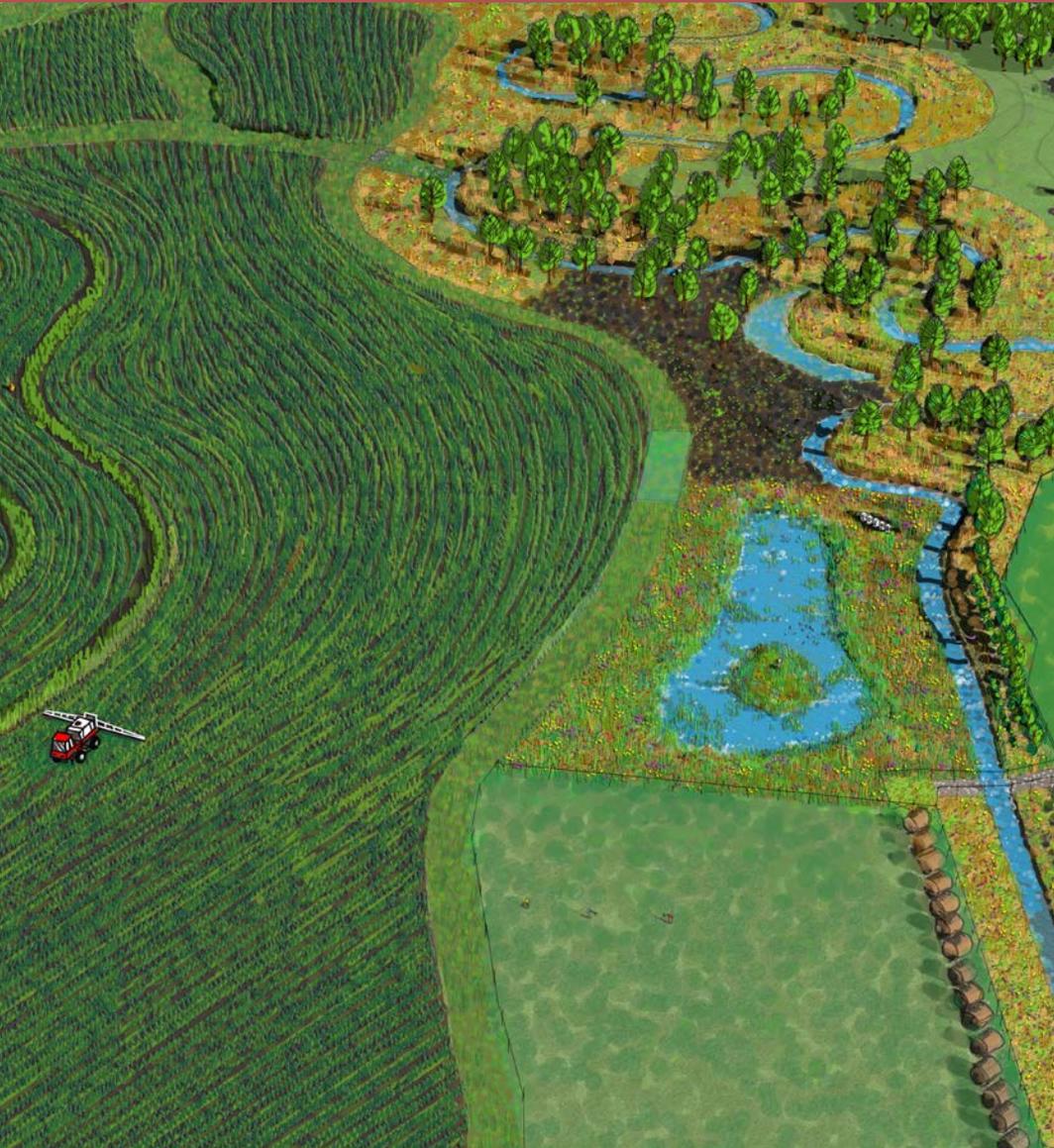




United States Department of Agriculture

CONSERVATION CHOICES

Your Guide to 32 Conservation and
Environmental Farming Practices



NRCS

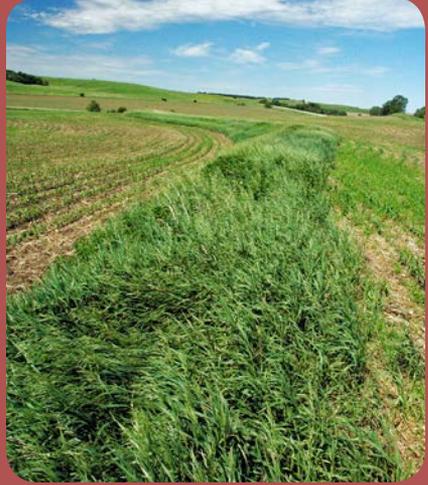
Natural Resources
Conservation Service

www.ia.nrcs.usda.gov

About This Guide

This guide features 32 conservation and environmental farming practices. The guide:

- » shows how each practice works and how it helps improve a farm.
- » lists items to think about when considering each practice.
- » gives information about NRCS technical standards.
- » talks about maintenance needs.



Conservation Planning

A USDA-Natural Resources Conservation Service (NRCS) comprehensive conservation plan is the first step to managing all the natural resources on your farm. The planning process combines your existing production methods with recommended conservation practices to best manage your farm's unique natural resources, while allowing you to improve sustainability and productivity.

Your conservation plan is the end product of the NRCS conservation planning process. As your conservation decision partner, NRCS provides free assistance to landowners to reach land use and natural resource goals. Our local offices, staffed with conservation professionals with local knowledge, can help you make well-informed conservation decisions.

During the planning process, we will:

- » discuss your objectives,

- » examine your natural resource concerns,
- » point out areas for possible protection and improvement,
- » discuss your economic goals for the farm, your current farming operations and your future plans,
- » review your conservation practice options, and
- » help you weigh your alternatives.

We will help you balance the needs for profit, protection and productivity. Each of these factors is considered when NRCS writes a plan for your approval and implementation.

A conservation plan provides you a step-by-step road map for meeting your natural resource conservation goals. It includes helpful information on each of the practices included in your plan: how they benefit your farm, how to maintain them, and how they help the soil, water and wildlife.

“Before any work is done, each farm or ranch is carefully analyzed, both as a piece of land and as a business enterprise.”

– **Hugh Hammond Bennett**,
Father of Soil Conservation



Use this booklet to identify the practices you might add to your farm. Then, review each practice to see whether it could work with other practices to better protect your soil and water.



Short videos about each of these practices are available on the Iowa NRCS YouTube channel at: www.youtube.com/user/iowaNRCS.

Illustration by Doug Adamson, RDG Planning & Design

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- 29 Water and Sediment Control Basin
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- 31 Wetland
- 32 Windbreak/Shelterbelt

Benefit Symbols

Each practice in the guide will work most effectively in combination with others, as part of a total resource management system.

Seven symbols are used throughout the book to show the benefits of each practice featured in the guide. The symbols and the explanation of each are listed below.



The practice helps **reduce soil erosion and sediment runoff**.



The practice helps **improve soil health** by adding organic matter, biological activity, or by helping water infiltrate.



The practice helps **protect or improve water quality**.



The practice helps **increase profits** by reducing farm expenses, improving yields or both.



The practice helps **provide wildlife habitat or food sources**.



The practice helps **improve energy efficiency** on the farm.



The practice helps **improve air quality** by reducing odor and other problems.

