groundwater Protection Planning region (Dulka, 1998).

As this is almost entirely a rural area, the majority of active water wells are from rural homesteads and farms. The reported number of private wells within Tazewell County is 1,647, however, the total number of private wells within this subwatershed is not known at present, but could be estimated from the Illinois State Water Survey Private Well Database. The village of Deer Creek has one active well that supplies services to a population of 684 residents. In 1995,

20,7000 total gallons were used, with a per capita use of 83 gallons per day (CTAP, 1997). There are no listed abandoned wells for this subwatershed.

Physical Data

The following physical data was collected in 1987 at DKG-01.

Geological Table	DKG-01: 1987
Hydraulic Features:	
Stream Order	4.0
Mean Stream Width (ft)	10
Mean Stream Depth (ft)	0.7
Mean Thalweg Velocity (ft/s)	0.02
Discharge (cfs)	0.14
Pool (%)	25.0
Riffle (%)	30.0
Substrate	
Silt/Mud (%)	8.0
Sand (%)	13.0
Fine Gravel (%)	11.0
Medium Gravel (%)	13.0
Coarse Gravel (%)	33.0
Small Cobble (%)	13.0
Large Cobble (%)	9.0
Boulder (%)	0.0
Bedrock (%)	0.0
Claypan (%)	0.0
Plant Detrius (%)	0.0
Vegetation (%)	0.0
Submerged Logs (%)	0.0
Other (%)	0.0
Other	
Shading (%)	25.0
Instream Cover (%)	6.0
IBI	**41.1**
Biotic Potential Category	**B**

No comparison data was available, as this test site was not used by the Illinois EPA in 1994.

Irrigation

There are no known irrigation systems within this watershed.

Drainage

The effects of surface drainage within this watershed results in an increase in soil erosion, therefore there is a decrease in water quality. The majority of surface drainage would come from surface runoff from farm fields and from roadways and storm sewers associated with the village of Deer Creek and Interstate 74. (Interstate 74 contributes 73 surface acres of impermeable surface).

The effects of subsurface drainage result in an increase in water volume and altered hydrology. Subsurface drainage would come from farm field tile systems. The purpose of tiling is to remove water from saturated fields and farmed wetlands in order to increase agricultural productivity. The effect of this is to increase river discharge after a storm event. Tiles serve to drain the land after the peak event and therefore contribute to a higher sustained discharge. This then lowers the general water table in the area, effectively reducing base flows during dry periods. Historically, wetlands would have held water on the land, and probably contributed significant amounts of water to the river during periods of low precipitation. Further study of the effects of subsurface tiling on the river system after a storm event and during base flow periods is needed.

There is no record of the extent of drainage systems in this subwatershed to date. There are no active Drainage districts within this subwatershed.

Floodplain Boundaries

Flooding Frequency and History

No data was available at the time of this report. This data will need to be obtained during 1998.

Flood Structures

No flood structures are located within this subwatershed.

Floodplain Boundaries

A FIRM map (flood insurance rate) is available from SWCD of Tazewell County, which indicates flood plain boundaries/100 year flood zone. Copies of this map will be obtained in 1998.

Flood Damage Estimates

No flood damage estimates are available. (Flooding and high flow data regarding the Mackinaw River Basin can be found in the IDNR Mackinaw River Area Assessment, Vol. I. pg. 3-29)

Municipal/Industrial

In the Mud Creek subwatershed, there are approximately 264 total stream miles. The upper portion of Mud Creek is primarily a low slope tributary lined with agricultural grasses, and is generally stable (Gough, 1997). The middle section becomes a higher slope tributary, with a more extensive (up to 200 feet) riparian corridor (Tazewell County NRCS, 1998).

Riparian Corridors

In the Mud Creek subwatershed, there are approximately 264 total stream miles. The upper portion of Mud Creek is primarily a low slope tributary lined with agricultural grasses, and is generally stable (Gough, 1997). The middle section becomes a higher slope tributary, with a more extensive (up to 200 feet) riparian corridor (Tazewell County NRCS, 1998).

Streambank Erosion

The amount and extent of streambank erosion has not been surveyed. This survey will be completed by the Tazewell County SWCD in 1998.

Existing Vegetation

The type of existing vegetation occurring along Mud Creek is primarily cool season grasses, trees, and shrubs. A detailed analysis of vegetation has not been completed. Most of the corridor is bordered by pasture or cropland. No riparian trees exist in the first ten miles of this subwatershed, and the lower section (8 miles) has a variable (from 50 feet to 200 feet) band of trees (Tazewell County NRCS, 1998).

Filter Strips

There are approximately 3 miles of filter strips in this subwatershed (Tazewell County NRCS, 1998).

Hydrologic Modifications

Approximately 1.5 miles of the upper stream has been channelized (C. Myer, 1998). Channeled streams undoubtedly play a role in downstream flooding and sedimentation problems because of their efficiency in carrying stormwater. These channeled ditches do not have floodplains, therefore any capacity for water storage currently does not exist. Most tile outlets observed in this area enter channels at elevations greater than three feet above the bed and are in little danger of blockage by sediment deposition (Gough, 1997). Downcutting does occur in some areas, with a resulting effect of increased erosion.

Other types of hydrologic modifications include subsurface tiling. Please refer to the **Drainage** section of this report for a discussion about

subsurface tiling and its effects on this subwatershed. There are no dams, and there are approximately 17 bridges and culverts.

