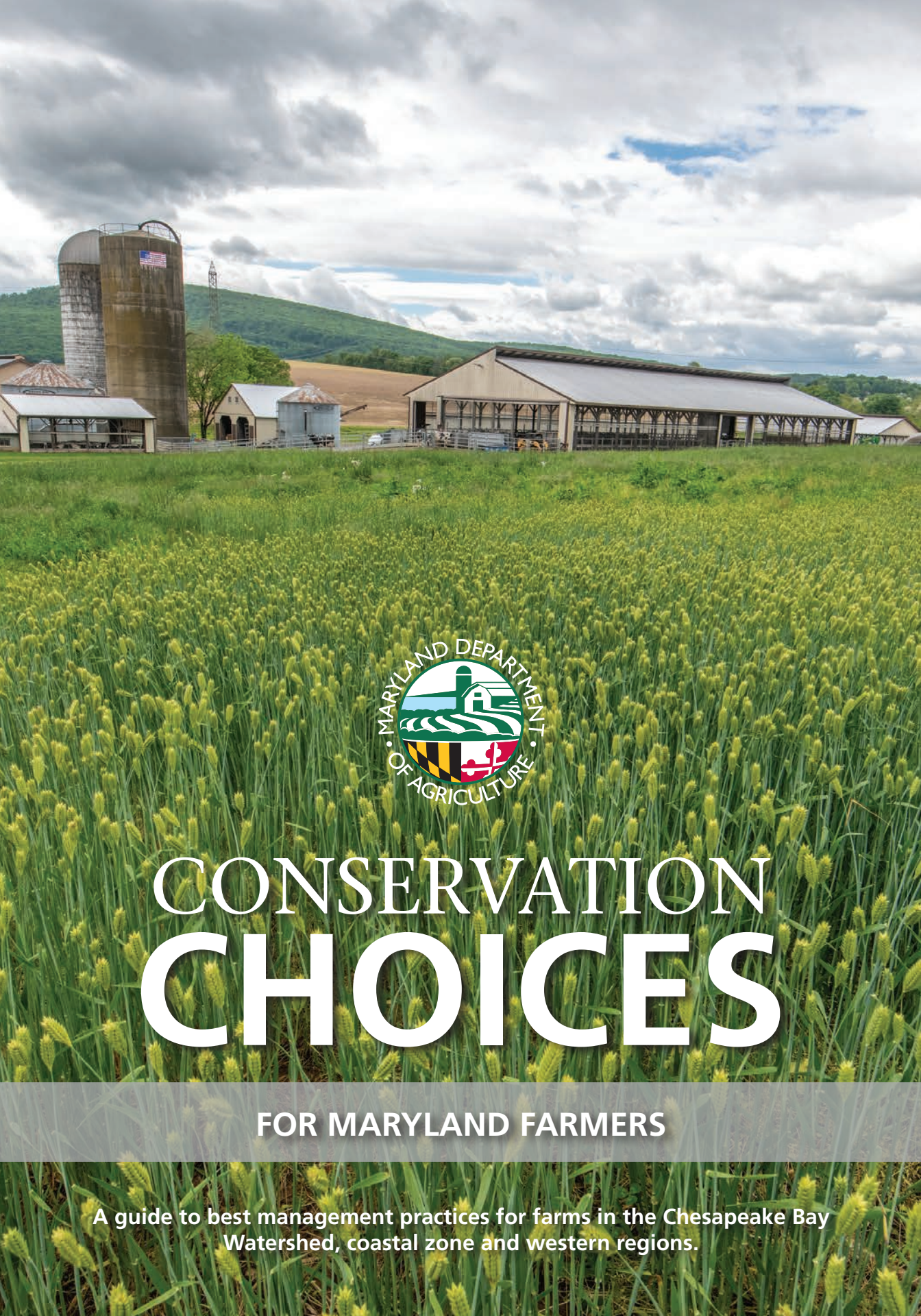

MARYLAND DEPARTMENT OF AGRICULTURE

# CONSERVATION CHOICES

## FOR MARYLAND FARMERS

**A guide to best management practices for farms in the Chesapeake Bay Watershed, coastal zone and western regions.**

## ABOUT THIS GUIDE

Maryland farmers play a key role in protecting water quality in our streams, rivers, and the Chesapeake Bay. With two million acres of land devoted to agriculture, farming activities can have a direct impact on water quality throughout the state. As Maryland works to meet federally mandated nutrient and sediment reductions for the Chesapeake Bay known as the Total Maximum Daily Load (TMDL), the conservation work of farmers takes on even greater importance.

This guide features popular conservation practices—best management practices (BMPs)—that farmers can use to maintain farm production, control soil erosion, improve soil health, manage nutrients, safeguard water quality, provide wildlife habitat, and improve air quality.

A description of how each best management practice works, items to think about when considering a practice and tech notes based on USDA Natural Resources Conservation Service (NRCS) technical standards and maintenance requirements are included.

Six symbols are used throughout the guide to show the benefits of individual best management practices:

Helps improve soil health and reduces erosion and sediment runoff.

Helps protect or improve water quality.

May help increase profits by reducing costs, increasing production or both.

Provides wildlife habitat or food.

Helps improve air quality by reducing odors or other pollutants.

May qualify for state and/or federal cost-share and financial assistance.

## COMPREHENSIVE FARM PLANNING

A Soil Conservation and Water Quality Plan (SCWQP)—sometimes referred to as a farm plan or conservation plan—is a tool that helps farmers protect and enhance the natural resources that support productive and profitable farming operations. These plans identify and prioritize natural resource concerns on the farm and provide farmers with a blueprint for making environmental improvements. A typical farm plan includes land use maps, soils information, an inventory of natural resources, engineering notes, and other supporting information. Farm plans outline best management practices that can be installed by farmers in stages based on time, money, and environmental need.

A system of diversions and grassed waterways may be prescribed by the farm plan to prevent soil from washing down a hillside. Cover crops and streamside buffers are often recommended to protect nearby streams from sediment and nutrient runoff. Other more complex best management practices, such as animal waste storage structures and heavy use areas provide water quality benefits for livestock operations.

Because of their importance in protecting natural resources, farm plans are required by the Federal Food Security Act on all highly erodible lands. At the state level, active plans must be implemented on all farmland enrolled in the Maryland Agricultural Land Preservation Program and on farms located in the Chesapeake and Atlantic Coastal Bays Critical Area. The Maryland Department of the Environment requires certain livestock and poultry farmers to implement farm plans as part of the Confined Animal Feeding Operation (CAFO) permitting process. In addition, farm plans are a key feature in Maryland's Watershed Implementation Plan to protect and restore the Chesapeake Bay.