Land Use Symbols

Most of the conservation practices in this brochure can be used to protect resources on various types of agricultural land. The following symbols indicate all potential land uses where the practice could be applied:

CROP

Cropland

WILD

Wildlife

GRASS

Grassland/Pasture

FARM

Farmstead

32 conservation and environmental practices

- 1 Brush Management
- 2 Conservation Cover
- 3 Contour Buffer Strip
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- 5 Cover Crop
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- 32 Windbreak/Shelterbelt

1

Brush Management

LAND USES:

GRASS

WILD

FARM



What it is

Brush management is the removal, reduction or manipulation of woody trees and shrubs.

How it helps

Managing unwanted trees and brush may help to restore desired vegetative cover to protect soil from erosion, reduce sediment, improve water quality, and enhance wildlife habitat and species diversity.

It may also be used to improve grazing conditions (picture above) so grazing animals can easily access forage of better quantity and quality. Brush management can also be used to protect property from wildfires.

Planning ahead

- » Do you need this land for livestock or crops?
- » Are unwanted trees or brush a fire hazard?
- » Is thickness of trees or brush keeping vegetation from growing below?
- » Do you have the time, equipment and manpower to remove the brush?

Tech Notes

Brush management can be accomplished by using one or a combination of the following alternatives:

- 1. Mechanical:** This includes tree shearing, using a dozer, use of mechanical devices, mowing, or hand cutting.
 - » Shearing is best accomplished when the ground is frozen or dry.
 - » Maximum regrowth (suckering) is achieved when cut during the dormant season (October - March).
- 2. Prescribed Burning:** Burning should be completed using an approved burn plan that meets the NRCS Prescribed Burn (338) conservation practice standard.
- 3. Chemical/Herbicides:** This includes broadcast, spot, cut stem or basal treatments. Due to cost and environmental considerations, herbicide treatments should be restricted to small manageable areas.
- 4. Biological:** Goats are the species of choice for controlling brush in pastures and abandoned farmland.

Maintenance

Without continued management activities small shrubs and trees become large and overgrown. Maintenance activities need to be continued on a regular schedule to suppress the growth of woody vegetation.

2

Conservation Cover

LAND USES:

CROP

GRASS

WILD



What it is

Establishing and maintaining permanent vegetative cover of either introduced or native grasses, legumes and forbs for nesting cover, winter cover, brood cover, pollinator habitat, and food for wildlife.

How it helps

- » Reduces soil erosion and sedimentation.
- » Improves water and air quality.
- » Enhances plant diversity.
- » Increases soil organic matter.
- » Improves soil health.
- » Manages plant pests.

Planning ahead

- » What type of wildlife or pollinators do you want to attract?
- » Are you prepared to take the land out of agricultural production to allow for cover to establish?

Tech Notes

- » Select plant species and cultivars based upon adaptation to site conditions, including moisture regime and landscape preference.
- » Plant a diverse species mix to promote biodiversity and meet the needs of the targeted wildlife species.

- » Tall fescue should not compose more than 10 percent of the mixture if the primary or secondary purpose is wildlife.
- » Control weeds during the establishment year to ensure the new permanent seeding survives.
- » A temporary cover may be needed to reduce potential weed and erosion problems.

Maintenance

- » Mow, burn, clip or use approved chemicals to maintain planned vegetative community.
- » Any mowing after seeding establishment, except for noxious weeds, will be done after Aug. 1 to protect nesting wildlife.
- » Do not mow an entire field annually.
- » Maintain levels of plant nutrients as necessary.

3



Contour Buffer Strip

LAND USES: CROP



What it is

Contour buffer strips are strips of grass or a mixture of grasses and legumes that run along the contour of a farmed field. They alternate down the slope of a field with wider cropped strips.

How it helps

Established contour buffer strips can significantly reduce sheet and rill erosion. Strips slow runoff and trap sediment. Contaminants such as sediment, nutrients, and pesticides are removed from the runoff as they pass through a buffer strip. Buffer strips may also provide food and nesting cover for wildlife and pollinators.

Planning ahead

- » Have you decided whether to have parallel crop strips or parallel buffer strips?
- » Are other conservation measures, such as crop residue management, installed or planned to help reduce grass strip siltation?
- » Will planned acres in row crops meet your production objectives?

Tech Notes

- » Buffer strips must be at least 15 feet wide. Width depends on slope, soil type, field conditions, climate, and erosion potential.
- » Either crop strips or grass strips may be parallel. When parallel, crop strips are easier to farm with no point rows, but that results in less of the slope in row crops.
- » Grass buffers commonly make up 20-30 percent of the slope.
- » Species to use for contour buffer strips depends on soil type, climate, and planned use.

Maintenance

- » Control weeds and brush in grass filter strips.
- » Delay mowing until July 15 to help ground-nesting birds.
- » Keep vegetation tall in spring and early summer to help slow runoff flow.
- » Fertilize as needed.
- » Buffer strips may be moved up or down the slope to help re-establish vegetation or for other maintenance needs.

4



Contour Farming

LAND USES: CROP



What it is

Contouring means farming with row patterns nearly level around a hill – not up and down hill. The rows form hundreds of small dams that slow water flow and increase infiltration to reduce erosion.

How it helps

- » Contour farming can reduce soil erosion by as much as 50 percent compared to up and down hill farming.
- » By reducing sediment and runoff and increasing water infiltration, contouring promotes better water quality.

Planning ahead

- » Will more than one key contour line be needed because of steep or irregular slopes?
- » Are terraces or stripcropping needed for steeper slopes?
- » Are field borders needed to replace end rows in the contouring system to control sheet and rill erosion?

Tech Notes

- » Establish a key line around the hill by using a hand level or contour gauge.
- » Contour key line grade should not exceed 2 percent, except within 100 feet of an outlet. In that case, the grade can be a 3 percent slope.
- » Perform planting and other activities parallel to the key contour line.
- » Replace end rows with field borders to reduce erosion.

Maintenance

- » Use grassed waterways in areas where runoff is concentrated to prevent gully erosion.
- » Contoured rows should enter the grassed area of waterways on the level, but should direct water into the grass.
- » To avoid laying out new key contour lines every year, establish a permanent narrow strip of grass along each key contour line.

5



Cover Crop

LAND USES: CROP



What it is

Crops such as cereal rye, oats and winter wheat are planted to temporarily protect the ground from wind and water erosion and supply living roots to the soil during times when cropland is often not adequately protected.

How it helps

- » Keeps ground covered to protect it from soil erosion.
- » Improves soil health by adding organic matter and biological activity.
- » Cover crops, such as tillage radishes, have a taproot that can help improve water infiltration.
- » Traps nutrients.
- » Can reduce weed competition.
- » Provides livestock grazing.

Planning ahead

- » What benefit would you like to get out of the cover crop?
- » What seeding method do you plan to use?
- » How will you plan to terminate a cover crop that over winters?

Tech Notes

- » Cover crops are especially beneficial when low residue producing crops, such as soybeans or corn silage, are grown on erodible land.

- » Most cover crops will need at least a month of growth before the first hard frost to allow vegetative growth large enough to survive the winter.
- » Establish cover crops according to the recommended seeding rates, dates, and methods provided.
- » If seeding the cover crop prior to harvest, use a broadcast method that allows for good coverage and prevents damaging the standing crop.
- » If seeding the cover crop after harvest, the seed may be no-tilled or broadcast seeded into existing residue cover.
- » Cover crops can be terminated by harvest, crimpers, frost, mowing, tillage and herbicides.

Maintenance

- » Cover crops should be terminated as late as possible to maximize plant growth and residual nutrient accumulation, while allowing sufficient time for the cover crop to decompose, release nutrients, and recharge soil moisture.
- » Do not allow livestock to graze the cover crop below two inches.