Stormwater Management

Tazewell County has adopted the *Model Soil Erosion Ordinance*, which was developed in 1996 by the Tri-County Regional Planning Commission. This ordinance, called the Tazewell County Erosion, Sediment and Storm Water Control Ordinance, describes what land projects are subject to the requirement of a permit, and specific standards for the design and maintenance of control measures for soil erosion, sediment, and storm water. This ordinance states that "no land surface shall be disturbed unless an erosion and sediment control permit, or an erosion, sediment and storm water control permit, has been issued for that project." Exceptions to this are:

1. Land disturbing activities which do not involve the construction of any new single or two-family dwellings, and for which the disturbed area is less than 5,000 feet.
2. Normal agricultural practices
3. Routine maintenance of roads and utility service lines
4. Tazewell County Road Departments

Applicants applying for a permit must file the application with the County, in addition to paying a fee and a site specific plan. For any commercial, institutional, multi-family, or industrial project with an area of more than one-half acre, or for a project requiring subdivision approval by a unit of local government with an area of more than one-half acre must also provide the additional information listed below:

1. Existing site conditions map
2. Plan of final site conditions
3. Sediment and Erosion control practices
4. Storm water management plans and controls
5. Schedule or sequence of development of installation of the elements of the site management control measures proposed.
6. A detailed estimate of quantities and estimated costs
7. A plan of the continued management and maintenance of such permit control structures

The issuance of permits, the inspection of control measures, and the enforcement of the ordinance is the duty of an appointed Erosion Control Administrator. Any permit can be revoked by the Erosion Control Administrator if the rules, regulations, or standards of the permit issued are being violated. Any violation is subject to a fine not to exceed five hundred dollars ($500.00) per day. There is an Appeals Board of five members appointed by the County Board Chairman, the Soil and Water Conservation District, and the Tri-County Regional Planning Commission.

The Village of Deer Creek has a combined sewer system. There are no other sewer systems within this subwatershed.

Wetlands

Wetlands are an important part of our landscape because they provide critical habitat for many plants and animals and serve an important role in mitigating the effects of storm flow in streams. The hydrogeology of wetlands allows water to accumulate in them longer than in the surrounding landscape, with far-reaching consequences for the natural environment. Wetland sites are important to organisms that require or can tolerate moisture for extended periods of time, and the wetland itself becomes the breeding habitat and nursery for many organisms that require water for early development.

The configuration of wetlands enables them to retain excess rainwater, extending the time the water spends on the upland area. The effect of this retention on the basin is to delay the delivery of water to the main stream. This decreases the peak discharges of storm flow or floods, thus reducing flood damages and the resulting costs. Wetlands also provide valuable water to the stream during periods of low flow. Water seeps from the wetland into the stream, increasing base flows and reducing elevated stream temperatures. The destruction of wetland areas has the opposite effect, increasing peak flood flows and thereby increasing flood damages and costs. During periods of low flow, water does not seep into the stream from upland areas. In stream temperatures increase, and base flows of the stream decrease.

Within the Mud Creek watershed, there are approximately 218 acres of wetlands. Of these wetlands, 22 acres are considered shallow Marsh/Wet areas, 129 acres are Forested wetlands, and 68 acres are shallow water wetlands (Varner, 1997). This represents a very small percentage (0.06) of the total acres within this subwatershed. Former wetlands existed in greater number in this watershed, but current floodplains are no longer hydrologically connected to the stream channel. The condition of these wetlands are degraded in diversity and hydrologically impaired.

Fish

The Index of Biological Integrity (IBI) is an aquatic assessment tool used by the Illinois EPA. The IBI evaluates fisheries data by assessment of community structure.

There were a total of 26 species of fish and a total of 2,306 fish collected at DKG-01 (Short, 1987). The list of species and their abundance is presented as follows.

Fish Species Occurring in 1994 at DKG-01 (Short, 1987)

Common name	Abundance
Carp	1
Creek chub	51
Hornyhead chub	51
Striped Shiner	34
Red shiner	117
Sand shiner	445
Steelhead shiner	2
Common stoneroller	499
Golden redhorse	92
White sucker	68
Stonecat	9
Smallmouth bass	1
Green sunfish	2
Longear sunfish	11
Suckermouth minnow	96
Bigmouth shiner	25
Rosyface shiner	5
Redfin shiner	4
Bluntnose minnow	799
Quillback	7
Northern hogsucker	17
Black bullhead	1
Centrachide	1
Largemouth bass	2
Bluegill	6

A fish kill report was reported in September, 1986 on Mud Creek. The cause was determined to be agricultural related.

Habitat: The IBI rating (1987) for Mud Creek was 41.1 (Mean for the basin = 43.6) This indicates that Mud Creek is a highly valued aquatic resource.

Priority Waterbody

The Executive Committee for the Mackinaw River Project has chosen the Mud Creek subwatershed as a section 319 subwatershed priority area with the Illinois EPA for 1998 and 1999. Funding received as a subwatershed priority area will be directed towards landowner cost share for continued application of conservation practices within the three subwatershed priority areas, and the entire Mackinaw River watershed. Mud Creek is a Targeted Watershed Approach subwatershed area (Illinois EPA) with a non priority for Multiple Program Interests (Illinois Water Quality Report, Volume II, 1994-1995).

The Mud Creek subwatershed has been designated by the USDA as an interim EQIP priority area in 1996, and an EQIP priority area for 1997 and 1998. An application for redesignation as an EQIP priority area has been submitted to USDA for 1999 (Myer, 1998).

The Mud Creek subwatershed has qualified for the IDNR C2000 funding from 1996 to present and is part of a larger Ecosystem Partnership priority area for the entire Mackinaw River watershed. In the Mud Creel subwatershed, agricultural landowners have been able to access additional C2000 funding through the Conservation Practice Program (CPP) administered by the Tazewell County Soil and Water Conservation District office. The USDA Conservation Reserve Enhancement Program (CREP) priority area in Illinois includes the entire Mackinaw River watershed.

The Nature Conservancy has classified Mud Creek as a Zone A, which has a high priority for restoration.

