Chapter 6. Natural Resource Protection

Natural resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. In so doing, these activities enable the naturally beneficial functions of the land, such as fields, floodplains or wetlands, to be better realized.

Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants, and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved though regulatory steps for protecting natural areas or natural functions. This chapter covers natural resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Seven areas are reviewed:

- Wetland protection
- Erosion and sedimentation control
- River and stream restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

6.1. Wetland Protection

Wetlands are often found in floodplains and depressional areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and provide habitat for many species of fish, wildlife, and plants.

Wetlands that are determined to be part of the waters of the United States are regulated by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (US EPA) under Section 404 of the Clean Water Act. Before a “404” permit is issued, the plans are reviewed by several agencies, including the Corps and the U.S. Fish and Wildlife Service. Each of these agencies must sign off on individual permits. If a permit is issued by the Corps, the impact of the development is typically required to be mitigated. Wetland mitigation can include creation, restoration, enhancement or preservation of wetlands elsewhere. Wetland mitigation is often accomplished within the development site, however, mitigation is allowed off-site and sometimes in another watershed. The

appropriate type of mitigation is addressed in each permit.

> A 1993 study by the Illinois State Water Survey concluded that for every one percent increase in protected wetlands along a stream corridor, peak stream flows decreased by 3.7 percent.

Local implementation: In Jersey county we have a group of investors called Great River Road Land Trust that does several projects in the wetlands. One of their projects is coming up in this plan. For every acre that Jersey County takes out of wetland for roads or construction we replace it with wetlands somewhere else in the county. County Health department and Nuisance coordinator work closely to put out mosquito packets in the wetland areas to reduce risk.

The City of Grafton presently has designated wetlands areas, particularly, at the west end of the city along the bike trail. The city will soon begin construction of the Marquette and Joliet Wetlands Nature Walk, a grant funded project that will provide an elevated walkway allowing visitors to view the natural habitat of a semi-controlled wetlands.

CRS credit: The Community Rating System focuses on activities that directly affect flood damage to insurable buildings. While there is no credit for relying on the Corps of Engineers' 404 regulations, there is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations.

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

6.2. Erosion and Sedimentation Control

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. It can clog storm sewers, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to do their job, but the sediment in the water reduces light, oxygen, and water quality and often brings chemicals, heavy metals and other pollutants.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds).

Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Local implementation: Jersey County and the City of Jerseyville work closely with Water and Soil Conservation Dept. on all subdivision and building in the floodplain. The county also follows state requirements so if a developer changes over one acre of ground the have to put up silt fences and follows state requirements.

Following the Flood of 1993, the City of Grafton acquired approximately 235 acres of property for a new residential and commercial development. During the process of preparing to develop this land, the city put into place several ordinances to protect the city's natural resources. In July of 1994 the city council passed a soil erosion and sediment control ordinance. The purpose of the ordinance was to safeguard persons, protect property, prevent damage to the environment and promote the public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any development or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth on land situated in the city. It is the intentions of the ordinance that the delivery of sediment from sites affected by land disturbing activities be limited, as closely as practicable, to that which would have occurred if the land had been left in its natural undisturbed state.

CRS credit: Storm water ordinance's erosion and sedimentation control provisions qualify for 35 points, the maximum credit for programs that do not address erosion from farmland.

6.3. River and Stream Restoration

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

There is a growing movement that has several names, such as "stream conservation," "bioengineering" or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration" which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, and/or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing, and bird watching
- Reduces long term maintenance costs

Studies have shown that after establishing the right vegetation, long term maintenance costs are lower than if the banks were concrete. The Natural Resources Conservation Service estimates that over a ten year period, the combined costs of installation and maintenance of a natural landscape may be one-fifth of the cost for conventional landscape maintenance, e.g., mowing turf grass.

Local implementation: In Jersey County we have several streams and creeks to maintain with the help of local townships and our county highway dept. landowners work together to clear log and brush jams before they become a threat. We work closely with the Corp of Engineers to regulate river conditions throughout Jersey County.

CRS credit: The Community Rating System focuses on activities that directly affect flood damage to insurable buildings. However, there are credits for preserving open space in its natural condition or restored to a state approximating its natural condition. There are also credits for channel setbacks, buffers and protecting shorelines.

6.4. Best Management Practices

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

The term “best management practices” (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of storm water runoff rates and volumes, prevent erosion, protect natural resources and capture non point source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of storm water. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple uses of drainage and storage facilities.

Local implementation: Jersey County and the City of Jerseyville are in contact at all times with our local Soil and Water Conservation District who offer advice and services to the county and municipalities.

The City of Grafton passed an ordinance providing for the control of storm water runoff. The purpose of this ordinance is to diminish threats to public health, safety and welfare caused by runoff of excessive storm water from new development and redevelopment. This excessive storm water could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. The cause of increases in storm water runoff quantity and rate and impairment of quality is the development and improvement of land.

CRS credit: A storm water ordinance would receive up to 40 points for requirements that protect channel banks and lakeshores from development through setbacks or buffer zones and for requiring storm water management facilities to incorporate BMPs.

6.5. Dumping Regulations

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels’ and wetlands’ ability to convey or clean storm water.

Many cities have nuisance ordinances that prohibit dumping garbage or other “objectionable waste” on public or private property. Waterway dumping regulations need to also apply to “non objectionable” materials, such as grass clippings or tree branches which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard not realizing that it is needed to drain street runoff. They may not understand how regrading their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Local implementation: Being a small community like Jersey County we do not see to much stream dumping. When it does accrue the Floodplain Coordinator works with the County Highway Dept. to get the job cleaned up as soon as possible. The City of Jerseyville has a full time Code Enforcement Officer to keep track of dumping.

CRS credit: The CRS provides up to 30 points for enforcing and publicizing a regulation that prohibits dumping in the drainage system. As currently written, the Jersey County Storm water Ordinance would not receive this credit.

6.6. Urban Forestry

Hazards Addressed	
*	Flood
*	Tornado
	Earthquake
*	Thunderstorm
*	Winter Storm

The major damage caused by wind, ice and snow storms is to trees. Downed trees and branches break utility lines and damage buildings, parked vehicles and anything else that was under them. An urban forestry program can reduce the damage potential of trees. The cities in central Illinois are prone to ice storms and have initiated programs that select species that are resistant to ice and storm damage.

Urban foresters or arborists can select hardier trees which can better withstand high wind and ice accumulation. Only trees that attain a height less than the utility lines should be allowed along the power and telephone line rights-of-way. Just as important as planting the right trees is correct pruning after a storm. If not done right, the damaged tree will not heal properly, decay over the next few years, and cause a hazard in the future. A trained person should review every damaged tree to determine if it should be pruned or removed

By having stronger trees, programs of proper pruning, and on-going evaluation of the trees, communities can prevent serious damage to their tree population. A properly written and enforced urban forestry plan can reduce liability, alleviate the extent of fallen trees and limbs caused by wind and ice build-up, and provide guidance on repairs and pruning after a storm.

