Educational Fliers for Best Management Practices in Rural Areas

South Fork Kent Creek Watershed

Olson Ecological Solutions, LLC

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South Fork Kent Creek Watershed: Rural Best Management Practices

Grassed Waterways

Grassed waterways, either natural or constructed, are shaped or graded channels that are planted with suitable vegetation for runoff conveyance without causing channel erosion. (EPA BMP Descriptions for STEPL and Region 5 Model 2018).

Clean Water Iowa

Benefits:

- ✓ Conveys runoff from terraces, diversions, and other water concentrations without flooding or erosion
- ✓ Prevents gully formation
- ✓ Protects and improves water quality
- ✓ Provide wildlife habitat, corridor connections, and vegetative diversity

NRCS Wisconsin

With a life span of ten years, some waterways are maintained and improved each year. Existing grassed waterways within the watershed can be improved in order to handle larger storm events. The watershed-based plan will recognize the efforts being taken to maintain these grassed waterways, and implementation projects may include match funding for repairs.

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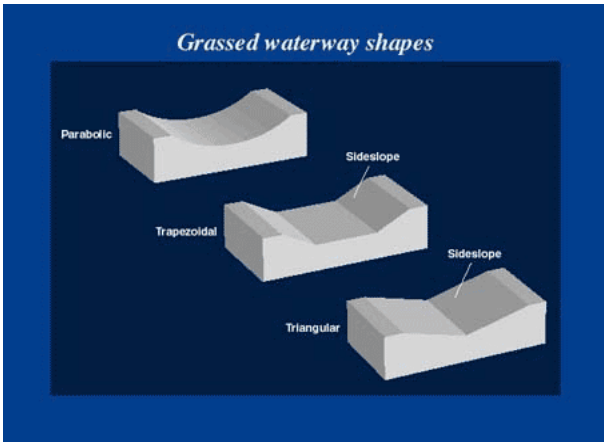
Rural Best Management Practices
Grassed Waterways

When designing grassed waterways, one must consider slope, vegetative cover, soil conditions and erodibility, channel shape and maintenance (US EPA Agricultural Management Practices for Water Quality Protection). Generally farmers use one of three grassed waterway shapes: parabolic, trapezoidal, or triangular. Many favor the parabolic shape as it is the shape naturally taken in watercourses, an easier shape to visualize and build, and easiest shape to cross with farm equipment. However, small water flows are less likely to meander in parabolic waterways (University of Illinois Extension, *This Land*).



University of Illinois Extension, This Land

Important Resources for planning and designing:

NRCS National Handbook of Conservation Practices
NRCS Engineering Field Handbook

US EPA

When initially installing grassed waterways, it is important to allow for grassed vegetation to establish in order for it to withstand the water velocities it is designed to accommodate. To aid in this process, side diversions can be installed along the sides of the waterway to keep flow out of the channel. Once grass has established, these diversions should be removed. Alternatively, one may utilize rock/fabric checks or mulching.

Conservation Practice Standard: Grassed Waterway, **Code 412**

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Ponds & Basins

Ponds and basins are constructed bodies of water created by either excavating an area for water storage or installing a dam across an existing water course (i.e. an existing gully or low-lying area). When installing these ponds and basins, one should ensure compliance with state laws and permits during planning, design, and layout phases. When possible, a pond should be installed with 2 or more specified uses. These intended uses should impact the installation and storage requirement specifications. The stated uses below are not all compatible with each other. It is also recommended that the plan include vegetation to allow for pollution to be filtered out of the water (NRCS Engineering Field Handbook).


NRCS USDA Ohio

Benefits and Uses:

- ✓ Captures runoff water and reduces peak stormwater runoff
- ✓ Reduces stormwater velocity
- ✓ Provides water for livestock or household use
- ✓ Offers irrigation storage
- ✓ Provides water source for pesticide spraying and/or fire protection
- ✓ Allows for recreational uses (fishing, boating, swimming, etc.)
- ✓ Enhances wildlife habitat and/or aesthetic appearance

