Best Management Practice List (Alphabetical)

BMP Code	Description	Unit
472	Access Control	AC
560	Access Road	FT
309	Agrichemical Handling Facility	NO
591	Amendments for Treatment of Agriculture	AU
366	Anaerobic Digester, Controlled Temperature	NO
316	Animal Mortality Facility	NO
350AA	Basin for Dredged Material	AC
314	Brush Management	AC
360	Closure of Waste Impoundments	NO
103a	CNMP Implemented	AC
102	CNMP Written	AC
317	Composting Facility	NO
327	Conservation Cover	AC
328	Conservation Crop Rotation	AC
332	Contour Buffer Strips	AC
330	Contour Farming	AC
331	Contour Orchard	AC
340	Cover Crop - Winter	AC
342	Critical Area Planting	AC
318	Dead Bird Composting Facility	NO
362	Diversion	FT
432	Dry Hydrant	EA
647	Early Successful Habitat Development	AC
592	Feed Management	AU
382	Fencing	FT
386	Field Border	FT
392	Field Windbreak	FT
393	Filter Strip	AC
394	Firebreak	FT
396	Fish Passage	MI
399	Fishpond Management	NO
511	Forest Harvest Management	AC
666	Forest Stand Improvement	AC
410	Grade Stabilization Structure	NO
412	Grassed Waterway	AC
561	Heavy Use Area Protection	AC
422	Hedgerow Planting	FT
441	Irrigation System, Microirrigation	AC
442	Irrigation System, Sprinkler	AC
447	Irrigation System, Tailwater Recover	NO
430DD	Irrigation Water Conveyance, High- Pr	FT
449	Irrigation Water Management	AC
468	Lined Waterway or Outlet	FT
634	Manure Transfer	NO
101	Manure Transport	TN
103	Manure Transport	TN
329	No-Till (See Residue and Tillage Management, No-Till)	AC
590	Nutrient Management	AC
512	Pasture & Hay Planting	AC

Best Management Practice List (Alphabetical)

BMP Code	Description	Unit
595	Pest Management	AC
516	Pipeline	FT
521C	Pond Sealing or Lining, Bentonite TR	NO
521D	Pond Sealing or Lining, Compacted CL	NO
521A	Pond Sealing or Lining, Flexible Mem	NO
521B	Pond Sealing or Lining, Soil Dispers	NO
409	Prescribed Forestry	AC
528	Prescribed Grazing	AC
345	Residue and Tillage Management, Mulch	AC
329	Residue and Tillage Management, No-Till	AC
344	Residue Management, Seasonal	AC
643	Restoration and Management of Rare o	AC
391	Riparian Forest Buffer	AC
390	Riparian Herbaceous Cover	AC
558	Roof Runoff Structure	NO
350	Sediment Basin	NO
378	Sediment Control Pond	NO
646	Shallow Water Development and Management	AC
527	Sinkhole and Sinkhole Area Treatment	NO
632	Solid/ Liquid Water Separation Facility	NO
574	Spring Development	NO
728	Stream Crossing	NO
395	Stream Habitat Improvement and Management	AC
580	Streambank and Shoreline Protection	FT
585	Strip Cropping, Contour	AC
586	Strip Cropping, Field	AC
589	Strip Cropping, Wind	AC
606	Subsurface Drain	FT
607	Surface Drainage, Field Ditch	FT
608	Surface Drainage, Main or Lateral	FT
600	Terrace System	FT
789	Transition to Organic Production	AC
612	Tree/ Shrub Establishment	AC
620	Underground Outlet	FT
645	Upland Wildlife Habitat Management	AC
425	Waste Storage Pond	NO
313	Waste Storage Structure	NO
359	Waste Treatment Lagoon	NO
633	Waste Utilization	AC
635	Wastewater Treatment Strip	AC
638	Water and Sediment Control Basins (W	NO
587	Water Control Structure	NO
642	Water Well	NO
614	Watering Facility	NO
658	Wetland Creation	AC
657	Wetland Restoration	AC
644	Wetland Wildlife Habitat Management	AC
650	Windbreak Renovation	FT
380	Windbreak/ Shelterbelt Establishment	FT

Best Management Practice List (Numerical)