Soil Classification

Soil Classifications for Mud Creek Subwatershed (Tazewell County SWCD, 1998)

Soil Classification	Total Acres	Soil Composition	Slope	Water Table (ft)	Permeability (inches)	Land Use Capability	Erodibility Index	Hydric
#2: Tama-Ipava-Sable	11,205							
Ipava		Silt loam	nearly level	1-3	0-18	I	2.8	no
Sable		Silt clay loam	nearly level	0.5-2	0-8	IIIw	2.8	yes
Tama		Silt loam	1-5%	4-6	0-12	IIe	3.4	no
#5: Birkbeck-Miami-Hennepin	4,999							
Birkbeck		Silt loam	5-10%	3-6	0-7	IIIe	17.1	no
Miami		Silt loam	5-10%	>6	0-7	IIIe	15.6	no
Hennepin		loam	20-35%	>6	0-5	VIe	3.2	no
#1: Ipava-Sable (soil characteristics listed above)	4,946							
#4: Rosetta-Stronghurst	3,478							
Rosetta		Silt loam	1-5%	4-6	0-7	IIe	6.6	no
Stronghurst		Silt loam	nearly level	1-3	0-7	IIw	3.7	no
#9: Ross-Landes-Lawson	627							
Ross		Silt loam	nearly level	4-6	0-13	IIw	3.2	no
Landes		Fine sandy loam	nearly level	>6	0-21	IIIw	2.5	no
Lawson		Silt loam	nearly level	1-3	0-11	IIIw	2.8	no

The majority of soils found in this subwatershed are considered suitable for agricultural purposes. Most of these acres (20,000) could be considered as prime farmland, with only (10,000) acres considered as HEL (Highly erodable land). The land use capability classes of these soils indicate that these soils are suitable for mechanized production of field crops and are generally not highly erodable.

Soil Erosion

Soil erosion is of concern in this subwatershed. As this area is almost entirely agricultural, row crop production and some tillage practices expose the soil to erosion. Erosion problems also exist on pasture land, forested areas, and areas near where there is development (village of Deer Creek). In any given area, some soil erosion will occur naturally, and land that is at "T" (tolerable soil loss)

or has a rate of erosion that will sustain soil productivity, still may be detrimental to water quality. Therefore, the total amount of soil erosion, regardless of the cause or whether acres of farmland are at "T" should be considered.

In Mud Creek, 17,779 acres of farmland are at "1T" or below. Approximately 1,951 acres are from "1T" - "2T", and 867 acres are over "2T". About 1,084 acres are listed in the "unknown" category. It is estimated that 108,399 tons of soil per year are delivered into the streambodies of this subwatershed, with 25 percent or 27,000 tons available for transport downstream (Brown et al., 1997).

As there is no major urban construction occurring within this subwatershed, most of the soil erosion is occurring from agricultural sources. The village of Deer Creek, and drainage from Interstate 74 does contribute to water volume within the streambody after a rain event, but the extent of this contribution to erosion rates has not been estimated. There have been complaints from area farmers that Interstate 74 (with approximately 73 acres of road surface) is a significant factor in delivering water volume to the stream after a storm event (Tazewell County SWCD, 1998).

There are four distinct types of erosion that occurs in the Mud Creek subwatershed. Sheet erosion occurs when unprotected soil is detached by the impact of raindrops and moves uniformly, or in a "blanket" effect from its original location in the field. Rill erosion occurs when stormwater runoff concentrates between crop rows, or in tillage channels, and cuts shallow areas of soil away (Brown et al. 1997). Cropland is the most susceptible to sheet and rill erosion because of frequent periods where the soil is unprotected. Ephemeral erosion occurs where stormwater runoff concentrates in an area forming large gullies that can still be eliminated by tillage operations. Classic gully erosion occurs when eroded channels too deep to cross with farm equipment are formed in the land. Classic gully erosion causes significant damage, as deep areas of soil are removed where concentrated water flow is unchecked (Brown et al., 1997).

Streambank erosion occurs when streambanks slough into the stream channel. Sloughing is caused by a number of potential sources including streamflows, overbank flows, unstable soil material, heavy equipment use in the floodplain, obstructions in the stream channel, unstable channel bottoms, and livestock trampling. Streambank erosion is of particular concern because one-hundred percent of the sediment eroded enters the river channel (Brown et al., 1997).

The following table summarizes sheet, rill, ephemeral, gully, and streambank erosion in the Mud Creek subwatershed.

Soil Erosion (Brown et al., 1995)

Type	Erosion (tons)	Sediment Delivery Rate	Sedimentation (tons)	Sedimentation transported (tons)	Sedimentation transported (%)
Sheet and Rill	120,217	0.70	84,152		
Ephemeral	10,200	0.80	8,160		
Gully	9,750	0.85	8,287		
Streambank	7,800	1.00	7,800		
Total	**147,967**		**108,399**	**27,100**	**25%**

Geology

The geologic foundation of the entire Mackinaw River watershed is bedrock and glacially derived sediments that lie directly beneath the soils and modern sediments at the land surface. The topography of the bedrock surface partly determined the type and distribution of the overlying glacial deposits. These sediments, in turn, determine the area's groundwater resources, form the parent materials of the region's rich soils, and play a role in the development of the watershed's wetland areas. Together, these geologic factors govern the development of the entire range of plant and animal communities within the watershed.

Mud Creek originates below the Eureka Moraine where it flows south for approximately 18 miles. It is considered a low slope headwater stream in the upper reaches. In the lowers reaches, the slope becomes greater, and it changes into a high-slope tributary stream. The bank materials vary from clay to silt with coarser stones imbedded. The bed materials are a combination of gravels and cobbles with sand. (Gough, 1994)

The top of the bedrock surface is a complex topographic surface containing buried valleys, lowlands and uplands. Within the Mud Creek subwatershed a major buried bedrock valley can be found and is a tributary to the buried Mackinaw valley. This major valley ranges in depth from less than 350 feet to 450 feet. (CTAP, 1997).

The sediments that overlie bedrock were deposited by a succession of glaciers that advanced across the area during the Pleistocene Epoch, or Great Ice Age. These sediments fall into two major categories: till and outwash. Overlying the deposits of glacial origin is a windblown silt (loess) of late glacial and postglacial age. Collectively, glacial sediments are called glacial drift.

The Mud Creek subwatershed was primarily influenced by the tills deposited during the Wisconsin Episode of glaciation belonging to the Wedron Group (CTAP, 1997). These tills occur at or near the surface and compose the landforms seen on the present land surface, primarily end moraines.