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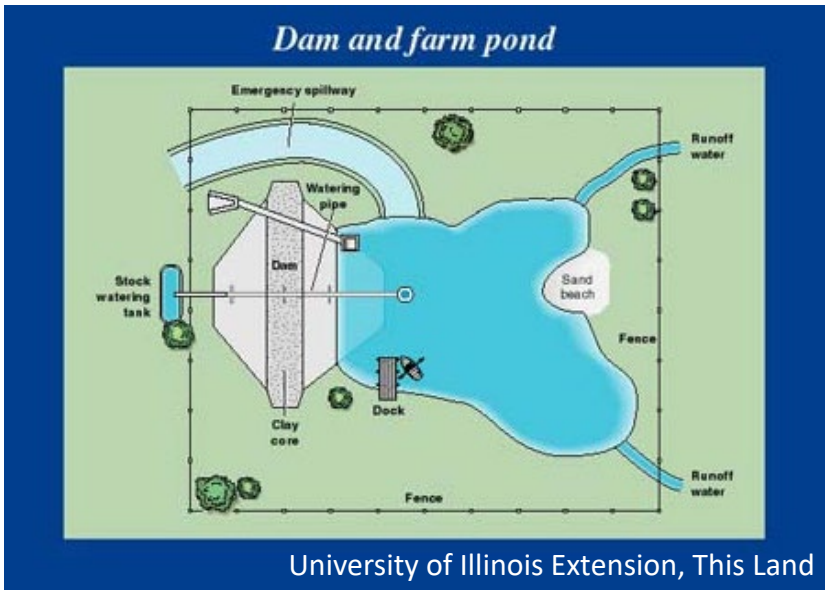
South Fork Kent Creek Watershed: Rural Best Management Practices

Ponds & Basins

Topography, hydrology, and water storage capacity play key roles in site selection for farm ponds and basins. One should locate a pond where the largest amount of storage capacity exists with the least amount of earthfill. Ideal topography utilizes existing low-lying areas. For instance, an area with a wide and gently sloping basin along with steep banks that come together at the dam site provides ideal water storage and a location for dam construction (thisland.Illinois.edu). Soils surrounding the pond must contain enough clay to ensure a watertight dam as well as to reduce the amount of water seepage through the bottom of the pond. Alternatively, a clay core in the dam center can assist in sealing the dam if there is not enough watertight soil. Installing a pre-fabricated pond liner could also help with minimizing seepage.



University of Illinois Extension, This Land

For more information on installing farms ponds and basins, please see the USDA NRCS Engineering Field Handbook.
Conservation Practice Standard: Pond, **Code 378**

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Forest Stewardship

Problem: Current forested lands are choked out by invasive plant species. Invasive plants grow, reproduce, and spread very quickly and eventually choke out native vegetation as they outcompete native plants and fill in the seed bank. Invasive plants are plants from other countries that have been brought over and established in natural areas. Invasive are able to kill off native habitats by spreading aggressively because of the lack of established predators and diseases that normally regulate them in their origin countries. If these invasive species are left unmanaged they have the high potential of taking over natural areas by drowning out native plants, forming a monoculture, decreasing biodiversity, reducing habitat, and negatively affecting the natural ecosystem and its inhabitants. Invasive and weedy trees and shrubs create an overstory that blocks the sun and reduces the potential for native seed germination.

Northwest Illinois Forestry Association

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South Fork Kent Creek Watershed: Rural Best Management Practices

Forest Stewardship

Solution: By clearing invasive/weedy trees and shrubs, the canopy is opened for sunlight to reach the forest floor, which can then foster a healthy environment for establishment of native vegetation. More ground layer vegetation reduces and filters stormwater runoff and stabilizes the soil. Cutting woody stems (via chainsaw, brush cutters, or loppers) and herbicide treatment of stumps is an easy way to clear woody invasive plants and can be conducted at any time of the year. Larger tree clearing projects usually occur in the winter months as frozen grounds help to reduce soil disturbance.

Lake County Forest Preserves


Tall Bellflower, native woodland plant

For herbaceous plants, invasive plant management includes manual removal (i.e. hand weeding), mowing (annuals or biennials soon before going to seed), or foliar herbicide application during the growing season. Foliar application is used for aggressive, perennial invasive plants like purple loose-strife, reed canary grass, common and cut-leaved teasel. For more information visit: www.invasive.org/illinois/SpeciesofConcern.html

Conservation Practice Standard: Forest Stand Improvement, **Code 666**

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South Fork Kent Creek Watershed: Rural Best Management Practices