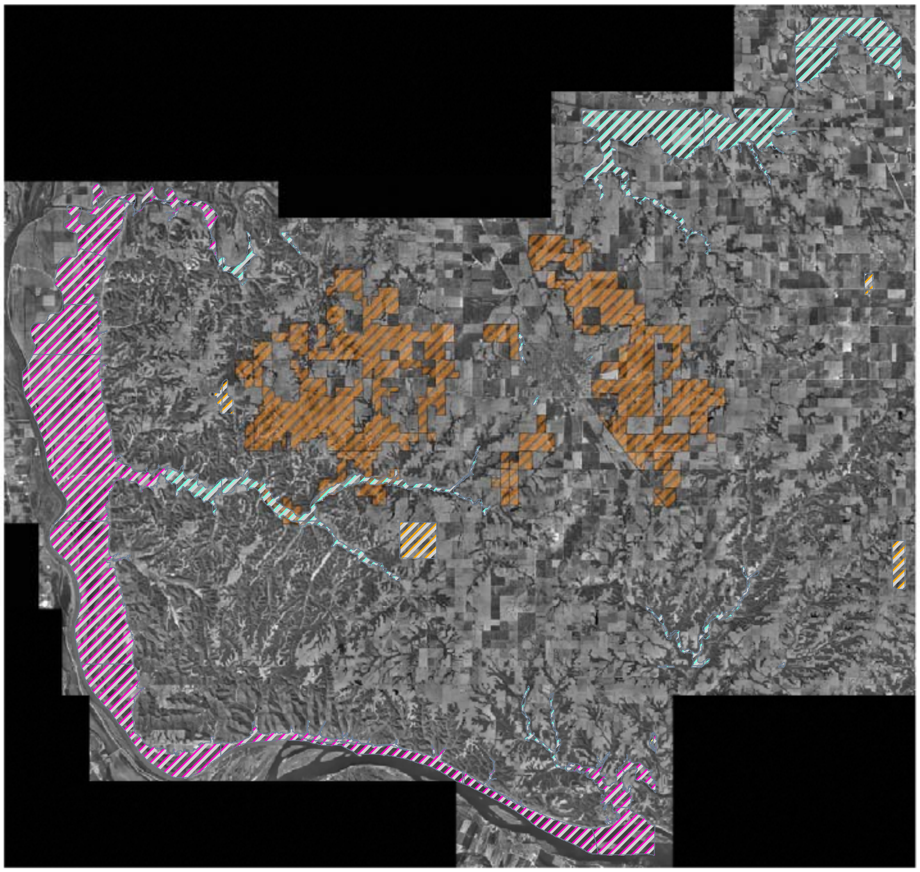
Local implementation: In the County it is every man for himself but in the city of Jerseyville they do have pickup procedures for residence. Grafton also has similar methods.

In the fall of 2006, the City of Grafton started a riverfront improvement project with the planting of indigenous trees and native grasses. In an effort to become a Tree City USA, the City of Grafton along with the Grafton Chamber of Commerce is presently planning an Arbor/May Day celebration. This should become an annual event with emphasis on meeting the four required standards to become Tree City USA.

CRS credit: Being a part of the National Flood Insurance Program, the CRS recognizes only activities that affect flood damage. It does not provide credit for projects or programs that only affect damage from other types of hazards.

6.7. Farmland Protection

Farmland protection is quickly becoming an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.



Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can create additional storm water runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land.

The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, local governments and to nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes crop-land, range-land, grass-land, prairie-land, and forest land that are part of an agricultural operation. Certain lands with historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation, discussed in Chapter 4. Preventive measures:

- Farmland is preserved for future generations
- Farmland in the floodplain keeps damageable structures out of harm's way

- Farmland keeps more storm water on site and lets less runoff downstream
- Rural economic stability and development is sustained
- Ecosystems are maintained, restored and/or enhanced
- The rural character and scenic beauty of the area is kept

Local implementation: The City of Grafton and the City of Jerseyville have been working on a new Comprehensive Plan, land use plan and a new zoning map. This plan should be completed and adopted by their City Councils. In the city's of Grafton and Jerseyville Zoning is applied to control farm land protection. In the 1980s Jersey County set up a farmland protection committee that over sees the land that was dedicated to that program. It takes a 2/3rd vote to remove the land ones it is placed into farmland protection. Jersey County also has 20,000 acres of floodplain that is in protection under and levee district. The Nutwood levee district is to under go an elevation in the next few years. An increase height of 3-5 ft. it had failed in 1993 and the farmland was flooded. Jersey County has very little in the way of stream cleanup and protection. It does have some out side groups that are willing to take on large projects and follow compliance.

CRS credit: Credit is given to preserving open space in the floodplain, regardless of why it is being preserved. Credit is also provided for low density zoning of flood prone areas. Agricultural zones that require minimum 10 or 20 acre lots would qualify.

6.8. The Piasa Creek Watershed Project

Hazards Addressed	
*	Flood
	Tornado
	Earthquake
*	Thunderstorm
	Winter Storm

The Piasa Creek Watershed covers approximately 78,000 acres, or 121.9 square miles, in portions of Jersey, Madison and Macoupin Counties. Almost the entire Macoupin County portion of the watershed (12%) is devoted to intense agricultural practices. The Jersey County portion of the watershed (62%) is predominantly intense agriculture with the exception of areas of steeper topography and stream corridor, which are primarily grasslands and forest cover. The Madison County portion of the watershed (26%) is the only segment with any significant urban population. .

As the result of years of hydraulic modification and increased drainage, Piasa Creek's natural ability to absorb flood waters, trap sediment or control erosion is greatly diminished. Alterations to the watershed hydrology from landscape modifications coupled with the region's highly erodible loess soils and steep topographic gradients have increased the magnitude and frequency of flash flooding. The instability of the unconsolidated stream banks has dramatically increased the sediment load of the water column. The most pervasive problem in the upper reaches is runoff from agricultural fields and urban landscapes. There are no known permitted point source discharges present within the Piasa Creek Watershed.

6.8.1. Great Rivers Land Trust & The Original Watershed Plan

GRLT is a local non-profit organization formed by private citizens in 1992. GRLT was one of the cooperating partners in the development of the original Piasa Creek Watershed Project in 1994.

In the summer of 1994, GRLT held a series of exploratory meetings to discuss possible solutions to water quality and flood related problems in the Piasa Creek Watershed. Although the Piasa Creek Watershed is impacted heavily by both urban and rural land uses, the local groups felt the need for assistance in addressing problems stemming from the agricultural sector. With funding from the McKnight Foundation, GRLT agreed to apply staff and financial resources to a one-year program for the purpose of working with members of the agricultural community to address environmental issues in the Piasa Watershed in a cooperative, pro-active way.

Using a process developed by the Natural Resource Conservation Service (NRCS) known as "resource planning", farmers, landowners and urban residents met to identify resource concerns and discuss possible solutions. After several meetings using the nominal group process to identify concerns, common themes emerged. Farmers and rural landowners were concerned about soil erosion and runoff from agricultural lands, but they also viewed urban pollution and encroaching land uses as equally serious threats to environmental quality in the watershed. They acknowledged that some flooding might be attributed to agricultural drainage and hydrologic modification on rural lands, but they felt that urban build-up and a lack of storm water handling facilities in residential areas greatly contributed to flood-related problems.

Based on these concerns, members of the Piasa Creek Watershed Partnership steering committee, serving as facilitators for the meeting process, made the decision to focus the discussion regarding potential solutions on three main subject areas: 1) soil erosion, 2) water quality and 3) urban issues. Recommendations for solutions to address these problem areas were listed, combined, and ranked using the nominal group process.

The original watershed management plan was developed in late 1995 at a time when watershed management was a relatively new concept. Although a number of watershed management projects have been implemented since the development of the plan, most of those projects have been small in scale, because no program existed to fully fund a total watershed treatment of this proportion.

The $4.15 million grant from Illinois American Water Company provides the funding resources to support the Piasa Creek Watershed Project and provide the seed for other funding sources. IAW and GRLT fully expect the new Piasa Creek Watershed Project will provide the sediment reductions required to fulfill the NPDES permit suspended solids trading requirements.