Farm plans are developed free of charge by technical staff working in Maryland's 24 soil conservation districts (SCDs). Districts help farmers calculate costs to install best management practices included in their farm plans and apply for state and federal cost-share programs and grants. In many instances, grant funds can be combined to make installation of best management practices very affordable.

## Questions to ask when developing your Soil and Water Conservation Plan

- What natural resources and sensitive areas are on my farm?
- What crops do I plan to grow?
- Am I rotating crops to increase bio-diversity and reduce disease and pest problems?
- Am I using commercial fertilizer, animal manure and/or other nutrients based on my nutrient management plan?
- Have I minimized runoff?
- Could I use wetlands or vegetated buffers to reduce nutrients leaving my farm?
- What types of wildlife do I want to see?
- Will a new best management practice interfere with or cancel out another practice?

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# Cover Crops

A small grain or legume crop planted in the fall to recover unused plant nutrients from the root zone, control soil erosion and improve the soil.

## DESCRIPTION

Cereal grains such as wheat, rye, or barley, brassicas (plants in the cabbage family), or legumes, such as clover that grow in cool weather are planted as cover crops in the fall following the harvest of corn, soybeans, vegetables or other crops.

## BENEFITS

Cover crops of small grains are recommended in the fall and winter to tie up nutrients that are left over from the previous crop and to reduce leaching of nutrients to surface and groundwater supplies. Cover crops are used to protect the soil from wind and water erosion, improve soil health, increase water retention, and reduce weeds and pests. Cover crops may reduce fertilizer requirements in the spring.

## PLANNING

- Can the cover crop be planted into standing crops?
- Will the seeding method allow you to meet fall planting deadlines for nutrient uptake?
- Are adequate soil conservation measures installed?

## TECH NOTES

- Cover crops are recommended to improve nutrient management.
- Cover crops need 30 to 40 days of good growth before the first hard frost. Plant fall cover crops from early August until mid-October for best results.
- Cover crops are often recommended when low residue producing crops such as soybeans or corn silage are grown.
- To optimize germination, use planting methods that achieve soil to seed contact.
- Cover crops may be aerial seeded prior to harvesting summer crops or seeded using no-till, vertical tillage, or conventional methods after harvest.
- Follow NRCS recommended seeding rates.
- Aerial seeding rates should be increased by 25 percent.

## MAINTENANCE

- Cover crops may be green chopped or grazed, once well established.
- Kill cover crops in the spring. Mowing or herbicide application is acceptable.
- Deep tillage to terminate cover crops is not recommended because it will bury residue.

# Critical Area Planting

Planting grass or other vegetation to protect a severely eroding area from soil erosion.

## DESCRIPTION

Grasses and legumes are established in areas with excessive soil erosion, often in places where there is bare ground or steep slopes. The vegetation provides surface cover to stop erosion caused by raindrop splash and helps slow runoff water flow.

## BENEFITS

- Reduces soil erosion.
- Improves water quality by reducing the amount of sediment, nutrients and pesticides running off farmland.
- Protects dams or gullied areas where vegetation may be difficult to establish.
- Vegetation provides nesting cover for birds and small animals.

## PLANNING

- Will the planting provide protection?
- Are proper soil conservation practices installed above the planting area?
- Will the planting provide wildlife cover?
- Will the planting be used for grazing livestock?
- Can the area be stabilized using other conservation methods?

## TECH NOTES

- Contact your local SCD for free guidance.
- Plant annual grasses to protect against erosion until permanent cover is established.
- Apply lime and fertilizer, if needed, in the top three inches of the soil before planting.
- Follow recommended seeding rates.
- Severely eroded areas may need a nurse crop like oats. Mow oats before they head out. Mow high to avoid clipping the permanent seeding.
- Areas disturbed during construction on barren slopes 4:1 or steeper should be mulched to provide temporary protection before seeding.
- Mulches include hay, grain, straw, or commercially produced wood fiber matting.

## MAINTENANCE

- Do not allow grazing the year after planting; prevent overgrazing after permanent cover is established.
- Fence, if needed, and permanently exclude livestock from extremely steep slopes.
- Native or warm season grasses may benefit from periodic burning to reduce and remove competing plants.

# Pasture Planting

Planting grasses or legumes to improve forage production, enhance livestock nutrition, protect the soil from erosion and safeguard water quality.

## DESCRIPTION

Establishing perennial grass cover provides quality forage for livestock, stabilizes eroding areas, filters runoff water, and provides wildlife habitat and cover.

## BENEFITS

- Heavy grass cover slows water flow, reducing soil erosion.
- Protects water quality by filtering runoff water and increasing infiltration.
- Provides cover and habitat for wildlife.
- Increases organic matter in the soil.

## PLANNING

- Are selected species suited to soil types?
- Will the species selected minimize pesticide and herbicide applications?
- Will the plant species selected meet livestock needs?

## TECH NOTES

- Use a current soil test to determine whether soil pH and nutrient levels need to be adjusted. For best results, allow several months before planting for lime applications to take effect.
- Before reseeding, graze or closely clip pastures.
- Use legumes to improve forage quality and extend the grazing season.
- Simple mixes of one grass plus one or two legumes are easier to manage and are generally preferred.
- Do not mix warm and cool season grasses in the same pasture.
- For most grasses and legumes, drill seed uniformly to a depth of 1/4 to 1/2 inch, or broadcast and cultipack on a conventionally prepared seedbed.
- For new pastures, plant a nurse crop on steeper slopes or where weeds may interfere with establishing a good stand. NRCS recommends seeding a small grain at 3/4 of a bushel per acre as a nurse crop.

## MAINTENANCE

- Wait until the pasture is well established before grazing.
- Mow weeds when they reach six to eight inches.
- Control persistent weeds with herbicides.
- Fertilize based on soil test results.

# Pollinator Habitat

Permanent vegetation (herbaceous and/or woody plants) planted in an agricultural landscape that is suited for pollinator habitat.

## DESCRIPTION

Pollinator habitat is normally established as part of a conservation management system. It provides wildlife with food and cover, reduces soil erosion and protects water quality.

## BENEFITS

Pollinator habitat provides nectar and pollen sources for pollinators and offers low-disturbance areas for nesting birds.

## PLANNING

- Use plant species that can provide food and cover for pollinators during spring, summer, and fall.
- A minimum of 0.5 acre of contiguous habitat is required to provide pollinators with enough space to find food and nesting sites.

## TECH NOTES

- Prepare the site to ensure the survival and growth of the selected species.
- It is important to treat any existing or potential weed problems prior to planting. This may require up to a year to accomplish. Consult with a weed specialist.
- No-till establishment is highly recommended.
- Follow NRCS pollinator habitat seed mixture recommendations for site conditions.
- Include at least three plants from each grouping (early, mid, or late season blooming) in the mix.
- Fertilizers are not recommended, as they will promote weed growth.
- If necessary, mulch newly seeded areas.
- Oats may be used as a companion crop to prevent erosion.