Stabilize Highly Erodible Land

According to the Food Security Act of 1985, USDA program participants who farm fields that are designed as Highly Erodible Land (HEL) are required to control sheet and rill erosion and wind erosion, control all ephemeral gullies, and maintain wetlands. If farmers do not control this erosion, they can risk losing USDA farm program benefits and crop insurance eligibility. The Natural Resources Conservation Service (NRCS) randomly selects HEL fields to perform compliance reviews to verify that erosion is sufficiently controlled (USDA, Iowa NRCS. "Conservation Choices: Controlling Ephemeral Gullies." Oct 2018).Ephemeral gullies are eroded channels cutting into the soil that form in natural concentrated flow areas due to the erosive nature of flowing water. There are many different types of conservation practices (BMPs)that can aid in reducing this type of erosion on HEL: Grassed Waterways, Terraces, Water and Sediment Control Basins (WASCOBs), Critical Area Planting, Cover Crops, and No-Till.

USDA, NRCS. Ephemeral gullies and rill erosion.

NRCS Ohio

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South Fork Kent Creek Watershed: Rural Best Management Practices

Stabilize Highly Erodible Land

When deciding on which conservation practice to enlist for stabilizing HEL and preventing ephemeral gullies, a primary factor to consider is the size and slope of the watershed. The steeper the slope and the larger the watershed results in the need for a more efficient conservation practice.

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South Fork Kent Creek Watershed: Rural Best Management Practices

Streambank Stabilization

Streambank stabilization, or streambank and shoreline protection, is the process of employing methods that protect and stabilize banks of streams, shorelines of lakes, reservoirs, or estuaries, and constructed water channels. These methods are employed on banks that are particularly susceptible to erosion and siltation.


NRCS Iowa


NRCS Iowa

A channel is considered stable if the bottom of the channel remains at a relatively consistent elevation over long periods of time. Methods of protecting and stabilizing banks include altering channel capacity, installing riprap lining (use of stones and rocks to armor banks against water's force), vegetating the banks and channel, and creating channel crossing for livestock.


NRCS Vermont

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Streambank Stabilization

In order to implement these streambank stabilization methods, it is important to identify the causes of streambank erosion and instability through shoreline site assessments. Potential causes of shoreline instability include watershed alterations (which can modify discharge and sediment amounts), in-channel modifications such as gravel mining, livestock access, water level fluctuations, and boat-generated waves.

Benefits:

- ✓ Reduces the negative effects of sedimentation, both on-site and downstream, resulting from bank erosion
- ✓ Prevents the loss of land or destruction of land uses or facilities near the waterway
- ✓ Helps to maintain the flow capacity of the waterway
- ✓ Improves stream corridor for fish and wildlife habitat and recreational uses
- ✓ Enhances aesthetics

Conservation Practice Standard: Streambank and Shoreline Protection, **Code 580**


NRCS USDA


NRCS Georgia

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Filter Strips

A filter strip is an area or strip of permanent, herbaceous vegetation for removing organic matter, sediment, and other pollutants from runoff before it enters water sources or water bodies. Filter strips are installed in environmentally sensitive areas that need protection from contaminated runoff.

Conservation Practice Standard: Filter Strips, **Code 393**

Benefits:

- ✓ Reduces suspended solids and other pollutants in runoff
- ✓ Reduces excessive sediment in waterways
- ✓ Decreases dissolved contaminant loadings in runoff

NRCS Georgia

NRCS USDA

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Filter Strips

Design Considerations: Filter strips should be planted cross-slope or on the contour downhill from the source of contamination. They should be wide enough to accomplish intended purposes. According to the NRCS Conservation Practice Standard, filter strip width should be based on a 15 minute flow through time determined not to exceed a 30 minute flow through time.

Species Considerations: Plant species should be adapted to climate and soil of the planting site and have a moderate to aggressive establishment rate in order to inhabit the site quickly. Chosen plants should also be able to tolerate polluted runoff, sediment deposition, and herbicide runoff. Ideally, selected plant species could have stiff stems and a high stem density close to ground surface.

Operation/Maintenance Considerations: In order to maintain the filter strip's filtering capacity, filter strip vegetation should be harvested and removed at appropriate times. Harvesting and removing dead vegetation will improve vigor and density of vegetation, remove pollutants absorbed in plant tissue, and aid in maintaining upright growth habit. Periodically it may be necessary to regrade or reestablish filter strip vegetation when sedimentation jeopardize the filter strip's function.