6

Crop Rotation

LAND USES: CROP



What it is

A conservation crop rotation is growing different crops on the same piece of land year after year in a planned, recurring sequence.

This may include alternating row crop production with a high residue producing crop, such as corn, to a low residue producing crop like soybeans. It also may involve a rotation to a small grain or a grass legume meadow, and may include crops planted for cover or nutrient enhancements.

How it helps

- » On sloping lands, crop rotations can help reduce soil erosion.
- » Rotations with alfalfa and other legumes reduce fertilizer needs because these plants replace some of the nitrogen removed by corn and other grain crops.
- » Pesticide costs may be reduced by naturally breaking the cycles of weeds, insects and diseases.
- » Rotations help improve soil health by adding diverse biological activity.
- » Grass and legumes in a rotation protect water quality by preventing excess nutrients or chemicals from entering water supplies.

Planning ahead

- » Do you have a use for other crops?

Tech Notes

- » Crops must be suited to your soils.
- » Design crop rotations to meet the residue needs of your crop residue management plan. High residue crops include: corn (grain), sorghum (grain), small grains, forages and winter cover crops.
- » Small grains and corn (grain) can be used to replace any low residue crop to gain better erosion control.
- » For crop rotations which include hay, the rotation can be lengthened by maintaining the existing hay stand for additional years.

Maintenance

- » Switch crops to maintain perennials in the rotation, if necessary.
- » Consider herbicide carryover to avoid crop failures.

7



Denitrifying Bioreactor

LAND USES:



What it is

An edge of field structure containing a carbon source, such as wood chips, installed to reduce the concentration of nitrate-nitrogen in subsurface agricultural drainage flow via enhanced denitrification.

How it helps

- » Bioreactors help improve water quality by reducing the nitrate-nitrogen content of subsurface agricultural drainage flow.

Planning ahead

- » Do water samples show there is a need to reduce nitrate-nitrogen concentration in subsurface drainage flow?
- » Do you have a good location at the edge of a field near an outlet pipe for a bioreactor?

Tech Notes

- A bioreactor should be designed to:
- » treat peak flow from a 10-year, 24-hour drain flow event.
 - » treat at least 15% of the peak flow from the drainage system.
 - » treat at least 10% of the peak flow from the drainage system if systematic monitoring will be taking place through NRCS.

- » use locally proven criteria that will result in the treatment of at least 60% of the long-term average annual flow from the drainage system.
- » achieve at least a 30% annual reduction in the nitrate-nitrogen concentration of water flowing through the bioreactor.

Media Chamber:

- » Use a medium for a carbon source that is reasonably free from dirt, fines, and other contaminants. Distribute the media within the bioreactor for a uniform flow path.
- » Use geotextile or plastic lining for the bottom, sides, and top of the bioreactor to prevent migration of soil particles into the bioreactor.
- » Design the bioreactor for an expected life of at least 10 years.

Water Control Structures:

- » Design water control structures to provide the required capacity and hydraulic retention time.
- » Evenly distribute and collect water in the upstream and downstream ends of the media chamber.
- » Allows for completely draining the media chamber to facilitate management and maintenance.

Maintenance

- » NRCS will provide an operation and management plan to the landowner.

8

Farmstead Energy

LAND USES:

CROP

GRASS

WILD

FARM



What it is

Finding ways to conserve energy on farmsteads. Practices could include improving lighting systems, planting windbreaks, reducing tillage or implementing any number of dairy system improvements.

How it helps

- » Energy conservation allows farmers to save money through reduced fuel consumption and energy use, and lowered operation costs.
- » Replacing florescent lights with LED lamps in farm buildings can reduce energy consumption by 50 percent, and they last much longer.
- » Windbreaks can block farmstead buildings from winds, which reduces energy consumption during colder months.
- » Reducing tillage passes or fertilizer application in crop fields reduces fuel costs.
- » Energy improvements to high-tech dairy systems can improve the efficiency of an operation and help produce better producing cows.
- » Energy efficient pumps that supply water to livestock or for irrigation can save farmers money.

Planning ahead

- » Have you considered greenhouse gas emissions and ambient air pollutants? Methods may be implemented to account for greenhouse gas emission credits.
- » Have you considered the use of renewable energy resources?
- » Have you considered implementing energy measures with ranking metrics such as life cycle energy savings, payback period, and cost-effectiveness?

Tech Notes

- » To implement energy conservation and efficiency measures, plans and specifications should be in accordance with NRCS standards and describe requirements for proper installation to achieve their intended purposes.
- » Replacement and retrofitted plans should be consistent with the purposes of the practice, its intended life, and safety requirements.

Maintenance

- » Maintain records to document the implementation of energy improvements. Retain and update records for a minimum of five years. This could include utility bills, fuel purchases, and yield of agricultural commodities.

LAND USES:

CROP

GRASS

WILD

FARM



What it is

A permanent, portable or temporary constructed barrier to animals or people.

How it helps

- » Fencing can help reduce erosion and control access by grazing animals to permit recovery or establishment of vegetation.
- » Improved forage production will help increase livestock production.

Planning ahead

- » Do the type and design of the fences meet your management and site objectives?
- » Do you need permanent, portable, or temporary fencing?
- » Do you need gates or cattle guards?
- » What height, size, spacing and fence material do you need?
- » What type of posts will best meet the needs for the style of fence?
- » Do you need fencing for watering facilities?

Tech Notes

- » Temporary fencing materials, types and designs are recommended for interior fencing situations such as interior paddocks or protecting riparian or forest buffers.
- » Design, locate and install fences to meet appropriate local wildlife and management needs/requirements.

- » Other considerations for fence design and location:
 - » topography
 - » soil properties
 - » livestock management
 - » animal safety
 - » livestock trailing
 - » access to water facilities
 - » development of grazing systems
 - » human access and safety
 - » landscape aesthetics
 - » erosion problems
 - » soil moisture conditions
 - » flood potential
 - » stream crossings
- » Mark fences to enhance visibility for human and animal safety.
- » Fences across gullies or streams may require special bracing or designs.
- » Ease of access for construction, repair and maintenance should be considered.

Maintenance

- » Routine inspection should be part of an ongoing management program.
- » Inspect fences in the spring after snow melt to determine if weakness, breaks or malfunctions have affected the intended use of the fence.
- » Check voltage regularly on electric fence. Correct any voltage issues.
- » Clear brush and fallen limbs from fence lines.

10

Field Border

LAND USES: CROP



What it is

A strip of perennial vegetation, primarily introduced or native grasses, established at the edge or around the perimeter of a field.

How it helps

- » Field borders control sheet, rill, gully and wind erosion at the edges of a field where end rows would run up and down hill.
- » They provide wildlife and pollinators food and cover.
- » They provide a turning point for farm equipment.
- » Vegetation filters runoff to improve water quality.
- » Grass and legume strips may be harvested in some cases.

Planning ahead

- » Will the width be wide enough to turn your equipment?

Tech Notes

- » Field borders must be a minimum of 30 feet wide, and wide enough to turn farm equipment – normally this is twice the width of equipment used.
- » To provide wildlife benefits, field borders should be 30-40 feet wide.

- » Seed with perennial grasses, legumes or a mixture of the two.
- » Seeding may be completed during the spring period, March 1 to May 15, or during the late summer seeding period, Aug. 1 to Sept. 15.
- » Seeding period for warm season grasses is April 1 to July 1.
- » Borders need to be seeded or left in place when a meadow field is plowed.
- » Drill seed across the slope, not up and down, if possible to help control erosion.
- » Drill grass and legume seed uniformly over the strip 1/4" to 1/2" deep or broadcast uniformly over the field border. Harrow and cult-pack to establish good seed to soil contact.