The only mineral produced in the Mackinaw River watershed is construction sand and gravel. There are no active sand and gravel pits in Mud Creek, however, the lower reaches of Mud Creek may be a potential source of sand and gravel in the future. (IDNR: Mackinaw River Assessment, Vol. I, Figure 2-8)

Topography

The Mud Creek subwatershed drains an area of approximately 29,800 acres or 46.6 square miles. The elevation of the subwatershed changes from 730 feet above mean sea level (ft. msl) to 540 ft. msl. Drainage patterns have been drawn for the subwatershed, and a map attached to this report has each stream order indicated.

The drainage density was calculated for the Mud Creek subwatershed by dividing the total acreage for the watershed by the total stream length. The drainage density is approximately equal to 113 acres of watershed per mile of stream (Brown, 1998).

Land Use

Rural

Agriculture is the dominant land use in this subwatershed, as it is for the entire Mackinaw River watershed. 92 percent or a total of 27,389 acres are in cropland or rural grasslands. Row crops account for 76 percent (22,675 acres), and grasslands (hay and pastures) account for approximately 16 percent of the total acres (Varner, 1997). In Tazewell County, the predominate crop is corn and soybeans.

The average size of farms in this subwatershed is 300 acres, and there are approximately 150 farms. The number of farms declined 19 percent in Tazewell County from 1982 to 1992. Data is not available regarding the percent cash renters, the percent who crop share, or the number of absentee landowners.

The values for agricultural acreage in this subwatershed varies from $2,500 per acre to $4,000 per acre. There are 12,500 head of cattle in Tazewell County (no major cattle producers), approximately 5,000 hogs. (112,500 total for Tazewell County). There are no open feedlots located in this subwatershed, and two hog confinement operations.

The woodland resources include approximately 1,563 acres, or 5.2 percent of the total acres of the subwatershed. There are 1,246 acres closed canopy, 300 open canopy deciduous trees, and almost 20 acres of coniferous trees. Approximately 128 acres are considered forested wetlands. (Varner, 1997) Mesic upland forest is the most prevalent type found in the entire Mackinaw River watershed, and to date, no detailed data is available for this subwatershed. It can be assumed that the canopy tree species would include various types of oaks, hickories, maples, walnut, black cherry, basswood, and white ash. Subcanopy species would include mulberry, alternate-leafed dogwood, hop hornbeam, paw paw, and Ohio buckeye. (CTAP, 1997) The condition and value of these woodland resources has not been assessed. There are no commercial logging operations, and human use of the woodland resources would be limited to private landowners for firewood, fencing materials, and woodworking materials.

Urban

There are approximately 425 miles of roads in this subwatershed, (1,699 miles in Tazewell County) with three major transportation routes (Interstate 74, US Rt. 150, State Rt. 9). These major roadways comprise a total of 131 acres. Active railroads comprise 51 acres, and 55 acres of railways have been abandoned. (Varner, 1997)

The only municipality in this subwatershed is the village of Deer Creek. The population in 1990 numbered 630 individuals. There is a 17 percent projected growth rate for Tazewell County. Zoning for Tazewell County has been developed and a copy of the Model Soil Erosion Control Ordinance accompanies this report.

There are no major industries within the Mud Creek subwatershed. Urban land use for Tazewell County is estimated at 27,152. The village of Deer Creek within the Mud Creek subwatershed has an area of approximately 116 acres.

Several commercial businesses are located in the village of Deer Creek. These businesses include 2 gas stations, 1 convenience store, 2 bars/restaurants and a Post office.

Tazewell County has a population of 123,692, with only a 4 percent increase from 1970 to 1990. The development potential for Tazewell County is fairly high, with much of it centered near the towns of Morton and Tremont. The development potential for the village of Deer Creek is not known, nor is it known what the development potential is for the Mud Creek subwatershed.

To date, approximately 3,016 acres are enrolled in the CRP program for Tazewell County. Further information concerning the amount of acreage enrolled in CRP in the Mud Creek subwatershed will need to be obtained through the Tazewell County SWCD.

Illegal dumps may be present in the Mud Creek subwatershed, but no data is present to confirm this. There are no landfills. There are two fertilizer companies located west of Deer Creek.

There are 13 Natural Areas and Nature Preserves within the entire Mackinaw River watershed encompassing 2,783 acres of land. None of these areas are located within the Mud Creek subwatershed (CTAP, 1997).

The Mackinaw River is a primary fishing site in Central Illinois because of the biological integrity of the stream and its supply of Smallmouth bass and channel catfish. In 1994, Illinois registered 4,985 boats alone within the watershed (CTAP, 1997). It is not known how many of these were registered within the Mud Creek subwatershed.

Information is available concerning reported hunting activity in the entire Mackinaw River watershed. Within the Mud Creek subwatershed, many residents hunt available grasslands and woodlands, and game harvested is included in these numbers (CTAP, 1997).

Hunting Activity (CTAP, 1997)

Game	# of Hunters	Days Afield	Harvest
Deer (Archery)	2,119	49,006	898
Deer (Shotgun)	3,342	12,541	2,410
Pheasant	6,593	41,375	26,416
Rabbit	5,467	32,392	32,406
Squirrel (Fox)	3,523	20,701	27,134
Squirrel (Gray)	820	3,122	4,395
Dove	2,851	14,372	43,146

**Note - Hunting data is from IDNR's "Hunter Activity and Wildlife Harvest in Illinois: County Averages for 1989-1993.

The Village of Deer Creek has 4 underground storage tanks.

There is no data available on existing best management practices within the Mud Creek subwatershed. This information will need to be obtained from the Tazewell County SWCD in 1998.