NRCS Iowa

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South Fork Kent Creek Watershed: Rural Best Management Practices

Reduced Tillage

Tilling the soil with conventional plow-based systems leaves the soil vulnerable to erosion and intensifies agricultural runoff. Many farmers have been turning to more conservative tillage practices to reduce negative impacts. Reduced tillage as a BMP is the process of utilizing any tillage practices that are less intensive or aggressive than conventional tillage. For example, if a tillage process that requires less energy per unit area replaces a conventional tillage process, then the farmer has achieved reduced tillage.

The term reduced tillage sometimes implies conservation tillage, but conservation tillage systems require farmers to cover 30 percent of the soil surface with residue after planting (EPA BMP Descriptions for STEPL and Region 5 Model 2018).

Photo credit: Jason Johnson, NRCS-Iowa. A no-till planter plants soybeans into a terminated cover crop

It is recommended to learn how to perform continuous no till from other producers who have had success, since periodic conventional till negates some of the benefits.

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South Fork Kent Creek Watershed: Rural Best Management Practices

Reduced Tillage

Conservation Practice Standard: Residue and Tillage Management, **Code 345**

Positives:

- ✓ Reduces soil erosion (in some cases by 70-100%)
- ✓ Reduces polluted runoff flow into water bodies
- ✓ Improves soil health and structure & reduces soil compaction
- ✓ Conserves water
- ✓ Decreases fuel by 50-80% and labor costs by 30-50%
- ✓ Sequesters carbon

Negatives:

- ✓ Transition from conventional to no till is difficult
- ✓ Requires pricey equipment (i.e. specialized no-till seeding equipment)
- ✓ Increases reliance on herbicide (alternatively farmers can use cover crop and crop rotation to aid in weed management)
- ✓ Causes unexpected shifts in weeds, disease, or pest prevalence
- ✓ Potentially slows germination and reduces yields

(Huggins, David & Reganold, John. "No-Till: The Quiet Revolution." *Scientific American Inc*. 2008, pp. 70-77.)

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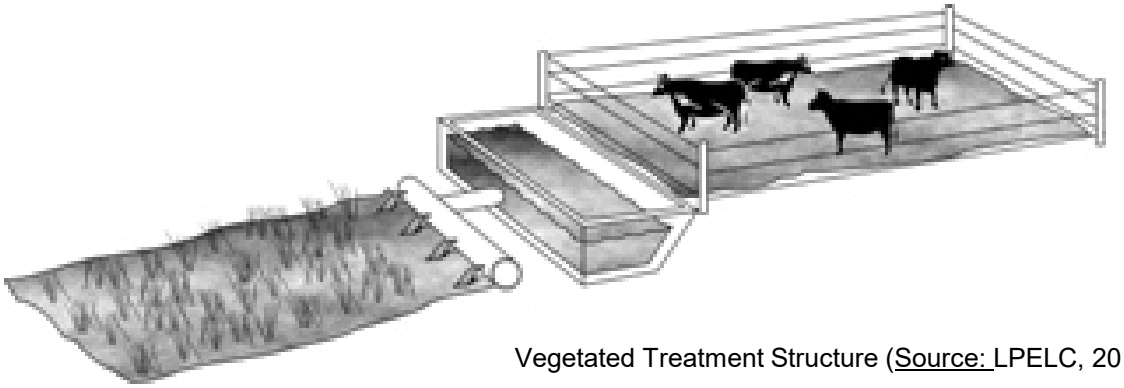
South Fork Kent Creek Watershed:
Rural Best Management Practices
Vegetated Treatment Area



Vegetated Treatment Structure (Source: LPELC, 2019)

An area of perennial vegetation can be placed near feedlots for livestock, barnyards, compost and solid waste operations, and other agricultural facilities. The purpose of this area is to collect contaminated runoff and reduce nutrients, organic materials, and pathogens from entering local water systems.

Runoff is first directed into a basin in which sediments settle before releasing the controlled liquids into the treatment area. Next, natural processes take place, using the nutrients and killing off any pathogens.

When designing a vegetative treatment structure, it is imperative that the land is graded or terraced to allow for both the basin, in which runoff is sorted, and a lower land area with enough surface area to evenly and meaningfully release liquids. High capacity nutrient cycling is contingent on the size of this area as is harvesting the vegetation to promote denser growth (LPEC.org). Selection of vegetation should be contingent on species that can grow there permanently and withstand flooding.