## MAINTENANCE

- Actively manage habitat(s) to prevent the spread of noxious or invasive plants.
- Inspect and repair pollinator habitat after storms.
- To protect ground-nesting wildlife, do not mow or burn during nesting season, normally May through mid-August.
- Prevent drifting of herbicides and pesticides onto pollinator habitat.
- After plants are established, mow no more than 30 percent of a pollinator planting in any one year.

# Riparian Buffers

Trees, shrubs or grasses planted next to waterways filter runoff, improve water quality, protect against erosion and provide wildlife habitat.

## DESCRIPTION

Vegetative buffers slow or intercept water flow, trapping sediment and other pollutants such as pesticides and nutrients. Trees and shrubs planted along a waterway (including rivers, streams and drainage ditches) provide wildlife habitat and reduce stream temperatures, providing aquatic benefits.

## BENEFITS

- Buffers prevent contaminants from entering waterways and provide shade, food, and habitat for wildlife, fish and other aquatic life.
- Buffers help stabilize streams.
- Trees and shrubs sequester additional carbon from the atmosphere.

## PLANNING

- Are adequate soil conservation measures installed upslope of the buffer?
- Will fencing be needed to exclude livestock from buffers?
- What types of plants are suitable for site conditions?
- How wide should the buffer be to meet objectives?

## TECH NOTES

- Work with your local SCD to select plants for the buffer and determine its width.
- Prepare the site to ensure the survival and growth of selected species.
- Treat any existing or potential weed problems prior to planting. This may take a year to accomplish. Consult with a weed specialist.
- Use tree shelters to increase the survival rate of young trees.

## MAINTENANCE

- Delay mowing grass areas until after August 15 to protect nesting birds.
- Troubleshoot survival problems before replanting; replace dead trees and shrubs as needed.
- Remove tree shelters two years after trees emerge.
- Control weeds and other undesirable vegetative competition.
- Repair fences and check for damage to livestock crossings.

# Windbreaks for Poultry Houses

Trees and shrubs planted near poultry houses improve air quality, create visual screens, protect against winter winds and provide shade.

## DESCRIPTION

One to three rows of trees and shrubs are planted adjacent to poultry houses. At least one row is usually planted with evergreens.

## BENEFITS

- Windbreaks next to poultry houses improve air quality by trapping bits of feathers, ammonia, and other odors that are blown out of ventilation fans.
- Windbreaks may reduce energy costs by keeping poultry houses cooler in summer and warmer in winter.
- Plantings may also be used as visual barriers to screen the production area from nearby roads and neighbors and improve farm appearance.

## PLANNING

- Consider on-farm traffic patterns, wind direction, adjacent drainage ditches, and neighbors.
- What types of plants are suitable for the site?
- Are utility lines nearby?
- Is a water source available for temporary drip irrigation during establishment?
- What setbacks are needed to allow equipment access to poultry houses?

## TECH NOTES

- Work with your local SCD to select plants for the windbreak type and configuration.
- Additional site preparation may be needed around buildings and other structures. Soil may be heavily compacted or contaminated with construction debris, gravel, and other fill material and may severely limit plant rooting and survival.
- Planting one to two gallon container plants in the spring, along with irrigation and good weed control, has produced the best results for plant survival and growth.

## MAINTENANCE

- Troubleshoot survival problems before replanting.
- Replace dead trees and shrubs as needed.
- Control weeds and other undesirable vegetation.

# Agrichemical Handling Facility

A facility with an impervious surface that provides an environmentally safe area for the handling of on-farm agrichemicals.

## DESCRIPTION

Provides a safe environment for the storage, mixing, loading, and cleanup of agrichemicals. Helps prevent spills and leaks from soaking into the ground and impacting surface water, groundwater, air, and/or soil.

## BENEFITS

- Provides a stable, safe surface for equipment storage and operation.
- Reduces the risk of agrichemical spills or leaks during loading, unloading, or mixing.
- Protects the environment by confining spills; allows for faster, more effective actions to clean the area of contaminants.
- Reduces the potential for accidental spills to reach waterways and groundwater.
- Reduces risks to humans handling agrichemicals.

## PLANNING

- Will the facility be located a safe distance from waterways?
- Is an adequate water supply available?
- Are soils and topography at the selected site suitable for construction?

## TECH NOTES

- Follow NRCS specifications.
- Design and construct the facility following all federal, state, and local laws.
- Secure all necessary permits to install and manage the facility.
- The size of the facility is determined by averaging the farm's agrichemical requirements over the last five years.

## MAINTENANCE

- Develop an operation and maintenance plan that addresses all safety requirements, design criteria, and federal, state, and local laws and regulations.
- Handle and mix all farm chemicals on the concrete slab.
- Contain, wash down, and clean up all spills immediately.
- Keep pumps and pipes in good working order.
- Perform regular checks to make sure chemicals are safe and dry.
- Post chemical spill emergency and toxic safety telephone numbers.

# Animal Mortality Facility

A roofed structure designed for composting the normal mortality rates at a poultry operation.

## DESCRIPTION

Composting provides a safe and desirable method for disposing of dead birds by converting nitrogenous materials (manure and birds) and carboniferous materials (straw or sawdust) into a humus-like substance.

## BENEFITS

- When properly managed, composting substantially reduces the volume of carcasses, kills most pathogens, prevents odors, and produces a stable, odorless, humus-like material that is useful as a nutrient source and soil amendment.
- By eliminating the on-site burial of large numbers of carcasses, composting facilities reduce the potential for groundwater contamination and protect public health.

## PLANNING

- Consider on-farm traffic patterns, wind direction, drainage ditches, sensitive areas, topography, and neighbors when deciding where to place the facility.
- Is a carbon source available?
- What equipment is available?

## TECH NOTES

- Contact your local SCD for free guidance.
- Follow the suggested straw-bird-litter ratio to create the compost pile.
- Always cover dead birds completely with dry litter.
- Turn and reactivate compost before applying to land.
- Use a thermometer to monitor temperatures within the compost bin.
- Do not pile birds against composter walls or leave exposed to flies or scavengers.
- Contact your local University of Maryland Extension office for additional assistance.

## MAINTENANCE

- Obtain and follow a written operation and maintenance plan from NRCS. Instructions should outline the materials to be used in the compost mix, moisture content, temperature to be achieved, aeration schedule, and end use for compost.
- The compost facility should be inspected at least twice a year when empty for structural integrity.

# Diversion

A long earthen embankment built across a slope to direct runoff water from a specific area.

## DESCRIPTION

A diversion is often built near the top of a steep slope to intercept runoff and reduce erosion. It may be used to divert runoff flows away from a feedlot or to collect and direct water to a pond.