Maintenance

- » Delay mowing until Aug. 1 to protect nesting birds.
- » Maintain desired vegetation and plant vigor by liming, fertilizing, mowing, disking, burning, and controlling noxious weeds to ensure effectiveness of the border.
- » Shut off farm chemical sprayers when turning on field borders.
- » Shape and reseed border areas damaged by storms, animals, chemicals, tillage or equipment traffic.

LAND USES: CROP

What it is

A strip of dense herbaceous vegetation such as grass, trees or shrubs that filters runoff and removes contaminants before they reach water bodies or water sources, such as wells. Filter strips are most effective when used in combination with other agronomic or structural conservation practices.

How it helps

- » The vegetation slows water flow and allow contaminants like sediment, chemicals and nutrients to collect in grass, trees and shrubs.
- » Filter strips improve water quality for fish and other aquatic life.
- » Grass, trees and shrubs provide cover for small birds, animals and pollinators.
- » Ground cover reduces soil erosion.
- » The vegetative strips move row crop operations further from a stream.

Planning ahead

- » Are adequate soil conservation measures installed above the filter strip?
- » Are plants adapted to your soil type?
- » Have you selected the correct plant species for the control you need?
- » Consider including species beneficial for pollinators and butterflies such as milkweed.

Tech Notes

- » Filter strips are most effective on slopes of 5% or less.
- » Filter strips for cropland must be at least 15 feet wide. Steeper slopes require wider strips.

<u>% Slope</u>	<u>Minimum Width</u>
0-10	15 feet
10-20	20 feet
20-30	25 feet

- » A minimum of 50 feet width is required for filter strips on forestland.
- » Do not use a filter strip as a roadway.
- » Filter strips will be less effective under snow or during frozen conditions.
- » Avoid drift when applying herbicides on surround cropland.
- » Controlled grazing may be allowed if filter strips are dry and firm.

Maintenance

- » Repair rills and small channels that may have developed.
- » Control grazing if livestock have access to filter strips.
- » Mow (and harvest if possible) grasses several times per year to encourage dense vegetative growth. For ground nesting wildlife, avoid mowing during nesting periods.
- » Restoration may be needed if sediment accumulates.

LAND USES:

GRASS

WILD



What it is

Planting grass and legumes – suitable for pasture, hay, or biomass production – to reduce soil erosion and improve production.

This practice does not apply to the establishment of annually planted and harvested food, fiber, or oilseed crops.

How it helps

- » Improves or maintains livestock nutrition and health.
- » Provides forage supplies during periods of low forage production.
- » Reduces soil erosion.
- » Improves soil health and water quality.
- » Lush pastures give cover and habitat for wildlife.
- » As plants recycle and roots die, organic matter in the soil is improved.

Planning ahead

- » Are selected species suitable to your soil types?
- » Have you chosen species that will help to reduce the use of pesticides and herbicides?
- » Have you selected species that meet the needs of your livestock?

Tech Notes

- » Follow NRCS recommendations for planting rates, methods and dates.
- » Plant at a depth appropriate for the seed size or plant material, while assuring uniform contact with soil.
- » Plant when soil moisture is adequate for germination and establishment.
- » All seed and planting materials will meet state quality standards. Do not plant federal, state, or local noxious weeds.
- » When planting legumes, use pre-inoculated seed or inoculate with the proper viable strain of Rhizobia immediately before planting.
- » Exclude livestock until plants are well established.
- » Select forage species based on the intended use, level of management, realistic yield estimates, maturity stage, and compatibility with other species.

Maintenance

- » Inspect and calibrate equipment prior to use, and continue to monitor during planting to ensure proper rate, distribution, and depth of the planting material is maintained.
- » Control undesirable weeds/plants.
- » For perennial species, ensure enough plant tissue remains after harvest for the plant to regenerate through photosynthesis.



LAND USES:

CROP

GRASS



What it is

An earthen embankment built across a watercourse with a drop spillway made of metal pipe, wood, concrete, or other materials.

These structures provide controlled passage of storm flow through a sudden drop in elevation from one stable grade to another.

There are several different types of grade stabilization structures:

- » Closed conduit structures
- » Full-flow open structures
- » Box inlets on existing road culverts
- » Side-inlet drainage structures

How it helps

- » Grade stabilization structures are often used at the outlet of a grassed waterway to stabilize the waterway outlet, preventing gully erosion.
- » Grassed, non-eroding waterways made possible with a grade control structure give better water quality, can be crossed with equipment, and look better than non-stabilized gullies.
- » If it is planned to store water, a grade stabilization structure may provide a water source and habitat for wildlife.
- » Improves water quality by reducing the amount of sediment delivered downstream.

- » Stops gullies from advancing up-stream through cropped fields and pastures.

Planning ahead

- » Are adequate conservation practices installed above the structure to prevent sedimentation?
- » Is the planned location in the proper place to achieve the level of control you want?

Tech Notes

- » NRCS can provide assistance with design and construction specifications.
- » Obtain any necessary easements and/or permits.
- » At a minimum, remove all trees and shrubs within 30 feet of the structure.
- » If livestock will have access to the site, fence the embankment.

Maintenance

- » Keep burrowing animals off of earthen structures.
- » Periodically, inspect the structure. Repair or replace any damaged or displaced rock, concrete, wood or other structural components.
- » Keep outlets free of debris.



LAND USES: CROP

GRASS



What it is

Grassed waterways are shaped constructed channels that are seeded to grass or other suitable vegetation to convey water to a stable outlet at a non-erosive velocity.

A structure is often installed at the base of the waterway to stabilize the waterway and prevent a new gully from forming.

How it helps

- » Grass cover protects the waterway from gully erosion and traps sediment in runoff water.
- » Vegetation can filter and absorb some of the chemicals and nutrients in runoff water.
- » Vegetation provides cover for small birds and animals.

Planning ahead

- » Is major land re-shaping needed?
- » Is there a proper outlet for surface runoff at the bottom of the waterway?
- » Are soil conservation measures installed to minimize siltation?
- » Will tile drainage be necessary to establish vegetation in the waterway?

Tech Notes

- » Shape a waterway so the depth halfway to the center is $\frac{3}{4}$ of the depth at the center. For example, if the center depth is 1 ft., depth halfway to center is .75 ft.
- » The final graded waterway surface to be seeded should be reasonably smooth, free of rills and gullies, and has the designed cross section.
- » Silt fence fabric checks may be needed after grading and smoothing to reduce potential for gully erosion until seeding is established.
- » A firm seedbed increases the chance of a good grass stand. A roller or cultipacker may be needed to get a firm seedbed.
- » Apply fertilizer and seeding at rates recommended by NRCS.

Maintenance

- » Lift implements out of the ground and shut off spray equipment when crossing the waterway.
- » Inspect after heavy rains. Fill, compact, and reseed areas damaged by the rain.
- » Don't use the waterway as a roadway.
- » Avoid planting along the waterway. This prevents a new gully forming on the outside edges of the waterway.
- » Fertilize as needed.
- » Mow periodically, but wait until after Aug. 1 to benefit wildlife nesting.

LAND USES: FARM



What it is

An enclosed polyethylene, polycarbonate, plastic, or fabric covered structure that is used to cover and protect crops from sun, wind, excessive rainfall, or cold, to extend the growing season in an environmentally friendly manner.

This practice only applies to crops grown naturally in the soil profile.