6.8.2. Project Goals, Plan and Benefits

Project Goal

The Piasa Creek Watershed Project will reduce sedimentation in the watershed by approximately 6,700 tons per year by the end of the ten-year program in 2010.

Project Plan

The basic project plan is elaborated in the Agreement between IAW and GRLT and in IEPA's NPDES Permit. In summary, the project plan includes:

- Year 1 (2001)
  - Employ Watershed Coordinator
  - Initiate Geomorphic Inventory Assessment (GIA)
  - Initiate watershed stakeholder contacts
- Years 2-5 (2002-2005)
  - Submit Watershed Assessment Report & GIA within 24 months after the effective date of the NPDES Permit (1/24/03).
  - Submit Watershed Implementation Plan within 30 months after effective date of the NPDES Permit (7/24/03)
  - Implement recommendations within 36 months after effective date of the NPDES Permit (1/24/04)
  - Address storm water ordinances in Godfrey
  - Monitor sediment reduction
  - Work to attract additional funding
  - Submit comprehensive assessment of the project status 180 days prior to expiration of the NPDES permit (7/24/05) to determine project viability for 5 more years.
- Years 6-10 (2006-2010)
  - Continue implementation
  - Monitor sediment reduction
  - Obtain 2:1 reduction goal (6,700 tons) by 12/31/08
  - Complete project –12/31/10
- All Years
  - Quarterly reporting to IAW and IEPA
  - Yearly meeting with IEPA

Project Benefits

There are multiple benefits beyond the sediment reduction goal. Some of the benefits are immediate, while others are long term.

One of the immediate benefits is that the water company received an NPDES permit from the IEPA allowing direct discharge to the Mississippi River. The result of awarding the permit to IAW is millions of dollars in savings in projected construction and operating expenditures. The lower construction and operating costs can result in lower water bills for area residents. Since a lagoon system will not be necessary, sediment will not have to be transported to landfills, the benefits of which include: fewer semi trucks traveling area roads, lower air pollution, and saving of precious landfill space.

Factors affecting the Piasa Creek Watershed include reduced erosion, improved water quality, storm water control, enhanced fish and wildlife habitat, protection of sensitive ecosystems, and financial incentives to farmers and landowners to implement conservation practices. The other major benefit in the end will be a cleaner Piasa Creek and a cleaner Mississippi River.

6.8.3. Current Watershed Conditions

GRLT secured the services of Shannon-Wilson, Inc., to conduct a Geomorphic Inventory Assessment (GIA) of the Piasa Creek Watershed. The GIA provided an assessment of the current geomorphology of the watershed and provides recommendations for reducing sediment load in Piasa Creek and ultimately the Mississippi River. The final report was published in October 2002.. The following paragraphs summarize the GIA findings.

Topography

Elevations in the Piasa Creek Watershed ranged from a low of 430 feet National Geodetic Vertical Datum (NGVD) at the mouth of Piasa Creek to a high of 740 feet NGVD on the bluffs along the Mississippi River. Elevations near the headwaters of Piasa Creek were approximately 660 feet NGVD.

Slope classifications include: 0-5% slope, 5-20% slope, 20-40% slope, and 40-100% slopes. GIA Table 1 presents the total and percent area of each slope classification within the watershed. Slope classifications were calculated from 30-meter USGS Digital Elevation Models (DEM) of the watershed.

Geology (Bedrock and Quaternary)

Mapping of the bedrock units within the watershed has been accomplished by the Illinois State Geological Survey and is presented in the 'Geological Map of Illinois' (Willman et. al., 1967). Six bedrock formations were identified within the watershed. Descriptions of the bedrock formations were obtained from the Handbook of Illinois Stratigraphy (Willman and et. al., Illinois State Geological Survey, 1975). GIA Table 1 presents a summary of the total and percent area of the bedrock units. Predominant bedrock deposits include: Mississippian-Upper, Middle, and Lower Valmeyeran, Pennsylvanian-Spoon and Carbondale Formations, and Pennsylvanian-Modesto Formation.

Information for the Quaternary deposits within the watershed was derived from the 'Quaternary Deposits of Illinois Map' (Lineback, 1979), published by the Illinois State Geological Survey. GIA Table 1 summarizes the total and percent area of the Quaternary deposits within the Piasa Creek watershed. The three predominant deposits included: Cahokia Alluvium, Peoria Loess and Roxana Silt, and Vandalia Till Member of Glasford Formation.

Soils

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, (NRCS)], has mapped the distribution of soil types in the Piasa Creek watershed. Composite maps of soil types were developed for each county in the watershed, based on the NRCS soil surveys. Four predominant soil associations have been identified in the watershed. These soil associations were designated by the NRCS based on similar soil characteristics, including parent material, slope, and drainage. The percent coverage of these soil associations in each sub basin is presented in Table 1 of the GIA. The predominant soils associations and their percentages of coverage in the watershed are as follows: Clinton-Keomah Association (45%), Fayette-Stringhurst Association (23%), Bottomland and Terrace Association, (17%), and Tama-Muscatine/Harrison-Herrick Association (15%).

Climate

The Piasa Creek watershed lies within an area that is characterized by an interior continental climate. As such, weather is influenced by the Gulf of Mexico, Pacific Ocean and the Arctic Ocean, depending on the season. Precipitation events in the spring and summer months tend to be of short duration and high intensity. Precipitation events in the fall and winter months are generally of long duration, frequently lasting several days, but of relatively low intensity.

According to the National Oceanic and Atmospheric Administration, average monthly temperatures in the study area are 28.8º in January, 56.1º in April, 78.9º in July, and 57.9º in October. Average annual precipitation between 1990 and 2000 was 37.37 inches. GIA Table 2 presents a summary of monthly rainfall between 1990 and 2000.

Land Cover

Land cover, shown in figure 2, is grouped into five general categories: Urban land cover (3.9%), agricultural land cover (48.1%), grassland land cover (17.2%), wooded land cover (28.7%), and water land cover (2%). The further details of each of these land cover types in each sub basin are presented in GIA Table 1.

Vegetation and Wetlands

Vegetation and habitat were varied within the Piasa Creek Watershed. Very little pre-European-settlement vegetation remained, but pockets of relatively undisturbed habitat existed along sections of Piasa Creek. Forest loss can play a significant role in bank stability and ecosystem health. Vegetation, particularly forests provide shade and thus keep water temperatures cooler. Forests also provide organic matter, and contribute woody debris for use as habitat cover. The roots of vegetation will help stabilize channel banks.

Agricultural Lands

The majority of the land cover within the watershed was in agricultural production. Many of the bottomland areas adjacent to Piasa Creek and its sub-basins have been cleared, and have been used for row-crop production. Similarly, the flat to gently rolling uplands have been cleared of forest and prairie cover and converted to row-crop production. Row crops produced were primarily corn, soybeans, and winter wheat. Some pasture was located on areas of rolling topography. Pasture areas and grassland consisted primarily of fescue. Only small pockets of native grassland were present within the Piasa Creek watershed, primarily in upland areas. Most grassland areas were either pasture or suburban lawns. In addition, only a few orchards were present in the watershed.

Forests

Forest habitat occurred primarily adjacent to Piasa Creek and its tributaries and along slopes and deep draws that were too steep to be plowed for row-crop production. Several types of forest habitat occurred within the watershed. These were generally grouped into bottomland and upland forest types.

