Appendix I – Best Management Practice Descriptions

Agronomy Consultations by a Certified Crop Advisor

Technical assistance provided to land users to address opportunities, concerns, and problems related to the use of natural resources and to help land users make sound natural resource management decisions. This assistance may be in the form of resource assessment, conservation activity plans, practice design, resource monitoring, or follow-up of installed practices. *(NRCS practice codes include Conservation Activity Plans: 102 CNMP, 104 NMP, 110 GMP, 114 IPMP, 130 DWMP, and a variety of on-the-ground best management practices.)*

This assistance can help land users:

- Maintain and improve private lands
- Implement better land management technologies
- Protect and improve water quality and quantity
- Maintain and improve wildlife and fish habitat
- Enhance recreational opportunities on their land
- Maintain and improve the aesthetic character of private land
- Explore opportunities to diversify agricultural operations and
- Develop and apply sustainable agricultural systems

Estimated Cost: $16/acre

Amending Soil Properties with Gypsum Products

The soil chemistry in the surface zone may become stratified over time in some minimum and no-till cropping systems. In most studies, this has not been shown to be a significant yield limitation, however, chemical and physical soil properties that affect water infiltration and runoff can have negative consequences if not monitored and managed accordingly. Using gypsum products to change the physical or chemical properties of soil can be a useful tool to help mitigate some of these negative consequences when combined with a sound conservation cropping system. *(NRCS practice code: 801)*

Primary purposes for Gypsum (calcium sulfate dehydrate – CaSO4)-derived products:

• Improve soil physical/chemical properties to reduce soil erosion and improve infiltration.
• Reduce dissolved phosphorus concentrations in surface runoff and subsurface drainage.
• Reduce the potential for pathogen transport from areas of manure and biosolids application.

Estimated Cost: $35/acre

Bottomland Timber Establishment

Establish woody plants in bottomland areas by planting seedlings or cuttings, direct seeding, or natural regeneration. Species selection is adapted to the soils, climate and site conditions. The selection of planting technique and timing must also be appropriate for the site and soil conditions. Native plant species are used whenever possible. *(NRCS practice code: 612 Tree and Shrub Establishment)*

The benefits of this practice include:

• forest products such as timber, pulpwood, etc.

• wildlife habitat
• long-term erosion control and improvement of water quality
• treating waste
• storing carbon in biomass
• reduce energy use
• develop renewable energy systems
• improving or restoring natural diversity
• enhancing aesthetics

Estimated Cost: $825/acre

Clearing and Snagging

Removal of vegetation along the bank (clearing) and/or selective removal of snags, drifts, or other obstructions (snagging) from natural or improved channels and streams that impedes the proper functioning along a length of the stream channel or water course to restore flow capacity; prevent bank erosion by eddies; reduce the formation of sediment bars; and/or minimize blockages by debris. This practice addresses resource concerns such as stream bank soil erosion. *(NRCS practice code: 326)*

Estimated Cost: $16/feet

Conservation Cover

This practice applies to land needing permanent protective cover, and typically involves conversion from a row crop cropping system to permanent vegetative cover. This practice is used to reduce soil erosion and sedimentation, improve water quality, and develop or enhance wildlife habitat. *(NRCS practice code: 327)*

Estimated Cost: $625 to $720/acre

Conservation Tillage - Residue and Tillage Management, Mulch Till and No Till/Strip Till

Mulch Till includes tillage methods where a majority of the soil surface is disturbed by tillage operations such as vertical tillage, chiseling and disking. It applies to stubble mulching on summer-fallowed land, to tillage for annually planted crops and to tillage for planting perennial crops. It also includes some planting operations, such as hoe drills that disturb a large percentage of the soil surface during the planting operation and cropping systems in which the majority of surface area is disturbed during harvest operations. Also included is the use of a "modified no-till" system (Indiana definition) that uses full width tillage but leaves as much as 85% of the initial residue on the soil surface. *(NRCS practice code: 345)*

This practice is applied as a part of a conservation management system to support one or more of the following purposes:
• Reduce sheet, rill and wind erosion
• Reduce tillage-induced particulate emissions
• Maintain or increase soil quality and organic matter content

• Reduce energy use
• Increase plant-available moisture

No Till/Strip Till only involves an in-row soil tillage operation during the planting operation and a seed row/furrow closing device. There is no full-width tillage performed from the time of harvest or termination of one cash crop to the time of harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation. This practice includes planting methods commonly referred to as no-till, quality no till, never-till, zero till, slot plant, zone till, strip till, or direct seed. Approved implements are: no-till and strip-till planters; certain drills and air seeders; strip-type fertilizer and manure injectors and applicators; and similar implements that only disturb strips and slots. *(NRCS practice code: 329)*

All of the benefits shown above for Mulch Till practices can be found using No Till or Strip Till practices in addition to improving soil organic matter content and decreasing carbon dioxide soil losses.