Recommended best management practices indicated for this subwatershed (according to the Mackinaw River Basin Assessment of the Conservation Treatment Needs, USDA/NRCS, 1996) include the following:

Recommended Best Management Practices for the Mud Creek Subwatershed (Brown et al., 1996)

Conservation Tillage (acres)	8,470
Contouring (acres)	35
Terraces (ft)	4,550
WASCOBs (#)	270
Structures (#)	16
Waterways (acres)	51

Air Quality

There are no controlled or permitted toxic releases to air within this subwatershed. The climate for this subwatershed is classified as humid continental. Summer maximum temperatures range from 80-90 degrees, with lows in the winter from 10-20 degrees. The mean annual temperature is 51.8 degrees. Mean annual precipitation is 37.75 inches, with the spring and summer months averaging the greatest amount of precipitation. The wettest year on record was in 1993, with 63.35 inches. The driest year was 1988, with 23.22 inches. For precipitation, the number of days with measurable precipitation shows a clear upward trend since 1970. (IDNR, Mackinaw River Area Assessment, Vol. 1)

Wildlife

Threatened or Endangered Species

The following is a list of the threatened and endangered species that occur or are likely to occur in the entire Mackinaw River watershed. Specific locations of many of these organisms were not provided with the data in order to further protect their existence. This information is provided by Dr. Michael Retzer, who performed an extensive freshwater mussel survey within the drainage, and CTAP.

Threatened and Endangered Species Occurring in the Mackinaw River Watershed (Retzer, 1997, CTAP, 1997)

Plants	
heart-leaved plantain	State Endangered
spreading sedge	State Threatened
tall sunflower	State Endangered
Birds	
Long-eared owl	State Endangered
Short-eared owl	State Endangered
Loggerhead shrike	State Threatened
Brown Creeper	State Threatened
Amphibians and Reptiles	
Kirtland's snake	State Threatened
Illinois chorus frog	State Threatened
Illinois mud turtle	State Endangered
Western hognose snake	State Threatened
Mussels	
round pigtoe	State Endangered**
slippershell	State Endangered**
elktoe	State Endangered**
rainbow	State Endangered

**indicates that records exist for these species within the upper Mackinaw River subwatershed.

Birds

Bird species will not be listed in this report because the list is far too long. Many species of birds only summer and nest in the Mackinaw River watershed, and migrate to another location to overwinter. For more information on birds, please reference CTAP, Mackinaw River Area Assessment, Volume 1, 1997.

Mammals

Forty-five mammal species are known to exist in the Mackinaw River Basin (CTAP, 1997). Their occurrence is dependent upon adequate habitat and the population status of these species is unknown. Data was not available as to how many of these species are found within the upper Mackinaw River subwatershed. The following list was obtained from CTAP, 1997.

Mammal Species Known or Likely to Occur in the Mackinaw River Watershed (CTAP, 1997)

Common name	Population status
Virginia opossum	Common
masked shrew	Common
northern short-tailed shrew	Common
least shrew	Common
eastern mole	Common
little brown bat	Common
northern long-eared bat	Common
silver-haired bat	Uncommon
eastern pipistrelle	Common
big brown bat	Common
red bat	Common
hoary bat	Uncommon
evening bat	Uncommon
eastern cottontail rabbit	Common
eastern chipmunk	Common
woodchuck	Common
thirteen-lined ground squirrel	Common
Franklin ground squirrel	Uncommon
gray squirrel	Common
fox squirrel	Common
southern flying squirrel	Common
plains pocket gopher	Common
beaver	Common
western harvest mouse	Common
deer mouse	Common
white-footed mouse	Common
meadow vole	Common
prairie vole	Common
pine vole	Uncommon
muskrat	Common
southern bog lemming	Common
Norway rat (exotic)	Common
house mouse (exotic)	Common
meadow jumping mouse	Uncommon
coyote	Common
red fox	Common
gray fox	Uncommon
raccoon	Common

Mammal Species Known or Likely to Occur in the Mackinaw River Watershed (CTAP, 1997) (continued)

Common name	Population Status
long-tailed weasel	Common
mink	Common
badger	Uncommon
striped skunk	Common
river otter	State Endangered
white-tailed deer	Common

Butterflies and Skippers

Twenty-one species of butterflies and skippers are known to occur in McLean County within the Mackinaw River Watershed. They are the black swallowtail, zebra swallowtail, cabbage butterfly (exotic), clouded sulfur, bronze copper, Dione copper, eastern tailed blue, spring azure, harvester, hackberry butterfly, tawny emperor, viceroy, question mark, hop merchant, silvery checkerspot, pearl crescent, regal fritillary, great spangled fritillary, variegated fritillary, monarch, and dun skipper (CTAP, 1997).

Amphibians and Reptiles

There are 13 amphibian species and 25 reptile species known or likely to occur in the Mackinaw River watershed (CTAP, 1997). A complete listing providing common name and abundance information is provided.

Amphibian and Reptile Species Known or Likely to Occur in the Mackinaw River Watershed (CTAP, 1997)

Common name	Abundance
smallmouth salamander	Common
tiger salamander	Uncommon
eastern newt	Uncommon
American toad	Common
Fowler's toad	Common
cricket frog	Common
striped chorus frog	Common
Illinois chorus frog	State Threatened
Cope's gray treefrog	Common
eastern gray treefrog	Common
bullfrog	Common

Amphibian and Reptile Species Known or Likely to Occur in the Mackinaw River Watershed (CTAP, 1997) (continued)

Common name	Abundance
northern leopard frog	Uncommon
plains leopard frog	Uncommon
snapping turtle	Common
painted turtle	Common
Blanding's turtle	Rare
Illinois mud turtle	State Endangered
map turtle	Uncommon
spiny softshell turtle	Uncommon
ornate box turtle	Rare
slender glass lizard	Rare
six-lined racerunner	Rare
eastern hognose snake	Uncommon
western hognose snake	State Threatened
racer	Uncommon
smooth green snake	Uncommon
rat snake	Uncommon
fox snake	Common
bullsnake	Uncommon
milk snake	Uncommon
prairie kingsnake	Common
western ribbon snake	Uncommon
plains garter snake	Common
common garter snake	Common
brown snake	Common
red-bellied snake	Uncommon
Graham's crayfish snake	Uncommon
northern water snake	Common

Socio-Economic/Human Resources

There has not been an analysis done on specific demographic data for this subwatershed. The following data represents demographics for Tazewell County.