## BENEFITS

- Reduces soil erosion on steep slopes by intercepting and preventing runoff water from reaching farmland or sensitive resources downslope.
- Vegetation in the diversion channel filters runoff water, improving water quality.
- Vegetation provides cover for small birds and animals.
- Allows better crop growth on bottomland soils.

## PLANNING

- Are proper soil conservation measures installed to prevent the diversion from filling with sediment?
- Is the outlet planned in a location that will not cause erosion?
- Are the diversion and outlet large enough to handle the runoff from the location?

## TECH NOTES

- Contact your local SCD for free guidance.
- Diversions must be built to carry at least the peak amount of runoff generated by a ten-year, 24-hour storm.
- Minimum top width for a diversion ridge is four feet.
- The diversion must have an outlet such as a grassed waterway, grade stabilization structure, or underground outlet.
- Establish vegetated outlets before the diversion is constructed.
- Diversions should not be built in high sediment-producing areas unless installed in conjunction with other conservation measures.

## MAINTENANCE

- Keep outlet clear of debris.
- Keep burrowing animals out of diversions.
- Maintain vegetative cover on the diversion ridge.
- Fertilize based on soil test results.
- Install filter strips above the diversion channel to trap sediment and protect the diversion.

# Grade Control Structure

Earthen, wooden, concrete, or other structure built across a drainage-way or gully to control and reduce water flow.

## DESCRIPTION

These structures drop water from one stabilized grade to another to prevent gullies from advancing up a slope.

## BENEFITS

- A grade control structure is often used to stabilize the outlet of a waterway, preventing gully erosion.
- Grassed, non-eroding waterways with a grade control structure improve water quality, can be crossed with equipment, and defend against gully formation in areas with severe erosion issues.
- If it is planned to retain water, a grade control structure will trap nutrients and sediment and may provide a water source and habitat for wildlife.

## PLANNING

- Are adequate conservation practices installed above the structure to reduce erosion and sedimentation?
- Is the planned location in the proper place to achieve the level of control needed?

## TECH NOTES

- Consult with your local SCD for design and construction specifications.
- Obtain necessary permits or authorizations before construction.
- Remove all trees and shrubs within 30 feet of the structure.
- Clear debris approximately 50 feet downstream from the spillway outlet.

## MAINTENANCE

- Keep burrowing animals off earthen structures.
- Repair cracks in concrete.
- Keep outlets free of debris.

# Grassed Waterway

Shaping and establishing grass in a natural drainageway to control soil erosion and prevent gullies from forming.

## DESCRIPTION

A natural drainageway is graded and shaped to form a smooth, parabolic-shaped channel. This area is seeded to sod-forming grasses. Runoff water flows over the grass instead of tearing the soil away to form a gully. An outlet is often installed at the base of the drainageway to stabilize the waterway.

## BENEFITS

- Grass cover protects the drainageway from gully erosion.
- Vegetation may act as a filter, absorbing some of the pesticides and nutrients in runoff water.
- Vegetation provides cover for wildlife.

## PLANNING

- Is major land reshaping needed?
- Is there a proper outlet for surface runoff at the bottom of the waterway?
- Are soil conservation measures installed to prevent siltation?
- Will tile drainage be necessary to stabilize the waterway?

## TECH NOTES

- Contact your local SCD for free guidance.
- A waterway should be designed to carry the peak runoff from a ten-year, 24-hour storm.
- Seed at the recommended time and rate. Place seed about 1/4 to 1/2 inch deep. If feasible, plant across the slope to reduce erosion.
- A nurse crop, temporary cover, or mulch may be necessary until permanent cover is established.

## MAINTENANCE

- Lift implements off the ground and shut off spray equipment when crossing.
- Do not use the waterway as a roadway.
- Fertilize based on soil test results.
- Maintain the width of the grass area when tilling surrounding fields.
- Avoid planting end rows along the waterway to prevent a new gully from forming on the outside edges of the waterway.

# Heavy Use Area Protection

Poultry Heavy Use Pad

Stabilizing areas that are disturbed because of frequent and intensive use by livestock or farm equipment.

## DESCRIPTION

Vegetative cover, concrete pads or other artificial surfaces are installed to protect water quality by stabilizing areas subject to intensive animal or equipment traffic.

## BENEFITS

- Reduces soil erosion by covering the ground with permanent cover such as tough grasses, gravel, or concrete.
- Can be designed to include storage for stackable manure.
- Improves water quality where livestock/animal manure is concentrated.
- Concrete walkways or pads allow farmers to scrape up manure more easily and manage it for future use.
- Improves livestock health by providing firm footing.
- Improves air quality be reducing wind-blown dust.

## PLANNING

- Have adjoining land uses and proximity to residences, utilities, wetlands, or other environmentally sensitive areas been considered?
- Will windbreaks be installed?
- Is the heavy use area as far away from waterways as possible? Can a vegetated buffer be planted?
- If the heavy use area is adjacent to existing buildings, is adequate roof runoff control installed to keep additional water off the heavy use area?

## TECH NOTES

- Contact your local SCD for free guidance.
- Keep heavy use areas as small as practical.
- Provide surface and subsurface drainage for disposal of runoff without causing erosion or water quality concerns.
- For heavy use areas protected by vegetation, choose appropriate plant species.
- Fence all livestock walkways.
- Collect, store and utilize manure and manure-laden runoff.

## MAINTENANCE

- Inspect the area annually and after significant storm events.
- Replant vegetative areas as needed.

# Livestock Exclusion Fencing

Protecting a stream by excluding livestock with a permanent structure that acts as a barrier.

## DESCRIPTION

Fencing prevents livestock from trampling streambanks, destroying vegetation, and stirring up sediment in the streambed. It is also used to exclude livestock from areas that need to be protected from grazing or browsing and to encourage animals to use stream crossings.

## BENEFITS

- Stabilized streams reduce erosion, decrease stream migration, and improve flood attenuation.
- Water quality and fish habitat benefit from reduced amounts of nutrients and sediment entering the stream.
- Riparian buffers provide wildlife habitat.
- Trees reduce water temperatures and provide food and cover for aquatic life.

## PLANNING

- The distance between the fence and the streambank is determined by the landscape, stream characteristics, flood levels and frequencies, state laws and regulations, Public Drainage Association maintenance right of ways, and wildlife and environmental considerations.
- Temporary fences are not eligible for cost-share.
- Establish vegetative cover on all disturbed surfaces; use gravel or lining to control erosion in areas where vegetation will not survive.

## TECH NOTES

- Work with your local SCD to establish this practice.
- Riparian forest buffers should be at least 1/3 of the width of the floodplain or a minimum of 35 feet wide to benefit water quality.
- Comprehensive habitat/stream protection benefits may require a wider buffer strip.
- All work must comply with federal, state and local requirements.