BMP Code	Description	Unit
101	Manure Transport	TN
102	CNMP Written	AC
103a	CNMP Implemented	AC
103	Manure Transport	TN
309	Agrichemical Handling Facility	NO
313	Waste Storage Structure	NO
314	Brush Management	AC
316	Animal Mortality Facility	NO
317	Composting Facility	NO
318	Dead Bird Composting Facility	NO
327	Conservation Cover	AC
328	Conservation Crop Rotation	AC
329	No-Till / Residue and Tillage Management, No-Till	AC
330	Contour Farming	AC
331	Contour Orchard	AC
332	Contour Buffer Strips	AC
340	Cover Crop - Winter	AC
342	Critical Area Planting	AC
344	Residue Management, Seasonal	AC
345	Residue and Tillage Management, Mulch	AC
350	Sediment Basin	NO
350AA	Basin for Dredged Material	AC
359	Waste Treatment Lagoon	NO
360	Closure of Waste Impoundments	NO
362	Diversion	FT
366	Anaerobic Digester, Controlled Temperature	NO
378	Sediment Control Pond	NO
380	Windbreak/ Shelterbelt Establishment	FT
382	Fencing	FT
386	Field Border	FT
390	Riparian Herbaceous Cover	AC
391	Riparian Forest Buffer	AC
392	Field Windbreak	FT
393	Filter Strip	AC
394	Firebreak	FT
395	Stream Habitat Improvement and Management	AC
396	Fish Passage	MI
399	Fishpond Management	NO
409	Prescribed Forestry	AC
410	Grade Stabilization Structure	NO
412	Grassed Waterway	AC
422	Hedgerow Planting	FT
425	Waste Storage Pond	NO
430DD	Irrigation Water Conveyance, High- Pressure	FT
432	Dry Hydrant	EA
441	Irrigation System, Microirrigation	AC
442	Irrigation System, Sprinkler	AC
447	Irrigation System, Tailwater Recovery	NO
449	Irrigation Water Management	AC

Best Management Practice List (Numerical)

BMP Code	Description	Unit
468	Lined Waterway or Outlet	FT
472	Access Control	AC
511	Forest Harvest Management	AC
512	Pasture & Hay Planting	AC
516	Pipeline	FT
521A	Pond Sealing or Lining, Flexible Membrane	NO
521B	Pond Sealing or Lining, Soil Dispersant	NO
521C	Pond Sealing or Lining, Bentonite Treatment	NO
521D	Pond Sealing or Lining, Compacted Clay Treatment	NO
527	Sinkhole and Sinkhole Area Treatment	NO
528	Prescribed Grazing	AC
558	Roof Runoff Structure	NO
560	Access Road	FT
561	Heavy Use Area Protection	AC
574	Spring Development	NO
580	Streambank and Shoreline Protection	FT
585	Strip Cropping, Contour	AC
586	Strip Cropping, Field	AC
587	Water Control Structure	NO
589	Strip Cropping, Wind	AC
590	Nutrient Management	AC
591	Amendments for Treatment of Agriculture	AU
592	Feed Management	AU
595	Pest Management	AC
600	Terrace System	FT
606	Subsurface Drain	FT
607	Surface Drainage, Field Ditch	FT
608	Surface Drainage, Main or Lateral	FT
612	Tree/ Shrub Establishment	AC
614	Watering Facility	NO
620	Underground Outlet	FT
632	Solid/ Liquid Water Separation Facility	NO
633	Waste Utilization	AC
634	Manure Transfer	NO
635	Wastewater Treatment Strip	AC
638	Water and Sediment Control Basins (W	NO
642	Water Well	NO
643	Restoration and Management of Rare o	AC
644	Wetland Wildlife Habitat Management	AC
645	Upland Wildlife Habitat Management	AC
646	Shallow Water Development and Management	AC
647	Early Successful Habitat Development	AC
650	Windbreak Renovation	FT
657	Wetland Restoration	AC
658	Wetland Creation	AC
666	Forest Stand Improvement	AC
728	Stream Crossing	NO
789	Transition to Organic Production	AC

Howard County TMDL Most Common Practices

Below are the practices that are found most commonly in the county. If you are going to learn practice standards, learn these first:

Access Road- 560-Ft

Conservation Cover-327-Ac.

Conservation Crop Rotation-328-Ac.

Cover Crop-Winter-340-Ac.

Critical Area Planting-342-Ac.

Diversions-362-Ft.

Fencing (stream, livestock)-382-Ft.

Field Border-386-Ft.

Filter Strip-393-Ac.

Grassed Waterway-412-Ac.

Grade Stabilization Structure-410-No.

Heavy Use Area Protection-561-Ac.

No-Till-329-Ac.

Nutrient Mgt.-590-Ac.

Prescribed Grazing-528-Ac.

Residue Mgt., seasonal-344-Ac.

Riparian Forest Buffers-391-Ac

Riparian Herbaceous Cover-390-Ac.

Roof Runoff Structure-558-No.

Spring Development-574-No.

Stream Crossing-728-No.