Tazewell County has a human population of 123,692. The population of Deer Creek is 630 individuals. The population density in 1990 for Tazewell County was 190.6 persons per square mile. There was an increase in population of 4 percent from 1970 to 1990. The median age in this county is 34.8 years.

The average per capita income in Tazewell County was $20,000, with an increase in 41 percent from 1970. The median household income for Tazewell County in 1993 was $40,449. The county unemployment rate is not known at present.

The only issue between farmers in this subwatershed and non-farmers is that some farmers feel that the construction of Interstate 74 has negatively impacted their farming practices by increasing the amount of flooding due to surface run-off from the roadway (per conversation, NRCS/Crystal Myers, 1998).

Less than 1 percent of Tazewell County is considered minority. The largest employers in Tazewell County (over 1,000 employees) are Caterpillar, Inc. (Morton and E. Peoria); Par-A-Dice Gaming Corp. (East Peoria); and Scrivner of Illinois, Inc. (East Peoria). Specific details regarding Tazewell County business and industry can be found in IDNR Mackinaw River Area Assessment, Vol. 2.

There are three major highways associated with this subwatershed. These roadways are Interstate 74, US Route 150, and State Route 9. There is one railway located in the upper subwatershed.

As this subwatershed is almost entirely a rural area, it has a definite agricultural identity and rural atmosphere. It is located near two fairly large urban areas however, Peoria and Bloomington-Normal.

Outreach programs would be offered through the University of Illinois Extension, NRCS/SWCD, The Nature Conservancy/Mackinaw River Project, and IDNR. There is no information on the number of limited resource producers in the Mud Creek subwatershed.

The Tazewell County Farm Bureau, which would represent farmers within the Mud Creek subwatershed, is located in Pekin. The Tazewell County Soil and Water Conservation District, would also represent landowners within this subwatershed , and is located in Pekin.

There are no Conservancy districts and no Drainage districts located in this subwatershed. There are no federal or state agencies located within this subwatershed. The Tazewell County seat is located in Pekin, Illinois. The village of Deer Creek has a village council and represents the residents of Deer Creek. Environmental associations: There are no environmental associations located in this subwatershed

The Pekin Daily Times and the Peoria Journal Star are the two daily newspapers with a significant circulation in this subwatershed. A weekly paper (Morton Weekly News) is published in Morton.

There is no data on land user problems or attitudes toward the watershed specific to this subwatershed, but a survey was done in 1995 to gather information about the views, opinions, and concerns of farm operators in the Mackinaw River Watershed. Specific problems identified in this study were as follows:

Flooding, Soil erosion and sedimentation, sand/gravel deposits, chemicals, and crop residue and debris in the river and stream were listed as problems. The top solutions to these problems were: maintain the current system of levees, develop detention basins, use Conservation Farming Practices, use proper application and/or reduced use of chemicals, allow flooding, and to increase trees along the river. (Farm Operator Study for the Mackinaw River Watershed, D. Schneider et al., 1995)

There are approximately 150 farms within the Mud Creek subwatershed. Forty-three percent own their farms, 40 percent own some and lease some, and 17 percent are tenant farmers. (Schnieder et al., 1995) The non-farm population is not presently known. The average farm gross income presently is not known. Farmers with Off-Farm employment: not known. The major off-farm employer is Caterpillar, Inc., located in Morton, Peoria, and Mossville.

No portion of Mud Creek has recreation opportunities available to the public. Outdoor recreation has already been discussed in the **Land Use** section of this report. Fishing, hunting, and hiking would be the primary recreational pursuits, however, this may be limited to private landowners and their guests.

Students living in this subwatershed attend school in Deer Creek, Mackinaw, or Morton. Three universities are within commuting distance: Illinois State University (Normal), Bradley University (Peoria), and Illinois Central College (E. Peoria).

This subwatershed has not had a specific targeted approach to gain support for improvement in watershed management practices, other than that done by the Tazewell NRCS/SWCD. Efforts to increase awareness and support would be desirable.

Component #5
Problem Statement

Problem #1

High volume and velocity of water after a storm event, caused primarily by altered hydrology, which enters Mud Creek is resulting in an increase in streambank erosion and sedimentation, and thereby a decline in water quality. Altered hydrology may include channelization, subsurface tiling, and the loss of functional wetlands.

Problem #2

High levels of chemical pollutants and fecal coliform concentrations, caused by excessive nutrient runoff from agricultural fields, stormwater runoff, and untreated sewage flowing into Mud Creek is resulting in a decline in water quality.

Problem #3

Water quality and wildlife diversity within the Mud Creek subwatershed has decreased due to the loss of wetland areas, a decrease in natural riparian areas, and increased water flows due to urbanization and agricultural practices within the subwatershed.

Problem #4

There is a lack of awareness about the relationship between land use and the condition of the river/stream, and the value of our water resources. This results in a need for additional conservation practices to improve water quality.

Component #6
Goals and Objectives

Goal #1

To reduce the volume and velocity of water which enters Mud Creek after a storm event, thereby reducing sediment loads and erosion and improving water quality.

Objective #1

A. To reduce and retain where possible, surface and subsurface runoff on 9,000 acres by promotion of such Best Management practices as Terraces, Contouring, Conservation Tillage, Filter Strips, WASCOBS, Waterways, and stormwater detention/retention basins.

B. To establish wetlands and stable riparian areas on 200 acres within the Mud Creek subwatershed.

Goal #2

To reduce the levels of chemical pollutants and fecal coliform levels that occur in Mud Creek which would contribute to an improvement in water quality.

Objective #2

A. Promote the use of conservation tillage practices, grass waterways, and filter strips.

B. Provide education and assistance to landowners in improving riparian corridors.

C. Provide technical assistance and support for the management of nutrients and human sewage.

Goal #3

To increase the awareness and application of Best Management practices of residents, which will improve water quality within the watershed.