## MAINTENANCE

- Keep fences repaired.
- Avoid damaging buffer zones with herbicides from surrounding cropland.

# Livestock Stream Crossing

Provides a hard, stable surface to transport livestock and farm equipment for pasture maintenance without damaging the streambed or banks.

## DESCRIPTION

Allows safe animal access to hard-to-reach pastures while helping to control streambank and streambed erosion. The stream crossing may also be used to transport equipment needed to maintain pastures.

## BENEFITS

- Provides livestock access to all pastures.
- Livestock are encouraged to use the crossing instead of the streambed to navigate streams.
- Crossings allow vegetation to stabilize streambanks while promoting wildlife habitat.
- Reduces the risk of livestock injury due to unstable footing in stream channels.
- Minimizes the risk of livestock breaking through frozen stream surfaces in winter.
- Improves cattle health by keeping animals out of the mud.

## PLANNING

- How will livestock be excluded from the stream?
- Can a livestock watering system be installed?
- Are soil conservation practices in place?
- What are conditions like upstream?

## TECH NOTES

- Contact your local SCD for free guidance.
- Slope the banks of the stream on each side and provide a firm streambed.
- Make banks flat enough for livestock or equipment to move safely down the bank.
- Protect banks with gravel laid over filter fabric.
- Make the streambed firm enough for cows to walk across or equipment to cross without causing ruts.
- All work must comply with federal, state, and local requirements.

## MAINTENANCE

- If livestock use the crossing, make sure that fences are in place.
- Inspect after major storm events.
- Remove accumulations of organic material, woody material or excess sediment.
- Replace surface stone used for the livestock crossing as needed.

# Livestock Watering System

A system of troughs and water lines to provide livestock with water from a spring, pond, well or other source.

## DESCRIPTION

Selectively placed watering troughs can make pasture management easier. Farmers can control grazing more efficiently and prevent erosion and water pollution by excluding livestock from streams, springs, and other environmentally sensitive water sources.

## BENEFITS

- Provides a clean, reliable, and easily accessible water supply for animals.
- Allows farmers to divide large pastures into smaller units and rotate livestock from one pasture to another to maintain good forage quality.
- Can help reduce erosion from messy or muddy areas resulting from livestock having uncontrolled access to springheads or streams.
- Can reduce mastitis or hoof problems by providing water for livestock in dry pastures.

## PLANNING

- Will the system have adequate capacity to meet livestock water needs?
- Will the watering system affect downstream flows or aquifers?
- Will wetlands or other water-dependent wildlife habitat be impacted?
- Will fencing be needed to exclude livestock from streams and sensitive areas?

## TECH NOTES

- Contact your local SCD for free guidance.
- Locate troughs to promote even grazing in pastures. Troughs should be located as far from streams and drainageways as practical.
- Overflow from a watering trough should be handled using an underground outlet.
- Permanently installed watering troughs should be constructed of reinforced concrete or an equally durable material.
- Obtain necessary permits or authorizations before construction.

## MAINTENANCE

- Reseed and fertilize as needed around the trough to maintain vegetative cover.
- Inspect the water source, pipelines, and outlets regularly.

# Manure Storage Structure

These structures are used to store poultry and livestock manure until conditions are right for field application or transport can be arranged.

## DESCRIPTION

The type of storage structure selected depends on the livestock operation, animal waste management system, and farm's nutrient management plan. Manure can be pumped, scraped and hauled, pushed, or flushed into a storage structure. These structures safely contain manure to minimize nutrient losses, prevent runoff, and protect water quality.

## BENEFITS

- Allows for field application based on the farm's nutrient management plan.
- Cuts fertilizer costs by reducing nutrient losses.
- Protects manure designated for transport.

## PLANNING

- Has a good location been selected for the structure? Consider the landscape, potential odor problems, sensitive resources, visibility, aesthetic value, and compatibility with existing farm buildings.
- Will the structure allow manure to be stored in a form that can be handled using existing equipment?
- Will buffers be planted around the structure?
- Is the structure the right size to handle the amount of manure produced?

## TECH NOTES

- Contact your local SCD for free guidance.
- The storage period is determined by the farm's nutrient management plan.
- If manure is stored as a solid, it should be protected from precipitation.
- Runoff from surrounding land and buildings should be diverted away from storage structures.
- In-ground structures must be fenced to protect livestock and humans.
- Ramps built for handling equipment must meet safety standards.

## MAINTENANCE

- Do not fill the structure above the planned storage capacity. Overfilled structures are a safety hazard and can cause significant environmental problems if they fail.
- Inspect regularly for leaks or seepage.
- Repair damaged fences immediately.

# Roof Runoff System

A system for collecting, controlling, and disposing of runoff water from non-residential farm buildings.

## DESCRIPTION

Gutters, downspouts, and other water conveyance devices prevent roof runoff water from causing severe erosion or mixing with animal manure and transporting pollutants to waterways.

## BENEFITS

- Improves water quality.
- Reduces soil erosion.
- Increases infiltration.
- Protects buildings and other structures.

## PLANNING

- Does runoff need to be diverted away from structures or contaminated areas?
- Will the runoff be collected and used for other purposes?

## TECH NOTES

- Contact your local SCD for free guidance.
- Runoff may empty into surface or underground outlets.
- Outlets must not discharge near wells, septic system drain fields, basements, or buried tanks.
- Discharge runoff a minimum of five feet from the building. The discharge area must slope away from the structure.
- Avoid discharging outlets directly into surface waters.
- When feasible, divert runoff onto pervious landscapes such as lawns, infiltration trenches, and natural areas.

## MAINTENANCE

- Keep roof runoff systems clean and free of debris and obstructions that reduce flow.
- Inspect regularly and perform repairs to ensure proper function.

# Roofs and Covers

A roof structure placed over a heavy use area to divert clean water from animal management areas such as barnyards or feedlots.

## DESCRIPTION

Installing roofs and covers over an existing or planned heavy use area helps prevent rainwater runoff from mixing with animal manure and transporting pollutants to nearby waterways.

## BENEFITS

- Prevents clean water from entering a barnyard or feedlot where it can become contaminated.
- Provides a temporary animal confinement area during inclement weather.

## PLANNING

- Cost-share assistance is available to construct roofs and covers on existing heavily used animal areas that pose a significant water quality problem.
- To qualify for state cost-share assistance, a minimum of 15 animal units must regularly use or occupy the area to be protected. *(One animal unit equals 1,000 lbs. of live animal weight.)* A minimum of 100 square feet of housing per animal unit is required with 40 square feet available or constructed at the owner's expense.

## TECH NOTES

- Your local SCD can provide design and construction specifications.
- Obtain necessary permits and authorizations before construction.
- To qualify for cost-share, the roof or cover may not be attached to an existing structure but may be attached to a new structure under construction. Additionally, a roof or cover may only be built over a heavy use area constructed of concrete.