How it helps

High tunnel systems help improve plant health and vigor.

Planning ahead

- » Plan supportive conservation practices to address all environmental concerns such as erosion, irrigation and runoff.
- » Locate the structure near a viable water source for irrigation.
- » Select a covering material thick enough to withstand temperature changes for a 4-year lifespan.
- » Consider a minimum clearance of 10 to 20 feet between side by side high tunnel installations for snow removal and cover installation.
- » Plan for proper disposal of the cover at the end of its useful life.

Tech Notes

- » Raised beds may be installed to improve soil condition, fertility, and access. Raised beds are a maximum of 12 inches in depth.
- » Do not use high tunnels for sheltering or housing livestock, or to store supplies or equipment.
- » The frame must be constructed of metal, wood, or durable plastic; and be at least 6 feet at the peak.
- » Direct runoff away from high tunnels to avoid ponding. Provide a detention basin, storage reservoir, or stable outlet when runoff empties onto the ground surface with potential to cause erosion.
- » Manage the high tunnel to improve soil health by following a soil management system.
- » Remove or roll up side covers to control internal temperatures and humidity.

Maintenance

- » The cover may need to be removed during the snow season.
- » Inspect the cover regularly for wear and tear.
- » Periodically remove accumulated snow to avoid structural weakening or collapse.
- » Repair or replace the cover if damaged from wind, snow or other weather-related occurrence.



LAND USES: FARM



What it is

A waste storage facility that protects downstream water courses from manure runoff by storing manure until conditions are appropriate for field application.

The type of manure storage structure depends upon the livestock operation, animal waste management system and planned field application. Options include earthen storage ponds, above or below ground tanks, pits underneath a confinement facility, or a sheltered concrete slab area.

How it helps

- » Protects water quality by preventing runoff from livestock operations.
- » Cuts fertilizer costs and reduces nutrient losses.
- » Allows for field application when conditions are right.

Planning ahead

- » Is the structure planned for the proper location considering the landscape, potential odor problems, visibility, aesthetic value, and compatibility with existing farm buildings?
- » Will the structure store manure in a form which you have the equipment to handle?

- » Are there buffer zones of vegetation around the structure to filter any runoff and to improve appearance?
- » Is the structure the right size to handle the amount of manure produced by your livestock during the planned storage period?

Tech Notes

- » Storage period should be determined by the manure use schedule. Plan to empty at least twice a year.
- » If manure is stored as a solid, protect it from precipitation.
- » Divert runoff from land surrounding livestock facilities from storage structures.
- » Fence off structures for livestock and human safety.
- » Ramps built for handling equipment must meet safety standards.

Maintenance

- » Watch for any leaks or seepage and make repairs.
- » Repair any damaged fences immediately.
- » Refer to Iowa Conservation Practice Standard 313 Waste Storage Facility for additional Operation and Maintenance information.

LAND USES: 

What it is

Performing no full-width tillage from the time of harvest or termination of one cash crop to the time of the harvest or termination of the next cash crop in the rotation, regardless of the depth of the tillage operation.

How it helps

- » Crop residue prevents soil erosion, protects water quality, improves soil tilth, and adds organic matter to the soil as it decomposes.
- » When soil is left undisturbed microbial activity increases, helping to build soil structure and improve soil health.
- » No-till helps form root channels and other near-surface voids that increase water infiltration.
- » No-till helps sequester additional carbon in the soil.
- » No-till reduces particulate emissions, which improves air quality.
- » Fewer trips with no-till reduces soil compaction, requires less energy use, and saves money through fewer inputs.
- » No-till increases plant-available moisture.
- » No-till provides food and escape cover for wildlife.

Planning ahead

- » Will your crop produce enough residue?
- » Do you have the needed equipment?
- » Is no-till part of your planned system of conservation measures?

Tech Notes

- » Leave stubble taller than the 10-inch minimum to trap more snow and provide better protection to plants from freezing or dryness.
- » Perform all field operations on the contour to slow overland flow and to improve water infiltration.
- » Leave crop residue undisturbed after harvest to maximize the cover and food source benefits for wildlife and pollinators.
- » Control weeds with herbicide.
- » The annual STIR (Soil Tillage Intensity Rating) value for all soil disturbing activities should not be greater than 15 for no-till.

Maintenance

- » In areas of heavy residue accumulation due to movement from water or wind, spread the residue prior to planting to reduce plant operation interference.

LAND USES: CROP GRASS

What it is

Nutrient management means managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments. These steps reduce the potential for nutrients to go unused and wash or infiltrate into water supplies. Nutrient sources include animal manure, sludge, and commercial fertilizers.

How it helps

- » Improves crop production by budgeting, supplying, and conserving nutrients.
- » Reduces input costs.
- » Protects water quality by preventing over-application of commercial fertilizers and animal manure.
- » Properly utilizes manure, municipal and industrial biosolids, and other organic byproducts as plant nutrient sources.
- » Protects air quality by reducing odors, nitrogen emissions, and the formation of atmospheric particulates.
- » Maintains or improves the physical, chemical, and biological condition of soil.

Planning ahead

- » Have you tested nutrient levels of your soil and livestock manure?
- » Are organic wastes or sludge available for you to use?
- » Have you determined realistic yield goals?
- » Are proper soil conservation measures installed?
- » Have you accounted for nitrogen credits produced by legume crops?

Tech Notes

Follow the 4Rs of nutrient management:

- » Select the **Right nutrient source**, considering what the crop needs, costs, availability, method of delivery, and environmental risk.
- » Select the **Right rate** by using the Corn Nitrogen Rate Calculator to determine the recommended Maximum Return to Nitrogen Rate.
- » Select the **Right time** by synchronizing nutrient availability with crop demand and reduced environmental risk.
- » Select the **Right place** by keeping nutrients where the crop can get to them, where nutrients are least likely to leave the field, and efficiency is maximized.

Review the NRCS 590 Nutrient Management Standard for more information.

LAND USES:

CROP

GRASS

WILD



What it is

Pest management means evaluating and using a tailored system to reduce crop and environmental damages from insects, weeds and diseases.

Scouting helps determine the type of pests, stage of development, and damage to species targeted for protection. The potential damage is then weighed against the cost of control. If pest control is economical, then alternatives are evaluated based on cost, results and environmental impact.

How it helps

- » Scouting and spot treatment for only threatening pests can save money.
- » Water quality is improved when precautions are taken to keep chemicals from leaving the field due to leaching, runoff or drift.
- » Good pest management reduces over-application of chemicals used for control.

Planning ahead

- » Which soils on your farm are likely to leach pesticides or lose pesticides from surface runoff?
- » Did you consider all pest control alternatives, including mechanical, biological and chemical?
- » Did you use crop and pest control records for reference?

- » Did you rotate crops and herbicides to reduce the potential for pest resistance to develop?
- » How will your Pest Management Plan effect pollinators and beneficial insects?

Tech Notes

Following are guidelines for applying and mixing pesticides:

- » Complete a pesticide risk assessment of potential environmental damage from leaching or runoff. Consider this information when selecting a pesticide.
- » Wear protective clothing.
- » Mix and load pesticides in an area that won't contaminate waste supplies; prevent back siphoning.
- » Triple rinse containers before disposal. Burn paper bags.
- » Apply pesticides during periods of minimal potential for drift or runoff.
- » Use the lowest application rate practical and rotate pesticides.
- » Use spot treatment or banding, when possible, in areas of concentrated pest populations.
- » Use proper erosion control.

Maintenance

- » Continue scouting to best identify pests and control methods.
- » Keep records to track costs and chemical application.
- » Calibrate spray equipment.