Estimated Costs: $11 to $52/acre

Cover Crops

Planting of non-income crops including grasses, legumes, and forbs for seasonal cover and are terminated by frost, mowing, tillage, crimping, and/or herbicides in preparation for the following crop. *(NRCS practice code: 340)*

The benefits from using cover crops include:
• Reduce erosion from wind and water
• Increase soil organic matter content
• Capture and recycle or redistribute nutrients in the soil profile
• Promote biological nitrogen fixation and reduce energy use
• Increase biodiversity and suppress weeds
• Manage soil moisture
• Minimize and reduce soil compaction

Estimated Costs: average $40/acre

Critical Area Planting

Critical Area Plantings are used to establish permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. *(NRCS practice code: 342)*

This practice supports the following purposes:
• Stabilize stream and channel banks, pond and other shorelines
• Stabilize areas with existing or expected high rates of soil erosion by wind or water
• Stabilize areas, such as sand dunes and riparian areas

Estimated Costs: $325/acre

Diversion

This practice applies to all land uses where surface runoff water control and/or management are needed and where soils and topography are such that the diversion can be constructed and a suitable outlet is available or can be provided. A diversion channel is generally constructed across the slope with a supporting ridge on the lower side. *(NRCS practice code: 362)*

Purposes of this practice include:
- Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing.
- Divert water away from farmsteads, agricultural waste systems, and other improvements.
- Collect or direct water for storage, water-spreading or water-harvesting systems.
- Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow.
- Reduce runoff damages from upland runoff.
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites.
- Divert water away from active gullies or critically eroding areas.

Estimated Costs: $6/feet

Drainage Water Management

This practice is applicable to agricultural lands with surface or subsurface agricultural drainage systems that are adapted to allow management of drainage discharges. Drainage discharges and water levels are managed in a manner that does not cause adverse impacts to other properties or drainage systems. This is accomplished by adjusting the elevation of the drainage outlet and/or installing water control structures. The structure for water control is used to convey water, control the direction or rate of flow, or maintain a desired water surface elevation. *(NRCS practice codes: 554 Drainage Water Management, 587 Structure for Water Control)*

The purpose of this practice is:
- Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters.
- Improve productivity, health, and vigor of plants.
- Reduce oxidation of organic matter in soils.
- Reduce wind erosion or particulate matter (dust) emissions.
- Provide seasonal wildlife habitat.

Estimated Costs: $24/acre annual labor; $1,450 to $2,800/structure

Field Borders & Filter Strips

Field borders are a strip of permanent vegetation established at the edge or around the perimeter of a field. This practice is applied around the inside perimeter of fields, and can support or connect other buffer practices within and between fields. *(NRCS practice code: 386)*

This practice may be applied to accomplish one or more of the following:
- Reduce erosion from wind and water

• Protect soil and water quality
• Provide wildlife food and cover and pollinator or other beneficial organism habitat
• Increase carbon storage
• Improve air quality

Filter strips are a strip or area of herbaceous vegetation that is established where environmentally-sensitive areas need to be protected from sediment; other suspended solids and dissolved contaminants in overland flow. Environmentally-sensitive areas include water bodies; water sources, such as wells; and tile inlets. *(NRCS practice code: 393)*

This practice supports the following purposes:
• Reduce suspended solids and associated contaminants in runoff
• Reduce dissolved contaminant loadings in runoff
• Reduce suspended solids and associated contaminants in irrigation tailwater

Estimated Costs: $488 to $678/acre

Grassed Waterway & Grade Stabilization Structures

A grasses waterway is a shaped or graded channel that is established with suitable vegetation to carry surface water at a non-erosive velocity to a stable outlet. They are used in areas where added water conveyance capacity and vegetative protection is needed to control erosion resulting from concentrated surface runoff. In urban settings, these are often referred to as swales. *(NRCS practice code: 412)*

A grade stabilization structure is used in areas where the concentration and flow velocity of water requires structures to stabilize the channel grade or to control gully erosion. They are most often used in conjunction with grassed waterways. *(NRCS practice code: 410)*

Grass waterways are used:
• To convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding.
• To reduce gully erosion.
• To protect/improve water quality.