## MAINTENANCE

- Inspect areas surrounding the roofed/covered heavy use area after major runoff events and repair promptly.
- Maintain grassed areas around the structure. Reseed as needed according to the operation and maintenance plan.
- Fill in low areas and re-grade as needed using materials similar to those originally installed.

# Wetland Restoration

Restoring the water and plant community in a former or degraded wetland to improve water quality and provide wildlife habitat.

## DESCRIPTION

Most wetland restoration work involves the use of small structures to hold water in an area where drainage, filling, or other methods were previously used to remove natural wetland characteristics. Surface drains and subsurface tile lines may be plugged. Concrete and earthen structures—usually low dikes or ditch plugs—are installed to retain water and maintain a specified water level. In some instances, adjustable outlets allow the landowner to fluctuate the water level during different seasons.

## BENEFITS

- Wetlands help improve water quality by intercepting surface runoff, trapping sediment, and processing nutrients and organic wastes before they reach open water.
- Wetlands store water temporarily, allowing it to percolate slowly into the ground, evaporate, or be absorbed by the roots of wetland plants. This temporary storage reduces peak water flows after storms.
- Wetlands provide habitat for waterfowl and many other species of wildlife.

## PLANNING

- Is there an adequate water supply?
- What types of wildlife are desirable?
- Will the entire site need to be planted?
- Will plugging drains or breaking tile lines to restore the wetland have adverse effects on other parts of the farm or neighboring farms?

## TECH NOTES

- Work with your local SCD to select plants for the restoration site, buffer, and any earthen structures.
- Obtain necessary permits or authorizations before construction.
- Keep livestock away from the area, unless the area is included in a grazing management plan.

## MAINTENANCE

- Some vegetation may need to be replanted until well established.
- Keep burrowing animals out of earthen structures and outlets free of debris.
- Inspect and repair pipe structures.

# Conservation Drainage

Conservation drainage practices treat drainage water from agricultural fields that are artificially drained. These edge of field practices provide numerous environmental benefits.

## DESCRIPTION

Conservation drainage practices help reduce the movement of sediment, nitrogen and phosphorus into surface waters from agricultural land that is artificially drained. Agricultural practices and components commonly used in Maryland include subsurface denitrifying bioreactors, saturated buffers, created wetlands, water control structures, underground outlets, and subsurface drains.

## BENEFITS

- Conservation drainage practices remove nutrients from subsurface drainage water before it leaves the farm.
- Wetlands and saturated buffers help maintain stream flow by storing excess water and slowly releasing it into adjacent streams.

## TYPES OF PRACTICES

- ***Subsurface Denitrifying Bioreactor***–A buried trench filled with a carbon source, usually wood chips, and installed at the edge of a field to remove nitrate nitrogen from subsurface agricultural drainage water.
- ***Saturated Buffer***–A biological treatment system used to divert subsurface drainage water to a vegetated area for treatment.
- ***Wetland Creation***–A wetland is constructed at the edge of a field to treat and filter drainage water on a site that was not previously a wetland. Wetlands remove sediment, nutrients, organic matter and other pollutants from subsurface groundwater associated with farming operations.
- ***Water Control Structure***–Used in conjunction with the above practices or as a stand-alone practice to help prevent gully erosion, manage water to improve crop production, and reduce the movement of nitrates to downstream waters.
- ***Subsurface Drain***–An underground pipe used to collect and convey subsurface drainage water to a buffer, wetland, or bioreactor.
- ***Underground Outlet***–Tubing, tile or pipe installed to move surface water from a treatment practice to a designated outlet.

## PLANNING

- Consider how this practice may affect surface water quality.
- Will the practice impact downstream flows or aquifers?
- A subsurface denitrifying bioreactor must be designed to achieve at least a 30-percent annual reduction in the nitrate nitrogen load of the water flowing through the bioreactor.
- Saturated buffers must intercept a subsurface drain outlet draining at least 15 acres; buffers must be a minimum of 30 feet wide
- Created wetlands should be located in landscape positions and soil types capable of supporting the planned wetland functions.
- Water control structures may be used as a component of a water management system to control the stage discharge, distribution delivery, or direction of water flow.
- Subsurface drains and underground outlets must be installed in association with another best management practice to ensure that discharging water is subject to a nutrient reduction process.

## TECH NOTES

- Work with your local SCD to determine the best practice for your farm.
- Cost-share funding is not available for field drainage laterals.
- Reduced cost-share funding is available for drainage mains.

## MAINTENANCE

- Trees and shrubs in the soil above and around these practices must be controlled by hand, machine, or chemicals.
- Protect outlets from rodents and other animals by installing a rodent guard.
- Conduct periodic inspections—especially following significant rainfall events—to keep inlets, trash guards, and collection boxes and structures clean and free of materials that can reduce flow.
- Repair eroded areas at pipe outlets.

# Contour Farming

Tillage, planting and other farming practices performed on or near the contour of the field—not up and down the hill.

## DESCRIPTION

Crop row ridges built by tilling and planting on the contour slow water flow and increase infiltration, reducing erosion. Contour farming may be used with stripcropping, whereby crops such as corn are alternated with strips of crops that grow close together (hay, alfalfa, clover, and small grains). Alternating strips slows runoff, increases infiltration, traps sediment, and provides overall cover. Crop rotation with legumes as part of the stripcropping measure will add nitrogen to the soil.

## BENEFITS

- Contouring may reduce soil erosion by as much as 50 percent.
- Contouring promotes better water quality.

## PLANNING

- Will more than one key contour line be needed because of steep or irregular slopes?
- Will stripcropping, crop residue management diversions, or other practices be needed for steeper slopes?

## TECH NOTES

- Contact your local SCD for free guidance.
- Establish a key contour line around the hill.
- The key contour line grade should not exceed two percent, except within 150 feet of a grassed waterway, field border, or other stable outlet. In these instances, the row grade may be up to three percent.
- Perform all tillage and planting operations parallel to the key contour line.
- Replace end rows with field borders to reduce erosion.
- Contour strips of open row crops such as corn should be approximately the same width as strips of close-grown crops, including small grains or meadow grasses.
- Strip widths may be adjusted to accomodate equipment.

## MAINTENANCE

- Use grassed waterways to prevent gully erosion.
- Keep strip widths consistent from year to year.

# Crop Residue Management

Residue from the previous crop is left on the soil surface for a specific period of time through the use of reduced tillage practices.

## DESCRIPTION

Crop residue management is part of reduced tillage and continuous no-till systems and may be used with conventional tillage. All tillage operations are reduced and some crop residue is always on the soil surface. This residue helps shield the soil from rain and wind until the next crop can produce a protective canopy. Continuous no-till systems provide the best soil protection because the soil is not tilled and all residue stays on top of the ground. Seasonal residue management can be used with conventional tillage systems when crop residue is left in the fall to protect fields during winter.