LAND USES:

CROP

GRASS

WILD

FARM



What it is

A farm pond is a pool of water formed by a dam or pit. There are two types of ponds - embankment ponds, which are water impoundments made by constructing an embankment, and excavated ponds, which are formed by excavating a pit or dugout.

How it helps

- » Prevents soil erosion by eliminating gullies.
- » Protects water quality by collecting and storing runoff water.
- » Provides water for livestock, fish and wildlife, recreational opportunities, fire control, and to develop renewable energy systems.
- » Adds value and beauty to a farm or farmstead.
- » Provides a water supply for emergencies.

Planning ahead

- » Are adequate soil conservation measures installed above or upstream from the proposed pond site to protect it from filling with sediment?
- » Is there a dependable source of clean water to fill the pond?
- » Is the soil at the proposed site capable of holding water?
- » Will the pond store enough water for the proposed uses—i.e. livestock,

wildlife, emergency water supply?

- » Can you incorporate vegetative species that benefit pollinators?

Tech Notes

- » Provide for principal and emergency spillways.
- » If the pond will be stocked for fishing, the pool should have at least 1/2 acre of surface area and be at least 8 feet deep.
- » If livestock are present, fence the embankment.
- » The landowner should secure necessary permits and/or easements.
- » Divert runoff from feedlots, barnyards and septic tanks if the pond is used for drinking water, livestock, wildlife or recreation.
- » Clear all trees and shrubs within at least 30 feet of the dam's spillway and embankment.
- » Generally, for every surface acre of pond, there should be at least 10 acres of drainage area.

Maintenance

- » Keep outlet free of debris.
- » Keep burrowing animals, trees and shrubs off the dam.
- » Maintain grass cover on the dam.

Refer to Iowa NRCS Conservation Practice Standard 378 for more information about ponds.



LAND USES:

GRASS

WILD



What it is

Fire applied to manage grassland, forestland, pasture land, wildlife areas, or hayland within a prescribed set of conditions, dates, and with appropriate safety precautions to achieve a specific purpose.

How it helps

Prescribed burning helps:

- » control undesirable vegetation
- » prepare sites for harvesting, planting or seeding
- » control plant disease
- » reduce wildlife hazards
- » improve wildlife habitat
- » improve plant production quantity and/or quality
- » remove debris
- » enhance seed production
- » facilitate the distribution of grazing and browsing animals
- » restore and maintain ecological sites
- » manage native plant diversity/composition

Planning ahead

- » What time of year are you planning to burn? Burning should be managed with regard for wildlife needs, such as nesting, feeding and cover.

- » Notify adjoining landowners, local fire departments, and public safety officials as appropriate within the airshed prior to burning.

Tech Notes

- » Burn only to meet a specific management objective, generally once every 3-7 years.
- » It may be necessary to burn woody vegetation two or more consecutive years to control undesirable sprouting woody vegetation.
- » Use existing barriers, such as lakes, streams, wetlands, roads and constructed firebreaks in the burn.
- » Consider any known cultural resources and threatened or endangered plants and animals.
- » Smoke could have an impact on the surrounding area during and after the burn.
- » Weather conditions are generally more favorable for burning following the passage of a weather front. Good burning conditions are frequently most favorable 1-3 days following a rain.

Maintenance

- » Monitor the burned site and adjacent areas until ash, debris, and other consumed material is at pre-burn temperatures.

LAND USES: GRASS



What it is

Managing the harvest of vegetation with grazing and/or browsing animals.

This is often attained through a rotational or mob grazing system where pastures are divided into four or more pastures or paddocks with fencing. Cattle are moved from paddock to paddock on a prearranged schedule based on forage availability and livestock nutrition needs.

How it helps

Improves or maintains:

- » species composition and vigor of plant communities;
- » quantity and quality of forage for grazing and browsing animal health and productivity;
- » surface and subsurface water quality and quantity;
- » riparian and watershed functions;
- » quantity and quality of food and cover available for wildlife.

Prescribed grazing also helps to reduce erosion and improve profits.

Planning ahead

- » Have you developed a grazing plan that includes your goals and objectives?

Tech Notes

- » Take a resource inventory that identifies:
 - » existing plant health and quantity;
 - » opportunities to enhance plant conditions;
 - » paddocks, acres, and the location of structural improvements such as fences, water developments, etc. using a plan map; and
 - » ecological sites or forage suitability groups when available.
- » Take a forage inventory of the expected forage quality, quantity and species in each management unit.
- » Take a forage-animal balance (carrying capacity) for the grazing plan that identifies forage surpluses and deficiencies for the kind and class of grazing livestock, and browsing wildlife of concern.
- » Develop a contingency plan that adjusts the grazing prescription in case of flood, drought, insects, etc.

Maintenance

- » Monitor data and grazing records regularly to ensure objectives are met, or to make necessary changes.

LAND USES:

CROP

GRASS

WILD

FARM



What it is

A planned area of trees, shrubs, and grasses and forbs planted along a stream or river.

A common design includes three zones: an unmanaged woody zone nearest to the stream, a middle woody zone, and an outside zone of grasses that may include forbs.

How it helps

- » Reduces excess amounts of sediment, organic material, nutrients and pesticides in surface runoff, and reduces excess nutrients and other chemicals in shallow ground water flow.
- » Creates shade to lower water temperatures to improve habitat for aquatic organisms.
- » Improves riparian habitat and provides a source of large woody debris.
- » Reduces pesticide drift entering the water body.
- » Restores riparian plant communities.
- » Increases carbon storage in plant biomass and soils.
- » Provides habitat for upland wildlife and pollinators.

Planning ahead

- » Does the potential site have the sufficient width, length, vertical density and connectivity to accomplish the intended purposes?

- » Can you incorporate species that benefit wildlife and pollinators?

Tech Notes

- » The buffer must be wide enough to achieve the purpose and at least 40 feet measured horizontally on a line perpendicular to the water body beginning at the normal water line.
- » Use locally grown native species.
- » Four or more plant species will be used suited to the seasonal variation of the site's moisture status. No single species will make up more than 25 percent of the total number of species planted.
- » Livestock need to be controlled or excluded to achieve the intended purpose.
- » For more detailed technical notes, refer to the Iowa NRCS Conservation Practice Standard 391.

Maintenance

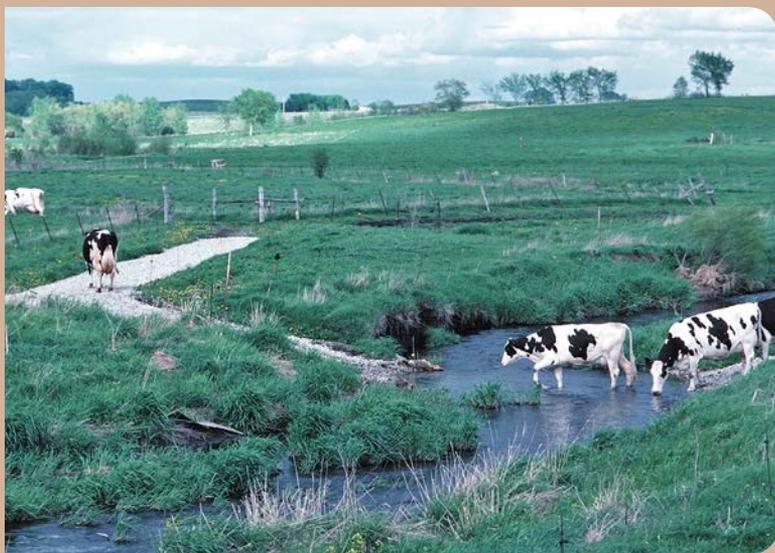
- » Control harmful plant and animal pests as necessary.
- » Protect from adverse impacts such as excessive vehicular and pedestrian traffic, pest infestations, concentrated flows, pesticides, livestock, or wildlife damage and fire.
- » Until the buffer is fully functional, replace dead trees or shrubs and control undesirable vegetation.