Objective #3

A. Provide educational opportunities, technical assistance, and financial assistance to residents of the watershed to learn about water resources and management.

Components #7, #8, and #9

Implementation Strategies, Cost Summary, and Measuring Progress

Strategy #1: Agricultural Best Management Practices

Utilize NRCS Whole Farm Planning and available funding to reduce soil loss on sixty percent of this subwatershed. Practices could include:

Type	Quantity	Cost Per Unit	Total Cost
Conservation tillage (ac)	8,470	$10.00	$84,700
Contouring (ac)	35	variable	NA
Terraces (ft)	4,550	$5.00	$22,750
Water and Sediment Control Basins	270	$1,000/each	$270,000
Structures (#)	16	$4,000	$64,000
Waterways (ac)*	50.7	$1,300	$65,910
Filterstrips	information not available		
Total Cost			**$507,360**

Schedule of Completion
5 years. Starting dates will vary, depending upon program sign-up dates.

Agency-organizational Roles/Resources
USDA/NRCS/SWCD will provide technical assistance and financial assistance. TNC/MRP: outreach and education, promotion of programs.

Environmental Impacts
These practices will reduce soil erosion, reduce volume and velocity of stormwater, and reduce sediment and nutrients. When implemented, these practices will achieve goals #1-3.

Projected Cost
See above

Funding Sources
Federal: USDA (EQIP, CRP, CREP); State: Illinois EPA, IDNR (C-2000); Private: TNC/MRP, Pheasants Forever, Monsanto Green Strip Program

Measuring Progress
Progress can be determined by the number of BMP and acreage enrolled in five years. Stream team (volunteer) water quality monitoring, hydrological data collection, estimation of soil erosion and sedimentation will also be used to measure progress. The number of landowners participating in these programs within the watershed can also indicate progress.

*Based upon research by the City of Bloomington, The University of Illinois, and Illinois State University on wetland treatment of surface and subsurface runoff from agricultural fields, the Mackinaw River Project would like to demonstrate field tile treatment wetlands in each subwatershed.

Strategy #2: Wetlands

Identify and promote protection, construction, and restoration of suitable wetland areas and promote sidestream storage of water. An increase of 200 acres of wetland areas in this subwatershed is desirable.

Schedule of Completion
5 years. Start date: Summer, 1998

Agency-organization Roles/Resources
USDA/NRCS/SWCD: design, technical, and financial assistance; IDNR: financial assistance, seed, trees. TNC/MRP: technical and financial assistance, labor, education and promotion. Illinois EPA: 319 funding. US Fish and Wildlife: funding. Army Corps of Engineers: permits

Environmental Impacts
Wetlands will reduce volume and velocity of water, treat nutrients, and enhance/increase habitat and biological diversity. This will achieve objectives #1-3.

Projected Cost
$1,200 per acre. Earth work: $2.70/cubic yard. Water level control structures installed: $250-2500 each. Seeding: $600/acre. Field tile removal: $500/acre. **Total costs: $465,000**

Funding Sources
Federal: USDA (CRP, CREP, WRP). State: IDNR(C-2000).
Private: TNC/MRP ($, labor), Pheasants Forever (seed, equipment), Landowners (cost-share, labor, equipment).

Measuring Progress
Progress can be determined by acres constructed or restored, Stream Team (volunteer) monitoring of water quality. The number of landowners participating.

Strategy #3: Wetlands for the Community of Deer Creek

Provide assistance to the village of Deer Creek in this subwatershed for the demonstration of constructed wetland treatment of wastewater, including nutrients and human sewage. Quantity: one (Deer Creek).

Schedule of Completion
3 years. Start date: Summer, 1998

Agency-organization Roles/Resources
Illinois EPA (permits). USEPA: financial and technical assistance. TNC/MRP: technical, financial assistance. Wetland Initiative: technical and financial assistance. Local government: land acquisition, financial. Army Corp of Engineers (permits).

Environmental Impacts
This strategy will treat nutrients and human sewage in communities wastewater. This achieves objective #2C.

Projected Cost
An estimated $50,000 to $100,000 will be used for design and construction of the demonstration wetland. This excludes the cost of land acquisition.

Total Cost
$50,000 to $100,000

Funding Sources
Federal and State: USEPA, Illinois EPA. Local community: Village of Deer Creek. Private: TNC/MRP, Wetlands Initiative.

Measuring Progress
Ambient water quality monitoring, including nutrients, fecal coliform and fecal strep.

Strategy #4: Streambank Stabilization

Stabilize streambanks where needed, encouraging the use of natural materials and native vegetation (buffer strips). Four miles of streambanks need stabilization in this subwatershed.

Schedule of Completion
3 years. Start date: Summer of 1998.

Agency-organization Roles/Resources
Illinois EPA(319), USDA/NRCS/SWCD: technical and financial assistance, education/promotion. IDNR(C-2000): financial. TNC/MRP: education and promotion, technical, financial. Pheasants Forever: financial.

Environmental Impacts
Reduction of streambank erosion and sedimentation. Increase habitat and biological diversity. This achieves goal #1 Objective B.

Projected Cost
Critical area seeding: $190/acre. Vegetative streambank: $20/linear foot. Total costs: $500,000

Funding Sources
Federal: CREP, CRP. State: Illinois EPA, IDNR: C-2000. Private: TNC/MRP (funding, labor, equipment), landowners (labor, equipment, cost-share).

Measuring Progress
Miles of streambank stabilized, Stream Team (volunteer) monitoring of stream and assessment of vegetative cover.

Strategy #5: Biological Diversity

Identify and enhance or restore natural plant areas compatible with soil type and historical use. (Historic use refers to Transect notes, centennial photos, and other historical records). Establish, restore or widen riparian zones where desirable. Within 15 years, target a minimum of 10 percent (2,975 acres) of the subwatershed to be in natural cover (Forest, savanna, prairie), with a target of approximately 60 percent (300 acres) of the riparian corridor in native vegetation.

Schedule of Completion
15 years. Start date: Summer, 1998.