Bottomland forests were found in the flat areas immediately adjacent to the creeks, and across floodplains. Bottomland forests consisted of three types: wet, wet-mesic and mesic, depending on the hydrologic regime. Wet bottomland forests generally occur immediately adjacent to creek channels, but can also occur in low-lying areas adjacent to a creek. Common species include silver maple, slippery elm, box elder, cottonwood, sycamore, green ash and willows. Condition of the forests varied throughout the watershed. A few small pockets of older growth were scattered throughout the watershed, particularly on the steeper slopes of upland forests and in bottomland areas of the lower Piasa. In bottomland areas where agriculture practices have been abandoned, early successional species were dominant. Notable dominant species were silver maple and black willow. Elsewhere, species composition was varied.

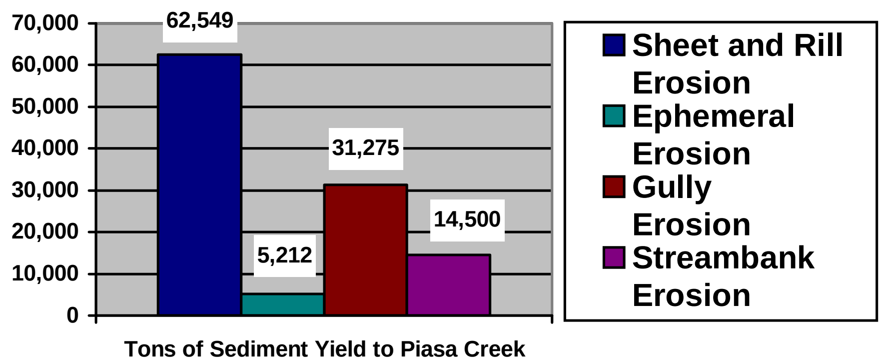
Wetlands

Wetland assessments included a review of NWI maps, NRCS Food Security Act Wetland Maps, the Illinois Wetlands Inventory data, aerial photography, and field investigations. Wetland habitat within the Piasa Creek watershed was limited to a few types. Most of the wetlands consisted of wetland woods or palustrine forested wetlands. Piasa Creek and its tributaries were riverine wetlands. No marsh wetlands, and only small pockets of shrub swamp wetlands, were identified. No natural lakes or ponds were present. Scattered livestock ponds occurred in some areas, but those were not hydrologically linked to waters of the United States, and therefore cannot be considered jurisdictional wetlands by USACE definition.

Sedimentation

Transport of sediment in stream channels can be characterized as ‘supply-dependent’ or as ‘transport dependent’. A supply-dependent stream has sufficient transport capacity, but limited sediment is available for transport. Most steep mountain streams and large rivers are in this category. A transport-dependent stream has sufficient sediment in the system, but flow events of sufficient size to transport it are intermittent. Desert ephemeral streams are an extreme version of this category. Because an abundant amount of stored sediment exists in the Piasa Creek basin channels, this stream system can be considered transport dependent.

Figure 3: Estimates of Annual Sediment Yield to Piasa Creek



Sediment Sources

Sources of sediment in the Piasa Creek basin include erosion of agricultural uplands by sheet runoff, as well as more concentrated (and therefore, more eroding) rill and gully processes (Figure 3). Sediment is also generated and delivered to the stream system as a result of soil erosion from construction sites and other areas of disturbed soil. Concentrated storm water that is discharged onto slopes in an uncontrolled manner, such as from culverts or ditches, can also initiate gully erosion and contribute substantial volumes of sediment.

Sediment can also be generated from erosion of channel banks and beds. Flow velocities and depths can increase substantially during periods of flooding as seen in GIA Table 2. As a result, greater shear stress on the bed and banks is available to erode and transport sediment. In general, the size and shape of channels reflect the 1.5 to 2-year return interval flood, referred to as 'channel-forming events'. Because of the relative regularity of these flood events, they are considered responsible for most of the work done in eroding and transporting sediment within the basin.

The rate of runoff in the Piasa Creek Watershed has increased in recent years due to an increase in less-permeable surfaces, such as roofs, roads, and compacted bare soil. In addition, the time between rainfall onset and peak flow has decreased as a result of increased channelization, such as drain tiles, ditches and culverts. This change in basin hydrology has resulted in a greater frequency of channel-forming events, even though the average size and frequency of precipitation storm events probably has not changed. Because much of this hydrologic change has been recent relative to rates of stream-channel formation, the impacted stream channels are still adjusting (i.e., eroding) to accommodate the larger and more frequent storm flows.

In the Piasa Creek Watershed, the beds of many of the upper and mid-channel tributaries appear to be armored by bedrock or by gravel and cobbles derived from bedrock. As a result, incision in these channels is uncommon. It is not clear if these channel beds were once alleviated (deposited by flooding) and the channel bed sediment has since been eroded, or if the channels were primarily always founded on bedrock. It seems, at least for Mill Creek and Rocky Fork that the latter is most likely. In any event, because of the more resistant channel beds, channel erosion is concentrated primarily along the banks.

Mill Creek is relatively stable with respect to channel bed and bank erosion, and appears to be in relative equilibrium with respect to sediment and flow events. Where bank erosion does occur, it is generally limited to the outside of bends, which is a natural process.

In contrast, significant bank erosion is occurring all along Rocky Fork. While the uppermost reaches appear relatively stable, significant bank erosion is occurring in the reaches upstream and downstream from the confluence of two channels. In these reaches, the creek bed is composed of bedrock and the banks are undercut, near vertical and raw, with numerous trees having toppled into the channel. Further downstream, Rocky Fork flows through what was once the Warren Levis Lake. This lake, which measured about 1,800 feet long and 400 feet wide, has filled with sediment to a depth of at least fifteen feet. A dam at the west end of the lake was breached, allowing the lake to drain and Rocky Fork to incise through the lake-deposited sediment. Banks along this reach were composed of steep, bare sediment that was sloughing into the creek. In the lower reaches of Rocky Fork, abundant sediment has been stored in lateral bars. Bank erosion has occurred as a result of flows deflected by these bars into the opposite banks. In addition, channel aggradation has led to increased bank erosion.

Similar to the lower reach of Rocky Fork, abundant sediment deposition in the low-gradient, lower reach of Piasa Creek has aggraded the channel and created lateral side bars that shift channel flow into the opposite banks. The middle reaches appear to be a zone of sediment transport and temporary storage, with abundant in-channel sediment but only scattered areas of bank erosion. Substantial aggradation can occur in reaches upstream of undersized stream cross-sections that impede flow, while bed scour and formation of pools commonly occurs where flow is constrained under bridges. Channel erosion appears to dominate in the uppermost reaches of Piasa Creek.

Although the other tributary channels were not investigated to the same extent as Piasa Creek, Mill Creek and Rocky Fork, based on similar land use and topography, channel conditions in East Newbern, East and West Little Piasa, and West Piasa Creeks as identified in GIA Figure 1 are probably similar to those in Upper Piasa Creek. Conditions in South Branch Creek may be closer to conditions in Rocky Fork Creek (i.e., relatively greater amounts of channel erosion) due to increased urban development resulting in increased storm runoff and more frequent high flow events.

Sediment Transport

Erosion and transport of sediment in the Piasa Creek basin occurs primarily during storm events. During the summer field season, only fine suspended sediment and fine sand bed load material was observed moving discontinuously. As shown in GIA Table 2, estimated average discharges in the tributaries and upper reaches of Piasa Creek are very low. These low discharges would correspond to low depths and velocities. As a result, the average stream energy to do ‘work’ (erode and transport) is also very low in these reaches during average flows. However, as the estimated hydraulic data shows in GIA Table 2 for a flood event, flow depths and velocities are relatively high, resulting in a greater amount of stream energy to do ‘work’.