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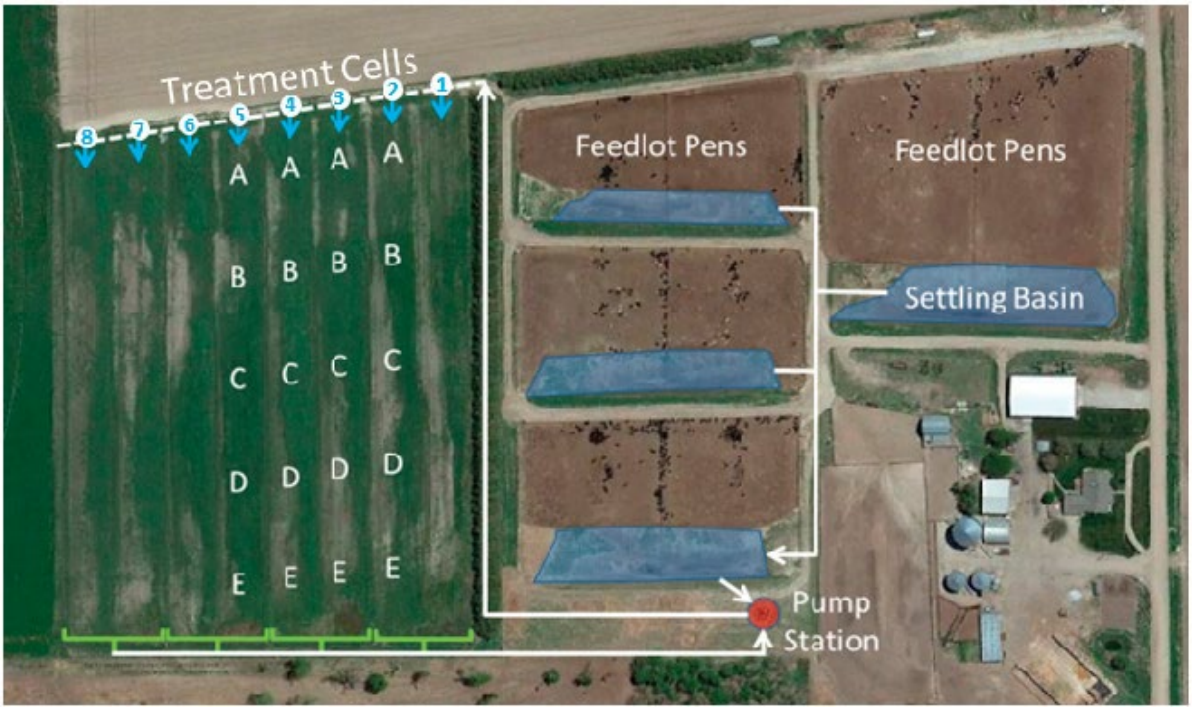
South Fork Kent Creek Watershed: Rural Best Management Practices

Vegetated Treatment Area



Bird's eye view of feedlots next to treatment area (Source: Durso, 2016)

Benefits:

✓Reduces loading of nutrients, organic material, pathogens, other contaminants from waterways

✓Protects water quality in sensitive areas

Additional management of treatment areas may also be implemented:

- Pumps that reroute runoff that is not infiltrated in time.
- Berms at the lower end of area will help to retain discharge.
- Water table monitoring is vital in the placement of the treatment area and to protect against watershed contamination.
- Storing excess effluent for other uses.
- Keeping humans and animals out of the area with fencing.

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South Fork Kent Creek Watershed: Rural Best Management Practices

Stream Crossing

Stream crossings are constructed access bridges, culverts, or fords to allow passage over a stream for wildlife, livestock, or people. The function of the crossings is to keep direct contamination out of a stream whilst maintaining the integrity of the physical streambed. A stream crossing must be non-erosive and structurally stable.

Bridges typically cause the least amount of disturbances to the stream bed or flow, but they are the most expensive to implement. Culverts are the most common and least expensive crossing to construct because building material can be reclaimed. Culvert crossings result in higher disturbance of a stream and surrounding area. Fords are best suited to areas where crossing is left at a minimum, they are most common in areas prone to flash flooding.