LAND USES:

CROP

GRASS



What it is

A stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles.

How it helps

- » Provides access to another land unit.
- » Improves water quality by reducing sediment, nutrient, organic, and inorganic loading to the stream.
- » Reduces stream bank and stream bed erosion.

Planning ahead

- » Is there a safe, stable location along the stream bed for a crossing?

Tech Notes

- » Locate the stream crossing in an area where the stream bed is stable or where it can be stabilized.
- » Discourage livestock loafing in the stream by locating crossings out of shady riparian areas, or by including gates in the design.
- » Install stream crossings perpendicular to the direction of stream flow.
- » Provide a way for normal passage of water, fish and other aquatic animals within the channel during all seasons of the year.

- » Provide an adequate travel-way width for the intended use.
- » Livestock-only crossings should be no less than 6 feet wide and no more than 30 feet wide.
- » A multi-use stream crossing should be no less than 10 feet wide.
- » Make all side slope cuts and fills stable for the channel materials involved.
- » Blend approaches to the crossing with existing site conditions, where possible.
- » All rock must be able to withstand exposure to air, water, freezing, and thawing. Use rock of sufficient size and density to resist mobilization by design flood flows.
- » Plant all areas to be vegetated as soon as practical after construction.

Maintenance

Develop an operation and maintenance plan for the life of the practice that includes:

- » inspecting the crossing after each major storm event and make repairs as needed;
- » removing accumulations of organic material, woody material, or excess sediment; and
- » replacing surfacing stone used for livestock crossings as needed.



LAND USES:

CROP

GRASS

WILD

FARM



What it is

Grass, rip rap, or other treatment used to stabilize and protect stream banks from erosion.

How it helps

- » Prevents the loss or damage to land uses or facilities adjacent to stream banks.
- » Helps maintain stream flow capacity.
- » Reduces off site and downstream effects of sediment resulting from bank erosion.
- » Improves and enhances the stream corridor for fish and wildlife habitat, aesthetics, and recreation.

Planning ahead

- » Are proper soil conservation measures installed in the watershed to prevent siltation of buffer zones and stream bed?
- » Will a stream crossing be needed for livestock?

Tech Notes

- » Fence livestock out of the stream.
- » Smooth stream banks to provide an adequate seedbed for vegetation.
- » The vegetation area along stream banks should be between 15 and 25 feet wide.

- » Remove fallen trees, stumps and debris that might cause turbulence in the stream.
- » Remove trees and brush that adversely affect the growth of desirable bank vegetation.
- » Avoid adversely impacting threatened and endangered species and their habitats.
- » Select vegetation best suited for site conditions and achieves the intended purpose.
- » Allow stream flow to access the floodplain.

Maintenance

- » Avoid damaging the buffer zone with herbicides from surrounding cropland.
- » Remove off-stream watering systems in the winter, and reinstall in the spring.
- » Periodically inspect and promptly repair or replace damaged components or erosion.

LAND USES: CROP

What it is

A terrace is an earthen embankment constructed across a field slope. They break long slopes into shorter ones – usually following the contour.

There are two basic types of terraces—storage terraces and gradient terraces. Storage terraces collect water and store it until it can infiltrate into the ground or release through a stable outlet.

Gradient terraces are designed as a channel to slow runoff water and carry it to a stable outlet.

How it helps

- » Help reduce erosion by reducing slope length.
- » Retain runoff for moisture conservation.
- » Provide nesting habitat.

Planning ahead

- » Will other conservation practices be used in conjunction with terraces to prevent sedimentation in the terrace channel?
- » Are soils and topography such that terraces can be constructed and reasonably farmed?

Tech Notes

- » Grassed backslope terraces have a farmable frontslope with a 2:1

backslope (2 feet horizontal to every 1 foot of vertical drop).

- » Narrow base terraces have 2:1 slopes on both the frontslope and backslope.
- » Broadbase terraces should not be built on slopes greater than 6%. Farmable slopes should not be steeper than 5:1.
- » Steep front, farmable backslope terraces should not be built on slopes greater than 6%. The front slope should be built with a 2:1 slope and the backslope should not be steeper than 5:1.
- » Terraces are designed to control runoff from a 10-year storm.

Maintenance

- » Periodically inspect the terrace, especially following significant rain events.
- » Promptly repair or replace damaged terrace components.
- » Maintain terrace ridge height, channel profile, cross-section and outlet.
- » Remove accumulated sediment in the terrace channel to maintain grade and capacity.
- » Regularly clean inlets for underground outlets. Repair or replace inlets damaged by farm equipment. Remove sediment around inlets to ensure they remain the lowest spot in the terrace channel.
- » Control rodents, trees and brush.

LAND USES:

GRASS

WILD

FARM



What it is

Establishing woody plants in non-forested areas by planting seedlings, container/potted plants, cuttings or by direct seeding.

How it helps

- » Woody plants can be established for forest products.
- » Provide erosion control.
- » Produce woody biomass for energy.
- » Improve energy conservation and beautification.
- » Improve water quality through uptake of soil and water borne chemicals and nutrients.
- » Beautify an area (aesthetics).
- » Protect a watershed.
- » Improve air quality.
- » Provide wildlife habitat.
- » Control snow drifting.
- » Store carbon in biomass.

Planning ahead

- » What is the goal of your tree/shrub planting?
- » Will plantings be protected from wildlife damage?
- » Will you need access lanes?
- » Will pesticide drift from cropland adversely affect plants?

Tech Notes

- » Follow state and local regulations for locating plants adjacent to roadways; avoid creating blind corners and intersections.
- » Choose species adapted to soil-site conditions.
- » Planting date and care in handling should ensure an acceptable rate of survival.
- » Only use viable, high quality and adapted planting stock or seed.
- » Prepare planting site to establish and grow selected species.
- » Choose the planting method appropriate for existing site conditions and species capabilities.
- » Timing and equipment should be appropriate for the site and soil conditions.
- » Keep the planting protected from adverse impacts such as livestock and wildlife damage and fire.

Maintenance

- » Control competing vegetation until the wood plants are established.
- » Check for insect and disease damage regularly.
- » Maintain firebreaks around all plantings, as needed.
- » Replant as needed.
- » The use of irrigation, mulching, geo-textile mats, tree shelters, and tree shades may be needed.

LAND USES: WILD

What it is

Planting and managing trees, shrubs and other vegetation that provide cover and food to attract wildlife to an area.

How it helps

- » Planned wildlife habitat provides food and cover for wildlife.
- » Ground cover helps reduce soil erosion, adds organic matter to the soil, filters runoff and increases infiltration.
- » It can add value to your farmstead.

Planning ahead

- » Will your planned habitat attract the type of wildlife you want?
- » Is a particular piece of land better suited for upland habitat than for livestock or crops?
- » Do you plan to allow hunting?
- » Are there threatened or endangered species in your area you could help protect?
- » How close do you want the habitat area to be to your farmstead?