Grade Stabilization Structures are used to:
• Stabilize the grade and control erosion in natural or artificial channels
• Prevent the formation or advance of gullies
• Enhance environmental quality and reduce pollution hazards.

Estimated Costs: Grassed Waterway $3,225 to $4,200/acre
Grade Stabilization Structure $5,000/structure

Greenways and Trails

A trail is a constructed path with a vegetated or earthen surface, or a greenway or walkway is a constructed path with an artificial surface. A trail/walkway is used to facilitate the movement of animals, people, or off-road vehicles. *(NRCS practice code: 575)*

A trail/walkway is used for the following purposes:
- Provide or improve animal access to forage, water, working/handling facilities, or shelter.
- Facilitate improved grazing efficiency and distribution.
- Protect ecologically sensitive, erosive, or potentially erosive sites.
- Provide pedestrian or off-road vehicle access to agricultural, construction, or maintenance operations.
- Provide trails/walkways for recreational activities or access to recreation sites.

Estimated Costs: $1.50 to $5.50/feet

Heavy Use Area Protection

Heavy Use Area Protection is used to stabilize a ground surface that is frequently and intensively used by people, animals, or vehicles. *(NRCS practice code: 561)*

Heavy Use Area Protection is used:
- To provide a stable, non-eroding surface for areas frequently used by animals, people or vehicles
- To protect or improve water quality.

Estimated Cost: $1.50/$ft^2$

Livestock Exclusion

A livestock exclusion system can include access control, access roads, fence, heavy use area protection, livestock pipelines, stream crossings, and watering facilities.

Livestock that have unrestricted access to a stream or wetland have the potential to degrade water quality and biotic integrity. Livestock can deliver nutrients and pathogens directly to a waterbody through defecation, and degrade the stream ecosystem indirectly by trampling and removal of vegetation through grazing of riparian zones. This can increase the potential for bank erosion and compact soils decreasing the areas ability to infiltrate water runoff. Removal of vegetation also limits the ability to filter pollutants in runoff.

Access control is the temporary or permanent exclusion of animals, people, vehicles, and/or equipment from an area. This practice is used for livestock exclusion from a stream, wetland, or woodland. *(NRCS practice code: 472)*

Access roads provide a fixed route for vehicular travel for resource activities involving the management of timber, livestock, agriculture, wildlife habitat, and other conservation enterprises while protecting the soil, water, air, fish, wildlife, and other adjacent natural resources. *(NRCS practice code: 560)*

The fence practice provides a means to control movement of animals and people, including vehicles, and is applied on any area where management of animal or human movement is needed. *(NRCS practice code: 382)*

Heavy use area protection is used to provide a stable, non-eroding surface for areas frequently and intensively used by people, animals, or vehicles. *(NRCS practice code: 561)*

A livestock pipeline and appurtenances are used to convey water for livestock or wildlife. *(NRCS practice code: 516)*

Stream crossings provide a stabilized area or structure across a stream to provide a travel way for people, livestock, equipment, or vehicles. The improve water quality by reducing sediment, nutrient, organic and inorganic loading of the stream, reduce stream bank and stream bed erosion, and provide access to another land unit. *(NRCS practice code: 578)*

A watering facility is a permanent or portable device to provide access to drinking water for livestock and/or wildlife to improve animal distribution and meet daily water requirements. *(NRCS practice code: 614)*

Estimated Costs: Access Control $40/acre
Access Roads $8/feet
Fence $2/feet
Heavy Use Area Protection $1.50/feet^2
Livestock Pipeline $1 to $3/feet
Stream Crossing $1.50/feet^2
Watering Facility $165 to 1,000 each

Low Impact Development

Low impact development (LID) can be used to manage stormwater runoff by using a site's presettlement hydrology to design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. LID practices can provide numerous benefits.

Green infrastructure includes two broad categories. The first encompasses the natural undisturbed environment such as wetlands, trees, prairies, lakes, rivers, and streams. The second category includes constructed or built green infrastructure.