The type of sediment in the Piasa Creek system is generally the easiest on which to initiate movement because it is predominantly composed of silt and sand. As a result, limited amounts of gravel and cobbles are available to provide a surface-armoring layer, and particle cohesion is relatively low compared to clay-dominated sediments. Although sediment data was not collected in Piasa Creek, visual observations during the field studies indicated the mean sediment size at most of the measured cross-sections probably ranges from fine to medium sand (0.1 to 2 millimeters in diameter). These particle sizes are entrained at velocities of 0.6 to 1 feet per second (fps). With estimated flood-event velocities in Piasa Creek and its tributaries of 3 to 7 fps as found in GIA Table 2, substantial sediment erosion and transport occurs during floods.

6.8.4. Sediment Reduction Project Plan

The sediment reduction project plan incorporates the findings of the GIA and separates the projects into two major categories-Upland Treatment (rural and urban) and Riparian Treatment.

The most effective measures to reduce the amount of sediment are those that reduce eroded sediment at the source before the sediment is transported off site and into creeks and rivers. Examples of this type of measure include vegetative cover such as reforestation; storm water management controls; best management practices for agricultural, construction and urban sites; and land-use changes that will result in a net reduction of erosion potential. Reducing the origin of in-channel sediment sources includes the use of channel grade controls to slow or eliminate head-cutting and measures to stabilize channel banks. The types and numbers of sediment reduction projects proposed for the Upland and Riparian treatment are presented in this section along with the current estimate of sediment reduction expected from these programs.

Upland Treatments

Due to increased runoff from agricultural and urban land uses, and improved subsurface drainage throughout much of the watershed, Piasa Creek and its tributaries are severely overtaxed during periods of excessive rainfall. Increased drainage and fast runoff during these periods create problems for both agricultural and urban residents. The primary tool is a sediment basin. There are a number of different designs of the basic sediment basin that can be introduced in different settings based need and site assessment. In some instances, additional Best Management Practices (BMPs) such as grass waterways, terraces and others may be used in conjunction with the basins to make them more efficient.

Rural Sediment Basins

The mechanical practices of sediment basins will be designed to control gully erosion, reduce sediment, and improve water quality. The sediment basins will preserve the capacity of ditches, waterways, streams, and Piasa Creek. The trapped sediment will reduce pollution by providing a place of deposition for soil particles.

The improved water quality will be based on a 24-hour dewatering time on cropland fields. This extended retention time will improve deposition time for sediment load. The majority of these structures are farm through basins that reduce the loss of production acres while still controlling erosion. The design criteria of a 24-hour dewatering time will maximize water retention without damage to growing crops.

Retention Basins

Another mechanical practice to improve water quality and retention of runoff is the use of upland retention basins. These structures will hold water on a year around basis. Their appearance is similar to a pond or lake; however they have a much greater temporary storage capacity during storm events. The retention basins have the added capability of providing water for livestock, irrigation, recreation and aesthetics. Upland retention basins will be designed to reduce the outflow to the standard of 0.15 cfs per acre of drainage. This reduced rate of release will control peak flow to the downstream drainage system and increase trapping efficiency 50%-90%. The 0.15 cfs is recommended by IDOT-DWR for storm water reduction and water quality improvement.

The performance of the practice will be calculated on the amount of drainage acres of control. The control will be based on a 25-year storm event with stage height above normal pool to control the outflow of 0.15CFS/ac of drainage. Participation would be limited to structures draining a minimum of 25 acres.

Urban Water Detention/Retention

Detention/retention facilities will be constructed in the urban portion of the watershed, the Rocky Fork sub-basin, where feasible due to their increased effectiveness and positive public acceptance. Based on an analysis of each site, some structures may retain water year around while others will only detain water during storm events. These structures may also have an associated wetland area above the main structure. The constructed wetland will absorb storm water and pollutants, trap sediment and extend the life of the structure.

Removing pollutants will be achieved by gravitational settling, algal settling, wetland plant uptake and bacterial decomposition. The degree of pollutant removal is a function of pool size in relation to the watershed area. Reliable removal can be achieved if the permanent pool is sized to store between 0.5 and 1.0 inch of runoff per contribution watershed area.

Reported sediment removal typically ranges from 50-90%. Urban water detention/retention basins are not only reliable methods of pollutant removal but also are widely adapted to most developments and have a longevity of 20 years or longer.

An additional cause of water quality degradation is excessive stream bank erosion. Studies confirm the effectiveness of these extended detention ponds not only for water quality improvement but also for "peak discharge control" and "stream bank erosion control."

Design of detention facilities in the Rocky Fork Sub-Basin will follow the best design procedures available to improve effectiveness, protect public safety, increase wetland area, enhance wildlife habitat and consider aesthetic value of proposed sites before and after construction.

The urban water detention structures will be based upon site suitability and will focus on fewer but larger structures in the urban areas. Permanent sedimentation basins will require periodic maintenance, and removal and disposal of accumulated sediment. Maintenance will be the responsibility of the landowner.

Riparian Treatment

Riparian Corridor Protection and Restoration

The riparian corridor is the zone of vegetation in, along, and adjacent to a creek, stream, or river. The riparian corridor varies in width, but if left unaltered would include the out-of- bank-flow areas adjacent to streams. Forested areas of the corridor contain deeply rooted tree species and shrubs that help bind the soil in the creek banks. This reduces the rate of bank erosion and sediment delivery into the stream. Sediment from overland flow or from out-of-bank flow is trapped by vegetation at the top of bank and adjacent to the channel. Reduction in the size or elimination of, the riparian corridor results in an increase in the amount of sediment eroded and the rate of transport. In addition to trapping sediment, trees, shrubs, and grasses in a riparian zone help remove nutrients, pesticides, pathogens, and other potential pollutants before they enter a stream or creek. A riparian corridor will help retain runoff and improve infiltration. A riparian zone can provide habitat, cover, and travel corridors for many species of wildlife.

Stream Bank Stabilization

Unstable stream banks along Piasa Creek contribute a significant amount of sediment to the channel. Because of the variability in channel flow and velocity, the banks are prone to caving and undercutting during periods of high water or storm events. Agricultural producers in the watershed often exacerbate this problem by farming to the very edge of the watercourse. This increases the potential for the channel to cut into fields, damaging crops and property, and adding sediment load to the stream flow.

The primary objective of riparian corridor treatment is to improve and maintain the quality of streams within the Piasa Creek Watershed and ultimately the condition of the Mississippi River. Objectives for obtaining this goal include the implementation of stream bank stabilization practices such as stream buffers, pool and riffle technology, incorporating peak stone protection, and debris removal.

In the past, bank protection usually meant hardening the bank with materials such as rock, broken concrete, old cars and other discarded materials. Rock usually was loose dumped, but was occasionally placed as an engineered, riprap revetment.

With changes in the Clean Water Act in recent years, more attention and effort has been directed at less ‘hard’ measures, and more ‘soft’ measures. These soft measures are typically referred to as ‘biotechnical stabilization’ or ‘bio-stabilization’ measures because they incorporate some of the engineered hard methods in combination with the use of live plant and wood material. Although the use of biotechnical measures can enhance the riparian habitat compared with a rock revetment, there are some instances where the hydraulic forces and/or the channel geomorphic conditions preclude the effective use of these softer measures. Deep-rooted riparian vegetation helps to bind the soil along stream banks, which helps prevent sloughing off of the banks. Because the bio-technical measures rely to varying degrees on the root reinforcement and channel roughening characteristics of live plant material, a lag period of several months to several years often occurs until the plants are well developed. Biotechnical bank stabilization measures are most vulnerable to damage from flooding and erosion during this lag time, and may require partial repair or replacement.