## BENEFITS

- Ground cover prevents soil erosion.
- Residue improves soil quality.
- Fewer trips across the field and less tillage reduce soil compaction and save time, energy, and labor.

## PLANNING

- Will the crop produce enough residue to protect the soil from erosion?
- Is special equipment needed?

## TECH NOTES

- Contact your local SCD for free guidance.
- Ensure ample residues are spread evenly over the field by combine at harvest.
- Reduce the number of unnecessary tillage passes.
- Use straight points and sweeps on chisel plows instead of twisted points. Twisted points can bury 20 percent more residue.
- Set tillage tools to work at shallower levels.

## MEASURING CROP RESIDUES

Estimate residue levels by using a line that has 50 or 100 equally divided marks. Stretch the line diagonally across crop rows. Count the number of marks that have residue under the leading edge. Walk the entire length of the rope. The total number of marks with residue under them is the percent of residue cover. If the line has only 50 marks, multiply the count by two. Repeat three to five times in representative areas of the field. Reduced tillage systems should leave at least 30 percent residue after planting each crop. Continuous no-till systems will leave much more residue.

# Crop Rotation

Changing the crops grown in a field on a regular basis to break the cycle of weeds, insects and diseases naturally.

## DESCRIPTION

Crops are changed or rotated seasonally or every few years in a planned sequence. On sloping lands, hay crops are often grown in wide strips across the hill, alternating with strips of grain crops such as corn. After a few years, the crops are rotated so that the hay strips are planted to grain crops and vice versa. On flat landscapes, entire fields are rotated from one crop to the next, sometimes within the same year (such as soybeans planted after wheat).

## BENEFITS

- Crop rotation adds plant and biological diversity to an operation. Pesticide costs are often reduced because growing different crops breaks the cycle of weeds, insects, and diseases naturally.
- Rotation of grain crops (corn, wheat and barley) with legumes (alfalfa, soybeans and clover) reduces fertilizer needs because legumes add nitrogen to the soil.
- Crops that grow close together (hay, alfalfa, clover, and small grains) can reduce soil erosion dramatically.

## PLANNING

- Can insect, weed, or disease problems be reduced by rotating crops?
- What crops are needed to support the farming operation? (For example, hay for livestock.)
- Is there a market for other crops?

## TECH NOTES

- Contact your local SCD for free guidance.
- Crops must be suited to soils and climate.
- Design crop rotations to meet the residue needs of crop residue management plans.
- Rotations that include small grains or hay provide better erosion control.
- For crop rotations that include hay (meadow grasses, perennial clovers, or alfalfa) the rotation can be lengthened by maintaining the existing hay stand for several years.

## MAINTENANCE

- Switch crops to use perennials in the rotation, if necessary.
- Consider herbicide carry-over to avoid crop failures.

# Integrated Pest Management

A site-specific combination of pest prevention, avoidance, monitoring, and suppression strategies are used only if pests reach threatening levels.

## DESCRIPTION

Crops are scouted to determine the type of pests (insects, weeds or diseases), stage of development, and extent of the problem. The potential damage from the pest is then weighed against the cost of control. All alternatives are evaluated based on cost, results, and environmental impact. Precautions are taken to keep pesticides from leaving the field by leaching, runoff or drift.

## BENEFITS

- Scouting and spot treatment for pests that threaten crop health or yields can save money.
- Using few pesticides protects water quality.
- Treatment for specific pests on targeted areas prevents over-use of pesticides.

## PLANNING

- Which soils are likely to leach pesticides?
- Have vegetative buffers been established?
- Have pest control alternatives been considered?
- Have crop records and controls been reviewed?
- Have crops been rotated to reduce pest problems?

## TECH NOTES

- Complete a pesticide risk assessment.
- Scout to identify pests.
- A Private Pesticide Applicator Certificate is required before purchasing or applying a restricted use pesticide.
- Use the lowest effective application rate to treat the problem.
- Rotate pesticides to reduce pest resistance.
- Use spot treatment when possible.

## MAINTENANCE

- Keep accurate records.
- Calibrate application equipment.
- Inspect equipment for wear and damage.
- Follow all label directions when applying pesticides
- Mix and load pesticides in an area that will not contaminate soil or water.
- Apply pesticides during periods of minimal potential for drift or runoff.
- Dispose of pesticide containers and bags according to label directions.

# Manure Injection

This practice uses special equipment to incorporate manure into the soil instead of spreading it on the surface.

## DESCRIPTION

Liquid manure—an organic fertilizer source—is injected below the soil surface to help prevent nitrogen and phosphorus runoff, reduce odors, and preserve beneficial surface residue.

## BENEFITS

- Reduces nitrogen volatilization, making more nitrogen available to crops.
- Reduces odors and complaints from neighbors.
- Minimizes soil disturbance and helps prevent soil erosion and nutrient losses.
- Works well with no-till and strip-till systems.
- Increases organic matter.

## PLANNING

- Will manure be injected by a custom applicator?
- Will equipment be leased or purchased? For example, you will need to decide on a drag line vs. a manure tank hauling system and a shank vs. disc injector.
- Injecting manure requires more time, fuel and labor than surface application.
- State cost-share funds are available on a per acre basis.

## TECH NOTES

- Contact your local SCD for free guidance.
- Injection must be performed based on recommendations outlined in the farm's current nutrient management plan.

# Manure Transport

Livestock and poultry producers transport manure away from areas with high soil phosphorus levels as part of their nutrient management plan.

## DESCRIPTION

Poultry, dairy, beef and other animal producers with high soil phosphorus levels or inadequate cropland immediately surrounding the manure production site transport manure to other farms, fields, or alternative use facilities that can use the product safely.

## BENEFITS

- Protects water quality.
- Reduces odors.

## PLANNING

- Is a storage structure available to protect stockpiled manure from the elements until transport?
- Does the receiving farm have a safe off-loading site that does not pose a risk to water quality?
- Has the manure been analyzed to determine nitrogen and phosphorus levels before transport?
- Does the receiving farm have a nutrient management plan?
- Is equipment available to transport the manure?
- State cost-share assistance is available for receiving operations.

## TECH NOTES

- Biosecurity measures must be followed for all transported manure.
- Do not transport poultry litter containing dead birds that are not completely composted.
- Schedule transport of manure to be compatible with weather conditions, use by the receiving facility, and in accordance with a nutrient management plan.

## MAINTENANCE

- Make certain that all equipment is in good working order.
- Promptly clean up manure that is spilled during loading and unloading.
- Make certain there is no leakage or loss of material from the transport vehicle, especially on public roads.
- Clean, wash, and disinfect all transport and handling equipment before it is used again.