LID practices include: bioretention (rain gardens), capture reuse (rain barrels), constructed filters, detention basins, infiltration practices, level spreaders, native revegetation, pervious pavement with infiltration, planter boxes, riparian buffer restoration, soil restoration, vegetated filter strips, vegetated roofs, vegetated swales, water quality devices, and other techniques. *(Low Impact Development Manual for Michigan) (NRCS practice codes: 558 Roof Runoff Structure, 570 Stormwater Runoff Control)*

Estimated Costs: Rain Gardens $100 to $500 each
Rain Barrels $100 each
Varies based on practice

Nutrient Management & Pest Management

The overriding objective of nutrient management is to ensure that, as practical as possible, nutrients are applied with the right placement, in the right amount, at the right time, and from the right source to optimize profitability and to minimize nutrient losses to our air and water

resources. This practice applies to all lands where plant nutrients and soil amendments are applied. *(NRCS practice code: 590)*

The benefits of this practice are:
- To budget, supply, and conserve nutrients for plant production.
- To minimize agricultural nonpoint source pollution of surface and groundwater resources.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To protect air quality by reducing odors, nitrogen emissions (ammonia, oxides of nitrogen), and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical, and biological condition of soil.

Integrated pest management is a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. *(NRCS practice code: 595)*

The purpose of this practice:
- Prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and absorbed runoff losses.
- Prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatization losses.
- Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact.
- Prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans.

Estimated Costs: $1,400 to $3,000/plan; $12 to $29/acre application

Open Channel – Two Stage Ditch

Where an existing agricultural drainage ditch will be converted to a two-stage ditch (wider ditch with benches), in which water flows with a free surface. The two-stage design improves ditch stability by allowing the water to have more area to spread out and decreases the velocity of the water. The benefits of a two-stage ditch over the typical agricultural ditch include both improved drainage function and ecological function by reducing water flow and the need for maintenance, saving both labor and money. The transportation of sediment and nutrients is decreased considerably because the design allows the sorting of sediment, with finer silt depositing on the benches and courser material forming the bed. This not only improves the water quality, but also improves the biological conditions of the ditches where this is located. *(NRCS practice code: 582)*

Estimated Costs: $11.50/feet

Precision/Variable Rate Technology – Equipment Modifications

Precision agriculture, also known as "site-specific crop management," is an information and technology based agricultural management system used to identify, analyze, and manage variability within fields for optimum profitability, sustainability, and environmental protection. Fields often vary in soil types, elevations, soil chemistry, fertility, and productivity. By applying precision agriculture practices, producers are able to specify the farm input needs (including nutrient and pesticide application, tillage, and irrigation) throughout an individual field.

Producers can use new precision tools, techniques, and services to enhance their efforts to save energy and reduce costs. These include yield monitoring, grid soil sampling, variable-rate application of nutrients, remote-sensing applications, soil electrical conductivity (EC) monitoring, and zone soil sampling. In addition to cutting production costs and saving energy, precision agriculture reduces environmental pollution and improves water quality by reducing nutrient runoff.

Other benefits include:
• Improved crop yield;
• Reduced compaction by limiting traffic to specified travel lanes;
• Increased opportunity to operate equipment after dark;
• Labor savings through reduced implement overlap; and
• More accurate farming records

Estimated Costs: $2,000 to $10,000/unit -varies based on precision tool, techniques and services

Prescribed Grazing

Prescribed grazing is the controlled harvest of vegetation with grazing or browsing animals, managed with the intent to maintain or improve water quality and quantity. This practice involves strategically moving livestock across sections of a pasture (paddocks) at set intervals of time so that the vegetation of the pasture can be managed at growth rates best suited to each producer. *(NRCS practice code: 528)* Prescribed grazing generally will require additional livestock practices such as fence, livestock pipeline, watering facilities, etc.

Benefits of prescribed grazing include:
• Improve or maintain desired species composition and vigor of plant communities.
• Improve or maintain quantity and quality of forage for grazing and browsing animals' health and productivity.
• Improve or maintain surface and/or subsurface water quality and quantity.
• Improve or maintain riparian and watershed function.
• Reduce accelerated soil erosion, and maintain or improve soil condition.
• Improve or maintain the quantity and quality of food and/or cover available for wildlife.
• Manage fine fuel loads to achieve desired conditions.

Estimated Costs: average $28/acre - start-up costs include fencing, and water distribution.

Rain Gardens & Rain Barrels

These practices are more applicable to urban settings or farmsteads. They allow stormwater to drain in a proper manner by having it absorbed into the soil, or storing it for future use. *(NRCS practice codes: 558 Roof Runoff Structure, 570 Stormwater Runoff Control)* *Also listed under LID practice.