Bridge Crossing (Source: Massachusetts Department of Environmental Protection,1997)

Benefits and Uses:

- ✓ Reduces load of sediment, nutrient, and organic material into steams
- ✓ Reduces erosion
- ✓ Provides access for livestock across sensitive areas
- ✓ Enhances wildlife habitat

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Stream Crossing

When planning a stream crossing it is best to evaluate stream channel conditions for any cases of overflow. Flooding of a stream bank may damage a crossing and reverse the positive effects of its placement. It is best to select locations where erosion activity is low to avoid stream and water degradation. The NRCS Conservation Practice Standard (CPS) Channel Bed Stabilization (Code 584) has more information on stable site locations on construction standards.

After construction, highly disturbed areas must be vegetated in compliance with CPS Critical Area Planting (Code 342) and CPS Heavy Use Area Protection (Code 561).

Fencing may also be used to deter livestock or wildlife from entering the stream and crossing, this is efficient for agriculture use.

Culvert Crossing (left) and Ford Crossing (right) (Source: Massachusetts Department of Environmental Protection,1997)

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Heavy Use Area Protection

Heavy Use Area Protection (HUAP) is a technique used to stabilize the ground's surface in an area that is heavily used by livestock, people, or vehicles. HUAP surface treatments can be made of concrete, asphalt, gravel, mulch, or any other non-erosive surface. Areas at risk of concentrated contamination are considered when stabilizing a surface for HUAP. Treatments are often practiced but not limited to livestock feeding areas and watering facilities.

Barnyard before (left) and after (right) surface stabilization using Heavy Use Are Protection (Source: USDA, 2014).

HUAPs can be used as stand alone solutions if proper maintenance and waste disposal practices are implemented. Fences (Code 382), Roof and Covers (Code 367), Vegetated Treatment Areas (Code 635), and Filter Strips (Code 393) are commonly used to accompany this conservation practice.

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South Fork Kent Creek Watershed: Rural Best Management Practices

Heavy Use Area Protection

Placement of HUAP should be away from any surface water. Alternatively, any surface water flow should be diverted from the treatment area. Other considerations should be made to collect, store, and treat manure when it may be a cause for concern. HUAP operations work best when introduced with a prescribed grazing plan on a site.

Prescribed Grazing (Code 528)

Benefits:
- ✓ Improves surface and subsurface water quality
- ✓ Reduces erosion
- ✓ Improves soil quality
- ✓ Enhances plant communities
- ✓ Enhances wildlife habitat

Managing the frequency, duration, and location of grazing or browsing by livestock is a highly effective conservation practice. Harvesting in prescribed areas increases productivity and diversity of plant communities, which in turn is beneficial to wildlife habitation. Soil and water quality also benefit from a balanced nutrient load while not being stripped of their vegetative cover. This cyclical practice should be used away from any surface water to protect from direct contamination. After grazing, livestock should be returned to their quarters, preferably in an area with heavy use protection (USDA,NRCS, 2010). *

* USDA, NRCS. (2010, September). Conservation Practice Standard: Prescribed Grazing. Retrieved from https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1045100.pdf.

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South Fork Kent Creek Watershed:
Rural Best Management Practices
Roofs, Covers, Runoff Structures

Roof Structures are highly recommended for placement above farm facilities such as compost and other containment areas. Providing a protection from rainfall is critical to keeping high concentrations of contaminants from entering surface or subsurface water.

Benefits of Roofs:

- ✓ Protects clean water from mixing with wastewater
- ✓ Improves and simplifies waste management
- ✓ Improves water quality

Slanted wooden roof over compost facility (Source: NRCS, 2015)

Cover over an agro-waste management facility (Source: NRCS, 2015)

Covers are another technique to protect waste management areas from rainfall and containing wastewater with the potential of entering freshwater systems. They capture biogases such as methane, which can be used for energy production, preventing it from entering the atmosphere as greenhouse gas.

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South Fork Kent Creek Watershed: Rural Best Management Practices

Roofs, Covers, Runoff Structures

Roofs and covers as conservation practices are commonly paired with other waste management treatments such as Anaerobic Digesters (Code 366), Waste Treatment Lagoons (Code 359), Composting Facilities (Code 317), Agrichemical Handling Facilities (Code 309), and On-Farm Secondary Containment Facilities (Code 319).