The following is a list of various bank protection measures, in approximate order from ‘softest to hardest’. Subsequent items can be added to those listed previously for combinations with increased bank stability.

- Bank regrading and revegetation – bank is graded to a typical 2 Horizontal to 1
- Vertical (2H: 1V) slope or flatter, and planted with native grasses and shrubs. Water velocities of greater than six feet per second can adversely affect some vegetation.
- Erosion control blankets – natural or synthetic fiber blankets may be laid over regraded bank and incorporated into revegetation.
- Toe rock – appropriately sized rock is placed along the toe of the re-graded bank where scour and erosion is greatest. Toe rock works well with using vegetation to stabilize other portions of the bank. Living or non-living vegetated materials may also be used for toe protection. Reed or willow rolls and bundles, or rolls constructed of coir (wood) fibers are also useful. Cribbing of willow or other wood timber is another form of toe protection.
- Stone peaks – small piles of stone extending out a short distance from the bank provide a hard point that can anchor softer bank protection.
- Rock barbs – rock dikes built to normal high water elevation and extending out from the bank at an angle oriented upstream. The barbs are intended to deflect flow away from the bank.
- Rock spurs – similar to barbs, but larger in that they are built as high as the design flood level.
- Full rock revetment – typical bank riprap revetment extending from the toe up to the bank top or just above design flood elevation. Vegetation is commonly planted between the rocks.

Prior to construction of channel bank stabilization measures in Piasa Creek or its tributaries, a study is conducted of the reach, including drainage area for a given location, estimated peak storm flows and velocities and other hydrologic and hydraulic characteristics. Soil characteristics related to bank stability (grain size, permeability, areas of seepage) and types of vegetation the soil can support, and potential upstream sediment sources that could compromise the stability of an improvement at a specific location should also be investigated.

Section 404 of the Clean Water Act requires that the U.S. Army Corps of Engineers issue a permit for the dredging or filling of material into wetlands and waters of the United States. Section 10 of the Rivers and Harbor Act has similar requirements. Rules formulated for implementing Section 404 will limit the amount of ‘hard’ material that may be placed in a water of the U.S. for stabilization purposes.

Rock Riffles

In many areas of Illinois, increased flooding has prompted landowners to channelize i.e., straighten streams so that floodwaters leave their property more quickly. Unfortunately, channelization increases stream power by increasing the slope of the channelized section. Increased power enables the stream to do more work to erode its channel and banks, thus increasing the potential for damage to adjacent properties.

Artificial riffles are made of stone to distribute the drop in streambed elevation over a longer distance. The technique drowns out the points of maximum channel incision and allows the riffles to adjust to future streambed changes.

The riffles are spaced so that local scour creates a pool downstream of each riffle. Essential to this technique is that sediment is not trapped in pools and bed material is allowed to move through each pool and riffle. The erosive energy of floods is dissipated in the deeper pools, thereby reducing bank erosion and lateral channel migration, and inhibiting the upstream movement of channel incision. Therefore, the rock riffles not only reduce bank erosion in channelized reaches, but they inhibit excessive bank erosion upstream. The technique provides stability to a stream reach while also protecting the entire watershed.

Other Best Management Practices

While sediment basins, water retention/detention basins and various stream bank stabilization methods are the tools with the highest level of erosion control, there may be circumstances at a particular site where other options may be the best fit for that situation. In those instances, other Best Management Practices (BMPs) may be considered. Best Management Practices are those construction practices that will result in water quality improvements, particularly sediment reduction, in a watershed.

While many of the examples given are for use in urban areas, many are applicable to non-urban areas as well, particularly those that apply to construction sites. Applicable BMPs include:

- Protecting grassed buffers at the perimeter of the construction site to help trap sediment.
- Use of sediment fences or staked straw bales to trap sediment before it leaves a site.

In addition to Best Management Practices that apply to construction sites and urban areas, many BMPs apply to agricultural areas as well. These include:

- Filter strips of grass, legumes or other non-woody vegetation that filters runoff and significantly reduce the amount of sediment and nutrients entering a water body.
- Grass waterways that are either natural or manmade channels to stabilize small gullies and washouts.

Land Acquisition and Protection

Just as important as upland water detention sites, cropped wetlands, bottomland fields and riparian areas subject to seasonal flooding should be allowed to carry out temporary detention functions. From a watershed or community perspective, these lowlands are potentially more valuable for flood control purposes than they are for agricultural production. Cropped wetlands and bottomland fields in the floodplain of Piasa Creek should be targeted for acquisition and conservation easements.

The introduction of agricultural practices and urbanization into the watershed has resulted in the two largest causes of increased rates of erosion and sediment transport within the watershed. As land cover and land uses have changed over the years, the amount and velocity of storm water flow has increased with a resultant increase in the rate of erosion and sediment transport, and a resultant increase in the amount of sediment delivered downstream from its source. Certain land use practices can be effective in reducing the rate and amount of erosion, the rate and amount of storm water runoff, and the rate and amount of sediment delivery.

Agricultural areas loose an average of eight tons of soil per acre per year, and higher on highly erodible soils and slopes. Forest areas lose an average of one ton or less of soil per acre per year. Reforestation of agricultural areas would potentially yield an annual reduction of seven or more tons of sediment per acre. The majority of Piasa Creek Watershed is in agricultural production, making it the single largest contributor of soil loss and sedimentation in the watershed. Taking agricultural areas that are of marginal value out of production and allowing them to revert to forest will result in a significant annual reduction of sediment yields in the Piasa Creek.

Development of a greenway to protect the riparian corridor is a positive land use policy that will help to protect the channel banks, and trap and reduce sediment. This will have the added benefit of providing protected open space. Greenways can provide recreation opportunities for people living within the Piasa Creek watershed and nearby communities. Greenways can enhance adjacent property values. Greenways may be developed by property acquisition or by use of conservation easements. Greenways require little maintenance.

Greenway development, buffer zones along stream corridors, open space preservation along stream corridors and in highly erodible areas, and establishment of conservation easements for forested areas and riparian zones may be used to help fulfill the National Pollutant Discharge Elimination System (NPDES) Phase II requirements of the Clean Water Act for small municipalities. This may be of additional benefit to urbanizing areas along Rocky Fork.

Wetland Restoration

One of the primary functions of wetlands is to trap sediment. In the case of Piasa Creek, this occurs for sediment transported by overland flow that passes through a wetland prior to entering the channel of Piasa Creek or its tributaries. It can also occur from sediment transported by out-of-bank flows (flooding) from the creek or its tributaries. For most of the existing wetlands adjacent to Piasa Creek and its tributaries, most sediment is captured during periods of flooding.

Restoring prior-converted wetlands and farmed wetlands to wetland conditions will have a positive affect on sediment transport in Piasa Creek. Prior-converted wetlands are those areas that have been converted or drained by some method for agricultural purposes. Farmed wetlands are those wetlands that have not been drained, but are dry enough to farm periodically.

Restoring wetland areas adjacent to Piasa Creek and the lower reaches of its tributaries will be more effective in reducing sediment than in restoring wetlands in the upper reaches of the watershed. Sediment loads in the stream are greater in the lower reaches. Longer duration flooding in the lower reaches allows interaction between sediment laden flood flows and wetlands to occur for a greater period of time. Letting prior-converted wetlands revert to wetlands in upland areas will intercept sediment that eroded from adjacent agriculture fields.