Estimated Costs: Rain Gardens $100 to $500 each
Rain Barrels $100 each

Riparian Forest Buffer & Herbaceous Cover

Riparian forest buffers are applied on areas adjacent to permanent or intermittent streams, lakes, ponds, and wetlands. They are not applied to stabilize stream banks or shorelines. *(NRCS practice code: 391)*

The benefits of a riparian forest buffer include:
- Create shade to lower or maintain water temperatures to improve habitat for aquatic organisms.
- Create or improve riparian habitat and provide a source of detritus and large woody debris.
- Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow ground water flow.
- Reduce pesticide drift entering the water body.
- Restore riparian plant communities.
- Increase carbon storage in plant biomass and soils.

Riparian herbaceous cover are areas adjacent to perennial and intermittent watercourses or water bodies where the natural plant community is dominated by herbaceous vegetation that is tolerant of periodic flooding or saturated soils. For seasonal or ephemeral watercourses and water bodies, this zone extends to the center of the channel or basin. The grasses, sedges, rushes, ferns, legumes, and forbs are established or managed as the dominant vegetation in the transitional zone between upland and aquatic habitats. *(NRCS practice code: 390)*

The benefits of riparian herbaceous cover include:
- Provide or improve food and cover for fish, wildlife and livestock,
- Improve and maintain water quality.
- Establish and maintain habitat corridors.
- Increase water storage on floodplains.
- Reduce erosion and improve stability to stream banks and shorelines.
- Increase net carbon storage in the biomass and soil.
- Enhance pollen, nectar, and nesting habitat for pollinators.
- Restore, improve or maintain the desired plant communities.
- Dissipate stream energy and trap sediment.
- Enhance stream bank protection as part of stream bank soil bioengineering practices.

Estimated Costs: $715 to $825/acre

Roof Runoff Structure

Roof runoff structures are used to collect, control and transport precipitation from roofs. This practice applies to areas where roof runoff from precipitation needs to be diverted away from structures or contaminated areas; collected, controlled and transported to a stable outlet; or collected and used for other purposes such as irrigation or animal watering facility. *(NRCS practice code: 558)*

This practice improves water quality, reduces soil erosion, increases infiltration, protects structures, and/or increases water quantity.

Estimated Costs: $7/feet - varies based on structures used

Septic System Care and Maintenance

Septic systems, or on-site waste disposal systems, are the primary means of sanitary treatment throughout rural areas. When septic systems fail, untreated sanitary flows are discharged into open water courses which pollute the water and pose a potential public health risk. Additionally, illicitly connected septic systems can contribute significant amounts of nitrogen and phosphorus to streams and rivers.

Care and maintenance can involve improving or updating parts of the septic system, such as replacing tanks or drainage systems. Annual maintenance of septic systems is also crucial for their operation, particularly the removal of accumulated sludge.

Estimated Costs: vary depending on maintenance, improvements or upgrades implemented

Stormwater Runoff Control

This practice applies to sites where stormwater runoff causes or may cause undesirable downstream flooding, sedimentation or channel degradation and/or degradation of surface or ground water quality if left untreated. This practice may apply both to sites undergoing development as well as remedial work on already developed sites. *(NRCS practice code: 570)*

The benefits of this practice include:
- Reduce onsite erosion.
- Reduce offsite impacts from sedimentation.
- Minimize erosion and sedimentation during and following construction activities.
- Reduce the quantity of stormwater leaving the site to levels that will not adversely affect downstream receiving channels.
- Improve the quality of stormwater leaving the site.

Estimated Costs: $1,500/acre – varies depending on control used (vegetative versus structural)

Soil Sampling

An analysis of a soil sample is used to determine the nutrient content, composition, and other characteristics of the soil. This test can determine the fertility, or the expected growth potential of the soil which indicates nutrient deficiencies, potential toxicities from excessive fertility and inhibitions from the presence of non-essential trace elements. Soil sampling is used to make decisions for nutrient applications, and is required for nutrient management planning.

Estimated Costs: $1/acre

Stream Crossing

This practice is used when a stabilized area or structure is needed to cross an intermittent or perennial watercourse to provide a travel way for people, livestock, equipment or vehicles. Stream crossings are located in areas where the streambed is stable or where grade control can be provided to create a stable condition. *(NRCS practice code: 578)*

The benefits of a stream crossing include:

- Improved water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
- Reduction in streambank and streambed erosion.
- Provides crossing for access to another land unit.