Roof Runoff Structure (Code 558)

Roof Runoff structures collect, control, and convey rainfall from a roof. Gutters are a typical structure. Directing runoff away from contaminated areas to managed areas promotes healthier water quality. Catch basins can be implemented to collect water for other uses or to facilitate its infiltration into the ground.

Rain gutters are often a component used in a roof runoff structure (Source: NRCS, 2014)

Most roof covers are built with a runoff structure in mind. The runoff structure allows for multiple uses of stormwater for enhancing BMPs elsewhere or other facilities on site.

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South Fork Kent Creek Watershed:
Rural Best Management Practices

Amendments for Treatment of Agricultural Waste

Manure, wastewater, and other organic contaminants from heavy use areas are not easily managed. Many times multiple conservation practices are used to ensure environmental safety in agricultural facilities. Treatment of these wastes with biological and chemical additives is usually implemented in waste management processes. The impact of certain amendments varies. For instance, some can be used to reduce ammonia emissions from manure to increase its nitrogen content. The best solutions have both environmental and economic benefits.

The planning and implementation of any amendments must follow federal, state, and local laws. They should be labelled with active ingredients, recommended application, safety and storage.

Manure amendment application (Source: NRCS, 2012)

Benefits:
✓Improves air and water quality
✓Protects animal health

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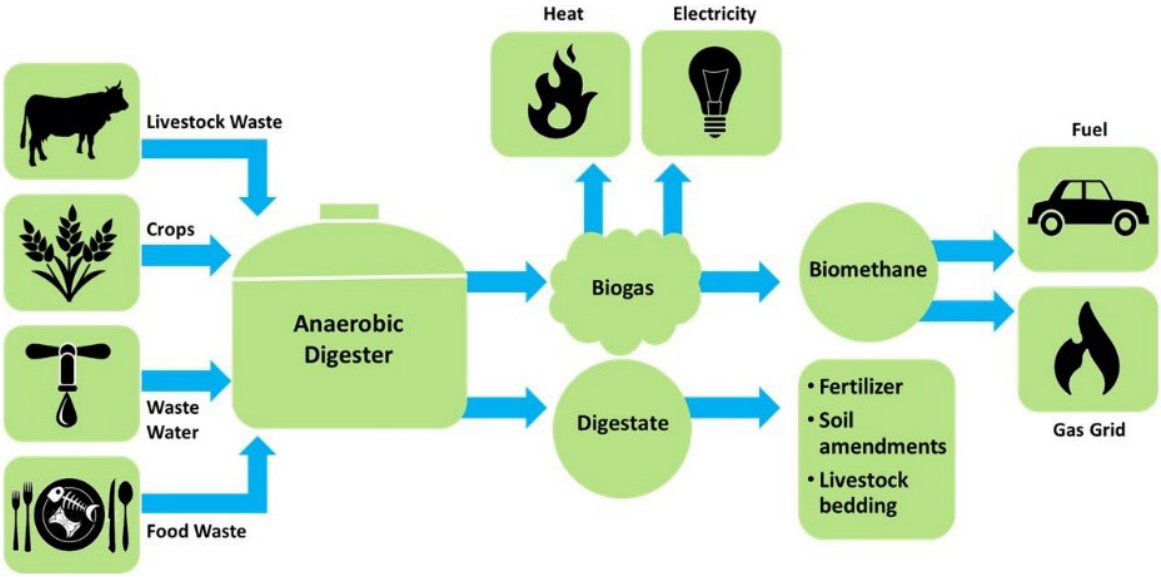
Anaerobic Digester

Organic materials from plants and animals break down by bacteria in an oxygen free environment to produce biogases. This process is called anaerobic digestion. An anaerobic digester is used to optimize the use of biogas as a renewable energy source and efficient waste management, and they are commonly used in waste facilities. A digester can be used to reduce odors, eliminate pathogens, and combat water pollution.

Operations using anaerobic digesters must comply with federal, state, and local laws. The digester is to be located outside of a floodplain to protect the facility from damage.

Other considerations to account for before using this type of facility:

- Proximity to sensitive areas and inhabited areas.
- Characteristic of inputs (animal waste, wastewater, food waste)
- Soil properties and nutrient availability



Anaerobic digestion and uses of biogas (Source: Tanigawa, 2017)

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