6.8.5. Sediment Reduction Project Summary

Since the Piasa Creek Watershed Project began in 2001 numerous projects have been completed including a total of 113 sediment basins, 6 storm water detention basins, 3 field terraces, a 500 foot buffer strip, 3 grass waterways, 1 grade control structure, 2 stream bank stabilization projects that incorporated 3 stream barbs, 7 rock riffles, and 450 of stone toe protection (Figure 4). Each project is documented and has calculations of numerous statistics including cost and tons of soil saved. As of January 1, 2004, a total of 3,716 tons of soil have been controlled (Table 1).

Projects in the active phase include the restoration of the Camp Warren Levis Boy Scout Lake in the Rocky Fork Sub-basin. The Warren Levis Lake restoration is the largest individual project to date. It involves the excavation of 15 acres of a silted-in lakebed and the establishment of a 10 acre enhanced wetland above the restored portion of the lake. Completion is anticipated for April of 2004. Other projects in the active phase include an additional 15 smaller sediment basins in the agricultural sector (Table 2, Figure 5).

In the area of land protection, GRLT has acquired 169 acres in the Piasa Creek Watershed, holds conservation easements on 253 acres, has pledges of conservation easements on an additional 20 acres, and is in negotiations with landowners for the acquisition of an additional 151 acres. Already 422 acres of the Piasa Watershed have been protected and it is anticipated that over 600 acres will be protected by the completion of the overall project.

Numerous pending projects are at various stages in the planning process. Although a number of sediment basins are on the pending projects list (Table 3) many others are anticipated following the completion of the Warren Levis Lake Project. The Piasa Creek Watershed Project is expected to receive more requests for projects than are possible to complete in the years that remain in the project timeline. It is anticipated that projects that provide the highest level of erosion control at the lowest cost will receive highest priority. High quality projects will still be considered in the agricultural community. A small number of larger scale sediment control projects will be considered in the four sub-basins (West Little Piasa, West Piasa, Upper Piasa, and East Little Piasa) with the highest erosion control potential from agricultural practices and in the Rocky Fork Sub-basin, the only urban sector (Figure 6).

It is estimated that an additional 250 sediment basins will be constructed in the watershed, primarily in the agricultural sector. An additional 5 larger scale water retention/detention basins will be constructed, one in each of the three northern sub-basins and two in the Rocky Fork sub-basin. It is also anticipated that an average of two large-scale stream bank stabilization projects will be completed in each of the next five years. Additional land and easement acquisition will be based on availability of priority properties, price, and supplementary grants and donations form outside sources. Other best management practices will be implemented on a case-by-case basis.

Piasa Creek Watershed Project Sediment Reduction Quantification

The method of quantifying sediment reductions into the Piasa Creek is the Sediment Input Reduction Analysis Method (SIRAM). SIRAM measures erosion and sediment trapped through the construction of sediment basins, stream buffers, retention and detention basins, and other best management practices. SIRAM is a summation of the sediment calculations from various erosion control practices. All calculations will be based on United States Department of Agriculture (USDA) standards, including USLE (Universal Soil Loss Equation) and RUSLE (Revised Universal Soil Loss Equation).

Different types of erosion have different methods of measurement. The four major forms of erosion include sheet and rill, ephemeral, gully and stream bank.

- Sheet and Rill Erosion Rate for Cropped A / B slopes x Acres x SDR 1
- Sheet and Rill Erosion Rate for Cropped C / D slopes x Acres x SDR 2
- Sheet and Rill Erosion Rate for Pasture x Acres x SDR 3
- Sheet and Rill Erosion Rate for Timber x Acres x SDR 4
- Sheet and Rill Erosion Rate for Urban x Acres x SDR 5
- Ephemeral Rate x Acres of affected cropland x SDR 6
- Gully Erosion Rate x Feet of eroding gullies x SDR 7
- Stream bank Erosion Rate X Feet of eroding stream bank X SDR 8

Each type of erosion produces sediment, but each also produces differing amounts. The amount of sediment produced by the different forms of erosion is the Sediment Delivery Rate (SDR). Sheet and Rill erosion has the most variable SDR's due to the sheet flow. Ephemeral, gully, and stream bank erosion are considered different forms of channel flow, with generally greater SDR's but less variability. The appropriate SDR is multiplied times the gross erosion amounts for that type of erosion, within a given land use, to obtain sediment "delivered to the field edge" and ready for flow into the stream system. The total of these products give the gross erosion in the watershed. The sediment delivery rate will then be used in the sediment trapping calculation of any of the erosion control practices. For example, if it was determined that the best practice to control a gully erosion problem on an agricultural site was to construct a sediment basin, an analysis of the site would be conducted. Factors considered would include the total number of acres drained, soil type, slope, land use, etc, to determine the gully erosion rate, multiplied by the total feet of eroding gully to give the sediment delivery rate for that site. If the SDR for this particular project was 100 tons and a sediment basin was constructed on the site with a trapping efficiency of 90%, the soil savings would be 90 tons. Soil erosion reductions will be further verified by periodic physical measurements at completed project sites.

Documentation of all structures and activities are compiled on an Access database that keeps a record of all completed, active, pending and future projects. The program will maintain a composite of the total tons of soil saved from erosion, cost per ton, cost per acre, acres affected, ownership, cost share dollars, cost share sources and digital photos of each project site. All of the data will be linked to a watershed map to further clarify the location of each project. GRLT will be responsible for the maintenance of all records and documentation on the Piasa Creek Watershed Project and will submit quarterly reports to IAW and the IEPA. The first and third quarterly report will include the most recent data on the tons of soil saved based on completed projects. Each end of year report will include the tons of soil saved to date and projections on the tons of soil savings based on active, pending and future projects. A time-line illustration will be included with the annual report.

A basis for long-term monitoring was established by identifying 30 monitoring sites, or "cross-sections, throughout the watershed. An evaluation of existing channel conditions at each site included an assessment of the bank and bed materials, and bank vegetation. Habitat adjacent to Piasa Creek and its tributaries was identified, including areas of riparian forest, wetlands, and others. Wetlands that were hydrologically linked to Piasa Creek and its tributaries were identified based on analysis of existing data and visually verified in the field. Soils with high erosion potential and hydric soils were identified within the watershed using NRCS soil surveys and other published data. The information compiled at the 30 cross-sections will be used not only during the course of this 10-year project, but well into the future. The cross-section data will provide baseline data for initial work, supporting documentation, and grant development. It will also serve as the foundation for future studies 15, 20 or even 30 years into the future. The methods of electronic documentation and the baseline identification of monitoring site will also serve as an example and guide to other watershed implementation efforts in the state and in the country.

The Piasa Creek watershed was divided into ten sub basins. These sub basins range in area from approximately 3,220 acres to 16,050 acres as shown in GIA Table 1. Thirty channel cross-sections of the existing channel were measured in the field at key points within the watershed, and at least one cross-section in each sub basin. Cross-sections were taken at points immediately above and below the location where a tributary joined the main channel, and where distinct changes in basin and sub-basin characteristics were observed. Channel and bed conditions, including hydraulic roughness, were identified at each cross-section. Channel slope instabilities, where they occurred, were also noted at each cross-section.

Vegetation was characterized at each cross-section, both in channel and adjacent to the channel. Identified habitats were correlated with published mapped data. The depth of rooting was measured on each bank, where it could be determined. Each cross-section was photo-documented. Elevations at each cross-section were determined using USGS Quadrangle maps of the watershed, and other sources of published topographic data. The channel width-to-depth ratio was calculated at each cross section, and used for further analysis of channel morphology. The channel slope was determined from survey data collected in the field. Evidence of channel down-cutting, when present, was ascertained at each cross-section. As no historic stream-gage data was available, stream power was estimated using the channel slope, cross-section area and drainage area at key locations. Photographic documentation of each cross-section and other field data is found in the Geomorphic Inventory Assessment of the Piasa Creek Watershed.