Estimated Costs: $1.50 to $2.00/feet^2

Tree and Shrub Establishment

Tree and shrub establishment can be applied on any appropriately prepared site where woody plants can be grown. Establishment can be made by planting seedlings or cuttings, direct seeding, or natural regeneration. *(NRCS practice code: 612)*

The purpose and benefits of tree and shrub establishment include:
- forest products such as timber, pulpwood, etc.
- wildlife habitat
- long-term erosion control and improvement of water quality
- treating waste
- storing carbon in biomass
- reduce energy use
- develop renewable energy systems
- improving or restoring natural diversity
- enhancing aesthetics

Estimated Costs: $825/acre

Underground Outlet (Blind inlet)

An underground outlet is designed to carry water to a suitable outlet from terraces, water and sediment control basins, diversion, waterways, surface drains, or other similar practices or flow concentrations without causing damage by erosion or flooding. This practice applies to areas where disposal of surface water is necessary, or areas where a surface outlet is impractical because of stability problems, topography, climatic conditions, land use or equipment traffic.

Underground outlets can provide a direct conduit to receiving waters for contaminated runoff from crop land. Underground outlets and the accompanying structure or practice should be installed as part of a conservation system that addresses issues such as nutrient and pest management, residue management, blind inlet designs, and filter areas. *(NRCS practice code: 620)*

Estimated Costs: $60/feet - varies based on design.

Waste Utilization

Large volumes of manure are generated by both small, unregulated animal operations and by confined feeding operations. Waste utilization involves using the manure, wastewater, or other organic by-products and biosolids from these livestock operations on the land as a nutrient source. Proper management of animal waste can be accomplished by implementing best manage practices that reduce or eliminate surface application of manure, or technology that increases the

application efficiency such as no-till manure injection, variable rate controllers, and Geographic Positioning Systems. The use of nutrient management strategies such as cover crops or crop rotations also improve nutrient cycling and reduce energy inputs.

Benefits of waste utilization practices include a decrease in water quality impacts, optimum nutrient levels for crops, forage, fiber production and forest products, improve or maintain soil structure, and an energy source. Proper manure management can effectively reduce *E. coli* concentrations, nutrient levels and sedimentation. *(NRCS practice code: 590 Nutrient Management)*

Estimated Costs: Waste Application $47/acre
Technology (equipment modifications) $2,000 to $10,000/unit
Nutrient Management Plan or Comprehensive Nutrient Management Plan
$6,000 to $14,500/plan

Water and Sediment Control Basin

A water and sediment control basin is an earthen embankment or combination ridge and channel constructed across a slope of minor watercourses to form a sediment trap and water detention basin with a stable outlet. Water collected in the basin is slowly released through the outlet structure. Water and Sediment Control Basins should be installed as part of a conservation system that includes such practices as grassed waterways, contouring, a conservation cropping system, conservation tillage, nutrient and pest management, crop residue management and filter areas to reduce or mitigate contaminated runoff. *(NRCS practice code: 638)*

This practice may be applied as part of a resource management system for one or more of the following purposes:
• To reduce watercourse and gully erosion
• To trap sediment
• To reduce and manage onsite and downstream runoff

Estimated costs: $2,885/structure

Wetland Creation, Enhancement and Restoration

Wetland creation standards are used to create a wetland on a site location that was historically non-wetland on soils capable of supporting wetland functions. *(NRCS practice code: 658)*

Wetland enhancement is the augmentation of wetland functions beyond the original natural conditions on a former, degraded or naturally functioning wetland site, such as enhancing plant and animal habitats. *(NRCS practice code: 659)*

Wetland restoration is the return of a wetland and its functions, value, habitat, diversity, and capacity to a close approximation of its original condition as it existed prior to disturbance on a former or degraded wetland site. This practice applies only to natural wetland sites with hydric soils which have been subject to degradation of hydrology, vegetation, or soils; and where the natural hydrologic conditions can be approximated by actions such as modifying drainage, restoring stream/floodplain connectivity, removing diversions, dikes and levees, and/or by using

a natural or artificial water source to provide conditions similar to the original, natural conditions. *(NRCS practice code: 657)*

Creating, enhancing and restoring wetlands in the watershed could return many of the functions that were lost when these wetlands were drained. The wetland systems store nutrients, sediment, and *E. coli* while also increasing water storage and reducing flooding. Wetlands also provide additional habitat, stormwater mitigation, and recreational opportunities.

Estimated Costs: Wetland Creation up to $4,500/acre
Wetland Enhancement and Wetland Restoration $450 to $2,450/acre