Tech Notes

- » Plant the wildlife area with a vegetative cover of grass, trees or shrubs.
- » Use native plants wherever possible.
- » To attract a specific wildlife species, choose cover and habitat for that species.
- » Create a diverse habitat to attract a wider variety of wildlife.
- » Consult the local DNR wildlife biologist for the recommended wildlife populations for the upland habitat area planned for your farm.
- » Encourage shrub growth between woodlands and grasslands.
- » Include bird houses and feeding stations in habitat areas.
- » Include milkweed for pollinator habitat.

Maintenance

- » Annually inspect and repair structural or vegetative components.
- » Prescribed burning may be necessary to regenerate growth and eliminate undesirable species.
- » Use weed management to maintain desirable plant and animal species.
- » Re-plant vegetation and trees if habitat area is damaged by disease or poor weather.



LAND USES:

CROP

GRASS



What it is

An earth embankment or a combination ridge and channel constructed across the slope of minor watercourses to form a sediment trap and water detention basin with a stable outlet.

How it helps

- » Basins help improve water quality by trapping sediment on uplands, preventing it from reaching downstream water bodies.
- » Structures reduce gully erosion by controlling water flow within a drainage area.
- » Basins reduce and manage on-site and downstream runoff.
- » Grass cover may provide habitat for wildlife.

Planning ahead

- » Is the site too steep for the basin to work properly or be economically feasible?
- » Will the basin be part of an existing terrace system?
- » Is sheet and rill erosion controlled by another conservation practice?
- » Can adequate outlets be provided?

Tech Notes

- » The uncontrolled area draining into the basin must not exceed 50 acres.
- » Build the basin large enough to control runoff from a 10-year storm without overtopping.
- » Install an outlet that will convey water to a point where it will not cause damage.
- » Use fill material free of sod, roots, frozen materials, and stone larger than six inches in diameter. It should also have correct moisture content for adequate compaction.
- » Spacing for water and sediment control basins depends on the land slope, tillage and management system.

Maintenance

- » Reseed and fertilize as needed to maintain vegetative cover.
- » Check the basin after each large storm and make any needed repairs.
- » Inspect the outlet to ensure it is not damaged or plugged. Repair any damaged parts and remove trash buildup around the inlet.

LAND USES: GRASS



What it is

A permanent or portable tank or trough to provide an adequate amount and quality of drinking water for livestock and or wildlife.

How it helps

- » Provide access to drinking water for livestock and wildlife to meet daily water requirements.
- » Access to water helps improve livestock distribution to pastures.
- » Providing easily accessible water to meet daily livestock needs keeps livestock healthier.
- » Portable tanks prevent livestock from creating trails to watering facilities. This helps reduce compaction and soil erosion, and keeps pastures in better shape.

Planning ahead

- » Is there access to a water source, such as a well or pond?
- » How many animals do you plan to have access to the water?

Tech Notes

- » Design the watering facility to meet the daily livestock water requirements.
- » Locate water facilities to promote even grazing distribution and reduce grazing pressure on sensitive areas.
- » Install permanent watering facilities on a firm, level foundation that will not settle, such as bedrock or compacted gravel or soil.
- » Design to prevent overturning by wind or animals.
- » Design to withstand damage by livestock, wildlife, freezing, and ice damage.
- » Use durable materials with a life expectancy to meet or exceed the planned useful life of the installation.

Maintenance

- » Keep the watering tank or trough clear of debris, algae and sludge.
- » Check for leaks.
- » Check for erosion in area adjacent to the tank or trough.

LAND USES:

WILD

FARM



What it is

A marshy area with saturated soils and water-loving plants. Natural wetlands—swamps, bogs, sloughs, potholes and marshes—vary in size, shape and type. Sloughs, potholes and marshes in low-lying areas are most common in Iowa.

A wetland may have standing water year-round or may hold surface water for only part of the year.

Through NRCS assistance, wetlands can be created, enhanced or restored. In most cases the land must be suitable for wetland and wildlife benefits.

How it helps

- » Provide habitat for pollinators, fish and wildlife, including threatened and endangered species.
- » Improve water quality by filtering sediments and chemicals.
- » Reduce soil erosion and downstream flooding.
- » Recharge groundwater supplies.
- » Protect biological diversity.
- » Provide opportunities for educational, scientific and recreational opportunities.
- » Generate farm income through programs that offer financial incentives for restoring wetlands.

Planning ahead

- » Are the soils, hydrology, vegetative conditions, and adjacent landscape conducive to wetlands?
- » Will there be any adverse effects on adjacent landowners?
- » What type of vegetation do you want in your wetland?
- » What wildlife do you want to attract to your wetland?
- » Consider providing vegetation, such as milkweed, to encourage pollinators.

Tech Notes

Four categories of wetlands are found in Iowa:

- » **Fens** - perched wetlands that form in upland areas. They are fed by cool, mineral rich, oxygen poor groundwater. This promotes the formation of a peat soil that may be many feet thick, often floating on a bed of water.
- » **Forested Wetlands** - dominated by trees and shrubs, such as cottonwood, willow, ash, elm and sycamore that tolerate wet soils.
- » **Emergent Wetlands** - dominated by plants adapted to grow in water, such as cattail, arrowhead and bulrushes.
- » **Wet Meadows** - created and maintained by periodic inundation of low-lying areas and by soils that are temporarily to seasonally saturated.

LAND USES:

CROP

GRASS

WILD

FARM



What it is

Single or multiple rows of trees and shrubs in linear configurations that protect areas from wind.

How it helps

- » A windbreak reduces wind erosion, conserves energy, reduces heating bills, and beautifies a farmstead.
- » Trees serve as a sound barrier and muffle road noise.
- » Trees and shrubs provide food and shelter for wildlife and pollinators.
- » Improved livestock weight gains can be expected when livestock are protected from winter winds and snow.
- » Windbreaks can protect crops and plants from wind-related damage.
- » Windbreaks can serve as a natural snow fence.
- » They provide air quality improvement by reducing and intercepting air borne particulate matter, chemicals and odor.
- » Windbreaks help delineate property and field boundaries.
- » Improved irrigation efficiency.
- » Trees can increase carbon storage in biomass and soils.

Planning ahead

- » Have you planned enough space for summer air circulation, travel lanes or gardens?
- » Will a mature windbreak cast a shadow over the driveway or nearby road, prolonging icy conditions?
- » Will trees in the windbreak attract the desired wildlife species?
- » Will the position of a mature windbreak cause a visibility hazard for drivers or dump snow where it's not wanted?

Tech Notes

- » Plant trees according to spacing recommendations for the species, and protect from livestock grazing and fire.
- » Species must be suitable and adapted to the soils, climate, and purpose.
- » The location, layout, and density of the planting should accomplish the purpose and function intended within a 20-year period.
- » The planting should be done when survival and growth are ensured.

Maintenance

- » Control competing vegetation.
- » Replace dead trees and shrubs as necessary to maintain function.
- » Provide water as needed.



CHALLENGES AHEAD

The world's population will grow to an estimated 9 billion people by the year 2050. This means more food will need to be grown in the next 40 years as has been grown in the previous 500.

This population increase places tremendous pressure on farmers to produce enough food to feed the world. At the same time, we face the impacts of climate change, weather extremes, the continual loss of prime farmland, and the need to reduce use of finite resources.

The daunting challenge for farmers to produce more crops, however, does not have to come at the expense of our natural resources.

Through conservation planning and financial assistance, local, state and federal agencies are available to help farmers protect their natural resources.

Consider this book as another tool to help you meet the conservation and environmental challenges ahead. Select practices that will help balance the needs of the environment with your own economic needs and the needs of the hundreds of people you help feed every year.

Use the human resources available to you as well. Technical staff from federal and state agencies, as well as agribusiness specialists and private consultants, will help you protect your land and water.

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