# Nutrient Management

Farmers who follow the 4Rs of nutrient management apply the right fertilizer source, at the right rate, at the right time, and in the right place.

## DESCRIPTION

A nutrient management plan outlining the 4Rs is used to determine how much fertilizer, manure, or other nutrient sources may be safely applied to crops to achieve yields without impacting waterways. In Maryland, nutrient management plans are required for all agricultural land used to produce plants, food, feed, fiber, animals, or other agricultural products. Plans are prepared by University of Maryland Extension advisors, private certified consultants, or farmers who are certified to develop their own plans.

## BENEFITS

- Sound nutrient management reduces fertilizer costs and protects water quality.
- Applying manure to fields following the 4Rs can improve soil health.

## PLANNING

- Have realistic yield goals been determined?
- Have soil and manure been analyzed?
- Are conservation practices installed?
- Have nitrogen credits been accounted for?

## TECH NOTES

- Use a pre-sidedress nitrogen test when corn plants are between 6 and 12 inches tall.
- Split applications of nitrogen should be used to minimize nitrogen losses.
- Test soil at least once every three years.
- Test manure, if used, every other year.
- Calibrate spreading equipment.

## MAINTENANCE

- Make sure the farm's nutrient management plan is current and not expired.
- Farm fields with a soil phosphorus Fertility Index Value of 150 or greater must be managed using the Phosphorus Management Tool (PMT) as outlined in the farm's nutrient management plan.
- Keep all fertilizer application records and receipts.
- Submit annual fertilizer reports to the Maryland Department of Agriculture by March 1 of each year.
- Follow nutrient application setback requirements to protect waterways.
- Follow winter nutrient application restrictions.

# Rotational Grazing

Moving livestock from one area of a pasture to another to give each area a rest in order to maintain high quality forage.

## DESCRIPTION

The pasture is divided into two or more areas or paddocks with fencing. Livestock are moved from paddock to paddock on a planned schedule based on forage availability and nutritional needs. Livestock are not allowed to graze plants below a specific height. Allowing paddocks to rest and recover until the next grazing rotation maintains a vigorous plant community and high quality forage.

## BENEFITS

- Improves vegetative cover, protects soil from erosion, and improves water quality.
- Helps ensure high quality forage throughout the grazing season.
- Distributes manure more evenly.
- Improves habitat for birds and wildlife.

## PLANNING

- Is water available in all pastures?
- Is additional fencing needed?
- Are current forages adequate for the stocking rates and grazing system?
- Does forage quality meet the nutritional needs of livestock?
- How will adjustments be made for periods of low forage production, such as droughts?

## TECH NOTES

- Work with your local SCD to develop a rotational grazing plan.
- Plan the rotation so that the same paddocks are not grazed at the same time, year after year.
- Plan rest periods so that paddocks have enough time to recover from grazing.
- Know the proper grazing heights for forages in the grazing system.

## MAINTENANCE

- Check fences regularly and make repairs.
- Mow or harvest paddocks during periods of fast growth.
- Remove portable water systems in winter and reinstall in spring.
- Adjust the rotation schedule to match plant growth.
- Apply lime and fertilizer based on nutrient management plan recommendations.
- Control weeds.

# Well Protection

Changing farming practices near the farmstead to reduce the risk of contaminating water sources, particularly domestic water supplies.

## DESCRIPTION

The way materials are handled near a water supply and the distance of possible contaminants from a well or other water source can have a dramatic effect on the quality of drinking water on the farm. If pesticides are typically mixed near the well, the risk of contaminating the drinking water supply increases. To protect wells from contamination, take an inventory of farming practices, including pesticide mixing, container washing, and disposal methods. Follow up by assessing the risk of contamination and making needed changes.

## BENEFITS

- Farm modifications may improve efficiency and reduce operating and production costs.
- The drinking water supply and other water resources will be protected from contamination.

## PLANNING

- Are soil conservation and water quality practices in place?
- Has an inventory of activities near the farmstead been completed?
- Have all abandoned wells near the farmstead been properly closed and sealed?

## TECH NOTES

- Soil conservation practices may be installed to divert runoff from the well area.
- Mix farm chemicals and rinse containers a minimum of 100 feet from a well.
- Apply pesticides on days with minimal wind to prevent chemical drift into farmstead areas.
- Use a backflow device in the hose when filling a sprayer tank to be sure chemicals will not siphon back to the well.

## MAINTENANCE

- Keep an emergency chemical spill kit handy.
- Maintain filter strips surrounding the farmstead or wellhead.
- Repair wellhead casing, as needed.
- Repair cracks in concrete pads used for chemical mixing, loading, or container washing.

## MARYLAND'S CONSERVATION PARTNERSHIP

Free technical and financial assistance to install best management practices is available from local, state, and federal agencies, including soil conservation districts (SCDs), the Maryland Department of Agriculture, USDA's Natural Resources Conservation Service and Farm Service Agency, and the University of Maryland Extension. In addition, private nutrient management consultants, crop advisors, and agribusiness specialists may be hired to assist with conservation planning. Your local SCD can help you get started.

## SOIL CONSERVATION DISTRICTS

| | | |
|---|---|---|
| Allegany | 301-777-1747, ext. 3 | alleganyscd.com |
| Anne Arundel | 410-571-6757 | aascd.org |
| Baltimore County | 410-527-5920, ext. 3 | bcscd.org |
| Calvert | 410-535-1521, ext. 3 | calvertsoil.org |
| Caroline | 410-479-1202, ext. 3 | |
| Carroll | 410-848-8200, ext. 3 | carrollsoil.com |
| Catoctin | 301-695-2803, ext. 3 | catoctinfrederickscd.com |
| Cecil | 410-398-4411, ext. 3 | cecilscd.com |
| Charles | 301-638-3028 | charlesscd.com |
| Dorchester | 410-228-5640, ext. 3 | |
| Frederick | 301-695-2803, ext. 3 | catoctinfrederickscd.com |
| Garrett | 301-501-5856, ext. 3 | garrettscd.org |
| Harford | 410-638-4828 | harfordscd.org |
| Howard | 410-313-0680 | howardscd.org |
| Kent | 410-778-5150, ext. 3 | kentsoilandwaterconservationdistrict.org |
| Montgomery | 301-590-2855 | montgomeryscd.org |
| Prince George's | 301-574-5162, ext. 3 | pgscd.org |
| Queen Anne's | 410-758-3136, ext. 3 | qascd.com |
| St. Mary's | 410-475-8402, ext. 3 | stmarysscd.com |
| Somerset | 410-621-9310 | |
| Talbot | 410-822-1577, ext. 5 | talbotscd.com |
| Washington County | 301-797-6821, ext. 3 | conservationplace.com |
| Wicomico | 410-546-4777, ext. 3 | |
| Worcester | 410-632-5439, ext. 3 | |

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