Strip Cropping, Field-586-Ac.

Subsurface Drain-606-Ft.

Surface Drainage Main or Lateral-608-Ft.

Transition to Organic Production-789-Ac.

Tree/Shrub Establishment-612-Ac.

Underground Outlet-620-Ft

Waste Storage Structure-311-No.

Waste Storage Pond-425-No.

Waste Utilization-633-Ac.

Water Facility-614-No.

ACCESS ROAD

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 560

DEFINITION

An access road is a travelway included in a conservation plan to provide a safe, fixed route of travel for moving livestock, equipment, products and supplies. The practice applies to roads that provide access for proper management of the enterprise, including operation and maintenance of conservation practices. The roads also provide access to farms, ranches, specific fields, woodlands, recreation areas and various kinds of structures.

PRACTICE INFORMATION

This practice is planned when access is needed from a private or public road to and within a conservation enterprise. Access roads are designed to serve a specific purpose(s) and accommodate a specific type(s) of vehicle, or equipment. Visual resources and environmental values shall be considered in planning and designing the road or system of roads. Access roads range from seldom used trails constructed for fire protection to all-weather roads used by the public and built to very high standards. Where general public use is anticipated, roads are designed to meet applicable criteria established by appropriate national, state or local agencies.

Roads are planned and designed to assure maintenance requirements are in line with operating budgets of the enterprise. In addition to planning for the intended use, the following criteria is considered:

1. Control and disposal of water
2. Erosion control
3. Include scenic vistas when possible
4. Follow natural contours when possible
5. Consider pollution hazards
6. Road surface treatment in line with use
7. Safe entry on public roads

CONSERVATION COVER

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 327

DEFINITION

This practice involves establishing and maintaining a protective cover of perennial vegetation on land retired from agriculture production.

PRACTICE INFORMATION

This practice reduces soil erosion, associated sedimentation, improves water quality, and creates or enhances wildlife habitat.

Conservation cover applies to land retired from agriculture production. Generally, this involves land under contract in a land retirement program but does not exclude land retired for other reasons. The practice does not apply to planting vegetation for forage production or on critical eroding sites being protected with vegetative cover.

In selecting plant species for this practice, it is important to consider long tern land use objectives. If wildlife is a consideration, adapted species are usually available that can serve more than one objective .

CONSERVATION CROP ROTATION
PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 632

DEFINITION
This practice means growing various crops on the same piece of land in a planned sequence. This sequence may involve growing high residue producing crops such as corn or wheat in rotation with low residue producing crops such as vegetables or soybeans. The rotation may also involve growing forage crops in rotation with various field crops.

PRACTICE INFORMATION
The effects crop rotation have on the land varies with the soil type, crops produced, farming operations, and how the crop residue in managed. The most effective crops for soil improvement are fibrous rooted high residue producing crops such as grass and small grain.

Perennial plants used for forage are very effective in crop rotations due to increases in organic matter and reduced soil erosion. In addition, crop rotations help break insect, disease and weed cycles.

Rotations add diversity to farm operations and often reduce economic and environmental risks. Crop rotation is a low cost practice that often forms the basis for other conservation practices. Practices such as residue management, contouring, stripcropping, diversions, terraces and grassed waterways may not function properly without a planned crop rotation. Major benefits include:

1. Reduced runoff and erosion
2. Increased organic matter
3. Improved soil tilth
4. Reduced pests
5. Fewer chemicals needed
6. Better moisture efficiency
7. Higher yields
8. Improved aesthetics and wildlife habitat

COVER CROP

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 340

DEFINITION

This practice is growing a crop of grass, small grain or legumes primarily for seasonal protection and soil improvement.

PRACTICE INFORMATION

Cover and green manure crops are grown on cropland, orchards, vineyards, and certain recreation and wildlife areas where seasonal benefits of a cover crop are needed. These crops are usually plowed under or desiccated to accommodate the primary crop being produced on the site.

This practice may be applied for one or more of the following purposes:

1. To reduce erosion from wind and water;
2. To capture and recycle excess nutrients in the soil profile;
3. To promote biological nitrogen fixation;
4. To increase soil organic matter;
5. To minimize and reduce soil compaction;
6. To increase biodiversity;
7. To suppress weeds;
8. To provide supplemental forage;
9. To manage soil moisture;
10. To reduce particulate emissions into the atmosphere.

In orchards, this practice is also used to increase populations of bees for pollination purposes.

In addition, cover and green manure crops have beneficial effects on water quantity and quality. Cover crops have a filtering effect on movement of sediment, pathogens, and dissolved and sediment-attached pollutants.