The 30 cross-sections identified in the Geomorphic Inventory Assessment report will be monitored on periodic basis. A frequency of no more than every two years and no greater than every five years should be a sufficient interval. This will give a dynamic picture of how the channels are changing over time. The sections have been monumented, and located with a GPS system. This will make locating the sections relatively simple for future monitoring purposes.

The educational component (PC-WET program) will also conduct monitoring along the Piasa Creek. The monitoring will include physical, chemical, and biological parameters at twelve permanent site locations. Most of the chemical analyses will be done using instrumentation such as Computer Based Laboratory Calculator (CBLs) and Hach DRL instrumentation. The chemical parameters include: dissolved oxygen, nitrite/nitrates, five day BOD, phosphorous, pH, and hardness. All test procedures will meet EPA standards for data reporting. The physical parameters will include: flow rates, depths, sedimentation, and temperature. Field computers with interfacing probes will be used for the physical parameters. Biological parameters will include fecal coli forms and macro invertebrates as water quality indicators.

6.8.6 Storm Water Ordinance Development

Urban runoff can be a significant source of sediment in a watershed, and is one of the primary components of urban non-point source pollutants. Urbanization will have the net affect of increasing the peak of a storm water hydrograph compared to a pre-urban condition. Urbanization will also result in the peak being reached more rapidly than in a non-urban situation. A higher, quicker peak means that a greater volume of storm water would enter a creek in a much shorter period of time with a greater velocity than would normally be expected in a non-urban situation. The end result is that the potential for erosion and sediment transport increases.

Implementing storm water management guidelines will help to level out the hydrograph following a storm in an urban area. The use of detention basins will limit or 'detain' water flowing from a development to pre-development levels. Detention basins may be either wet detention or dry detention. Detention basins have the added benefit of trapping sediment at the source, in addition to reducing erosion potential downstream.

A storm water management, erosion control, and sediment-control ordinance for urban areas can provide requirements for reducing sediment production at its source and managing the rate and flow of storm water and sediment transport.

6.8.7. Piasa Creek Watershed Project, Education and Public Awareness Programs

The most effective methods for deliverance of a knowledge-based program involve public seminars, demonstrations, and extensive media promotions. This methodology can be used to focus on the specific issues unique to the Piasa Creek Watershed.

Brochures, Newsletters and Website

To encourage participation by area landowners, informational brochures have been developed for distribution throughout the watershed. GRLT publishes its own brochure about the Piasa Creek Watershed Project (PCWP). This brochure provides an overview of what a watershed is and basic facts regarding the Piasa Creek Watershed. The publication continues by illustrating the various problems associated by different types of erosion along with the tools GRLT uses to solve those particular problems. The brochure is distributed at Soil & Water Conservation Districts and USDA Service Centers, county courthouses, and libraries in the PCWP three county regions.

GRLT distributes a newsletter twice a year to approximately 2,500 residents of the region. Updates on the Piasa Creek Watershed Project are included in each issue.

The Piasa Creek Watershed Project is highlighted on the GRLT website, showing maps and an assortment of projects and updates on the effort. The website is www.greatriverslandtrust.com.

Tours

As various projects are completed, such as stream buffers, sediment basins, riffle pools, etc., tours will be arranged for area landowners to further encourage their participation by viewing successfully completed projects. On June 14, 2002, GRLT together with the PC-WET program hosted a driving tour of the major projects in the Piasa Creek Watershed Project. The trip began at Lewis & Clark Community College and drove along the sites of various projects that have been implemented or are in the planning stages. Along the way, PC-WET participants performed water quality tests along certain areas of the creek. The tour proved to be a hands-on approach to learning about how various tools can be utilized to prevent sediment reduction in the Piasa Creek Watershed.

Press

Piasa Creek Watershed Project has been publicized by various press releases since the project's beginning in 2000. These press releases have been in newspaper publications such as the St. Louis Post Dispatch, the Alton Telegraph, and the Illinois Business Journal. The project has also been featured in public radio announcements on WBGZ. Making the public more aware of this important project has made public acceptance of PWCP a reality. The following reflects in more detail some of the press releases during recent years.

- Illinois Business Journal (2001) – "Piasa Creek Watershed Project to have Benefits for All"
- Alton Telegraph (2002) – "Decision May Help River, Water Plant"
- St. Louis Post Dispatch (August 8, 2002) – "Organization Will Restore Lake at Boy Scout Camp"
- St. Louis Post Dispatch (September 5, 2002) – "Boy Scout Board OK's Plans to Develop Lake"
- St. Louis Post Dispatch (November, 2002) – "Piasa Watershed May Get Federal Fund Boost"
- Alton Telegraph (February 11, 2003) – " Council recommends Catholic Charities Lease"
- Alton Telegraph (February 11, 2003) – "After years of planning, road project to begin"
- Alton Telegraph (October 3, 2003) – "Deal will preserve Scout camp in Godfrey: Conservation group plans to restore 15 acres at Camp Warren Levis"
- St. Louis Post-Dispatch (October 29, 2003) – "Joint project will restore use of silted-up lake at Scouts' Camp Warren Levis near Godfrey"
- Alton Telegraph (October 30, 2003) – "Open house Sunday at Camp Warren Levis"

Awards

Piasa Creek Watershed Project was selected as a finalist for the 16th Annual Governor's Pollution Prevention Awards hosted by the Illinois Waste Management and Research Center (WMRC). The Governor's Pollution Prevention Awards annually honor Illinois companies and organizations that are making efforts to reduce their environmental impact and improve their economic viability. The award ceremony was held on October 18, 2002 in Champaign, Illinois. GRLT's Alley Ringhausen and Amanda Langford attended the event as well as Mark Johnson from IAW.

Piasa Creek Watershed Education Team Project

The Piasa Creek Watershed Education Team Project (PCWET) is an academic environmental education project that allows middle school students to better understand the importance of water quality to their community and fosters a sense of stewardship for their watershed.

Twenty public and parochial middle schools and two public high schools are currently participating in the project. It utilizes the watershed as and outdoor classroom for over one thousand students in the three southwestern Illinois counties. Through a comprehensive watershed monitoring program, involving the latest educational technology, the students collect baseline data for the determination of long-term changes in the physical, chemical and biological parameters of the watershed. The parameters include flow rates, sedimentation loads, temperature, depth, pH, dissolved oxygen, phosphates, nitrates, hardness, BOD, fecal coli form and macro invertebrate indices.

6.9. Recommendations

1. Jersey County, and local municipalities, engages in comprehensive land use planning.

2. Jersey County adopts and enforces various ordinances, including anti-dumping and storm water management.

3. Appropriate Jersey County organizations engage in and expand open space, agricultural lands, and urban forest programs, such as those undertaken by the State Park, the Soil and Water Conservation District, and the Great Rivers Land Trust.

4. Jersey County design and implement a program of bridge, culvert, and structure monitoring maintenance.

5. Appropriate Jersey County organizations, such as Great Rivers Land Trust, expansion of watershed preservation scheme from the Piasa Creek Watershed to the Macoupin Creek and Otter Creek watersheds.

6. The City of Grafton should continue to enforce erosion control, sediment control and storm water runoff ordinances. Keep the public informed about the use of retention basins to control gully erosion, reduce sediment and improve water quality.