Agency-organization Roles/Resources
USDA/NRCS/SWCD: CRP, WHIP, technical assistance. IDNR: funding (C-2000, Forestry Programs, Wildlife Habitat). TNC/MRP: financial and technical assistance. Pheasants Forever: financial

Environmental Impacts
Reduce volume and velocity of water, enhance and increase habitat and biological diversity, reduce erosion and sedimentation. This will achieve objectives #1-3.

Projected Cost
Technical assistance to identify natural community types: $1,000. Restoration of natural plant communities: $500 per acre. Total costs: $1,638,500.

Total Cost
$4,850,000

Funding Sources
Federal: USDA (CRP, CREP). State: IDNR (C-2000, Forestry Incentive Program, Partners for Wildlife). Private: TNC/MRP (funding, labor, technical assistance), Pheasants Forever(seed, equipment), Landowners (labor, cost-share, equipment)

Measuring Progress
Number of acres restored, numbers of landowners participating, Stream Teams (volunteer), EcoWatch.

Strategy #6: Stormwater Control

Enhance participation of rural landowners, the village of Deer Creek (developers, businesses, civic organizations), and IDOT in programs to control runoff, bank erosion, pollution, and soil loss. These will include installation of farm ponds, terraces, grade control structures, retention/detention basins, constructed wetlands, stormwater/erosion control ordinances, and Urban BMP.

Schedule of Completion
15 years. Start date: Summer, 1999.

Agency-organization Roles/Resources
Illinois EPA-319 (funding and technical assistance, NRCS/SWCD (technical assistance, funding), Local government (funding, planning), Army Corps of Engineers (permits), TNC/MRP: education/promotion, financial and technical assistance.

Environmental Impacts
Reduce volume and velocity of water. Objective #1 will be achieved by this strategy.

Projected Cost
Rural - Farm ponds: Earth work $2.60/cubic yard, overflow pipe $20-80/ft. Seeding $190/acre. Estimated cost for 15 farm ponds: $150,000. Constructed field tile outlet wetlands: $1,200 per acre, Tile outlet control structure at $2,500 each, Critical seeding at $600 per acre. Estimated costs: $94,300 (Other rural water retention/detention BMP are included in costs projected for Strategy #1.)
Urban - Detention/retention basins: $500,000
IDOT study and demonstration constructed wetland: $15,000
Total Costs: $760,000

Funding Sources
Federal and State: USDA(EQUIP), Illinois EPA (319). Local government: Village of Deer Creek. Private: Landowners (cost-share), developers, TNC/MRP.

Measuring Progress
Soil erosion reduction estimates, sedimentation reduction estimates, peak flooding levels (Stream teams).

Strategy #7: Nutrient Management

Provide and promote nutrient management for livestock producers and work with local agricultural chemical dealers to reduce over application of fertilizers and pesticides. Provide soil testing on fifty percent of the total acreage (11,338 acres) in row crop production for 5 years. This strategy will be accomplished through provision of information (newsletter, mailings, conferences, workshops), and the development of farm nutrient and pesticide management plans based on realistic productivity goals.

Quantity: For soil testing quantity, see information above. One conference/workshop per year, three newsletters, mailings dependent on programs. (This strategy will be accomplished throughout the watershed)

Schedule of Completion
5 years. Start date: November, 1998.

Agency-organization Roles/Resources
Illinois EPA (319), USDA/NRCS/SWCD: workshops, funding;
Agricultural businesses: (Monsanto, DuPont) funding, mailing;
TNC/MRP: newsletters, conferences/workshops.

Environmental Impacts
Reduction of nutrient loading, improvement in water quality. This will achieve Objective #2C and #3.

Projected Cost
Soil testing @$5.25 acres (GPS) For newsletters, mailings, and Workshop/Conference costs, refer to Strategy #8.

Total Cost
Total cost/year: $59,525 or $297,625 for five years.

Funding Sources
Federal: USDA (EQIP) for workshops/conference. State: Illinois EPA (319). Private: local agricultural business, Farm Bureau, TNC/MRP, for newsletters and mailings; Landowners.

Measuring Progress
Reduced application of nutrients and pesticides, number of landowner participation, attendance at conferences/workshops.

Strategy #8: Education

Develop a network of educational activities through which information about the watershed and available programs can be disseminated. This would include conferences, newsletters, mailings, a resource handbook, Stream Teams (organization and training) and coordination of workshops, watershed tours, and development of educational materials. (*Note: In order for this to be cost-effective, this strategy needs to be watershed, not sub-watershed wide)

Schedule of Completion
Start date: Summer 1998. Ongoing for 5 years.

Agency-organization Roles/Resources
Conferences, workshops, mailings, resource handbook. TNC/MRP: conferences, workshops, newsletters, resource handbook, watershed tours, Stream teams. IDNR: EcoWatch, C-2000, educational materials. Farm Bureaus: meeting facilities, watershed tours.

Environmental Impacts
Increased awareness and participation in conservation practices. This achieves Objective #3.

Projected Cost
Newsletter: $3,000 per year; mailings: $1,000 per year ;
Conference/Workshops: $8,000 per year; Resource handbook: $60,000.
Stream Teams: $5,500 per team.

Total Cost
Total costs: $120,000 for five years. Total Cost per subwatershed for five years: $13,000.

Funding Sources
Federal: USDA/NRCS (EQIP), USEPA. State: IDNR/C-2000, Eco-Watch (training). Private: TNC/MRP, Schools, Farm Bureau.

Measuring Progress
Stakeholder surveys, number of volunteers, participation in conferences/workshops.

Total Cost Summary for Implementation Strategies
Mud Creek Subwatershed

#1: Agricultural Best Management Practices	$507,360
#2: Wetlands	$465,000
#3: Wetlands for the village of Deer Creek	$100,000
#4: Streambank Stabilization	$500,000
#5: Biological Diversity	$1,638,500
#6: Stormwater Control	$760,000
#7: Nutrient Management	$297,625
#8: Education	$13,000
Total Cost	**$4,281,485**

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