This practice applies on all lands requiring vegetative cover for natural resource protection and/or improvement.

It is most often applied on cropland, especially on sloping land to protect the soil surface during the winter following a low residue crop, or as part of a nutrient management plan where a cover crop is used to immobilize or remove excess nutrients in the soil.

CRITICAL AREA PLANTING

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 342

DEFINITION

Planting vegetation on critically eroding areas that require extraordinary treatment

PRACTICE INFORMATION

This practice is used on highly erodible areas that cannot be stabilized by ordinary planting techniques and if left untreated may cause severe erosion or sediment damage. Examples of critical areas include the following:

1. Dams, dikes, levees, and other construction sites with very steep slopes.
2. Mine spoil and surface mined land with poor quality soil and possibly chemical problems.
3. Agriculture land with severe gullies requiring specialized planting techniques and management.

Erosion control is the primary consideration for plant material selection. However, a broad choice of grass, trees, shrubs, and vines are usually available and adapted for most sites. Wildlife and beautification are additional considerations that influence planning decisions on a site needing this practice.

The following decisions must be made when planning this practice:

1. Function or use of the site following establishment.
2. Species of plants to establish
3. Methods and rates of planting
4. Fertilizer, lime, and soil amendments necessary for establishment and growth of the plants.
5. Mulching requirements
6. Planting site preparation
7. Irrigation requirement
8. Site management following establishment of the vegetation.

DESIGN HIGHLIGHTS

Verify that the width of the critical area planting is such that the runoff from the field is addressed and no further erosion has occurred. Check for erosion along the outer sides of the critical area planting.

DIVERSION

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 362

DIVERSION

A channel constructed across the slope with a supporting ridge on the lower side.

PRACTICE INFORMATION

This practice applies to all types of diversions except floodwater diversions (400) and diversion dams (348). The general purpose of this type of diversion is to divert excess water from one area for use or safe disposal in other areas.

This practice applies to sites where:

1. Runoff damages cropland, grazing land, farmsteads, feedlots, or conservation practices such as terraces or stripcropping.
2. Surface flow and/or shallow subsurface flow caused by seepage is causing damage on sloping cropland.
3. Runoff is excessive and available for use on nearby sites.
4. A diversion is required as part of a pollution abatement system.
5. A diversion is required to control erosion and runoff on urban or developing areas and construction or mining sites.

The channel may be parabolic, V-shaped, or trapezoidal. The channel grades may be uniform or variable as long as the velocity is nonerosive considering the soil and planned vegetation or lining. The location of the diversion shall be determined by outlet conditions, topography, land use, farming operations, and soil type. Diversion layout in a cultivated field should be as compatible as practical with modern farm equipment.

Diversions must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, paved area, vegetated area, a grade stabilization structure, a stable watercourse, underground outlet, or a combination of these structures. The outlet must be able to convey the runoff to a point where outflow will not cause damage.

If the outlet is a vegetated area, the vegetation must be established before constructing the diversion.

Additional information including design criteria and specifications are on file in the local NRCS Field Office Technical Guide.

DESIGN HIGHLIGHTS

Each diversion must have an adequate, stable outlet. The outlet may be a grassed, stone center or lined waterway; a vegetated or paved area; a grade stabilization structure; a storm sewer; a stable watercourse; an underground outlet; a sediment basin, or a combination of these practices.

The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes. The ridge shall have a minimum top width of 4 feet at the design elevation.

FENCE

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 382

DEFINITION

A fence is a constructed barrier to livestock, wildlife, or people.

PRACTICE INFORMATION

This practice may be applied to any area where livestock and /or wildlife control is needed, or where access to people is to be regulated.

A wide variety of types of fencing has developed. However, fencing material and construction quality is always designed and installed to assure the fence will meet the intended purpose and longevity requirements of the project.

The standard fence is constructed of either barbed or smooth wire suspended by posts with support structures. Other types include woven wire for small animals, electric fence as a cost efficient alternative, and suspension fences which are designed with heavy but widely spaced posts and support structures. Designs for most types of fences are available at the local NRCS field office.

Things to consider when planning a fence include the following:

1. For ease of maintenance purposes avoid as much irregular terrain as possible.
2. Wildlife movement needs should be considered.
3. State and local laws may apply to boundary fences.
4. Consider livestock handling, watering and feeding requirements when locating fences
5. Consider soil erosion potential and feasibility of fence construction when planning fences on steep or irregular terrain.

DESIGN HIGHLIGHTS

See attached NRCS Practice Standard Table 1 and Table 8

TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing [1/]

Type of Livestock	Type of Fence				
	Non-Electric High Tensile Smooth Wire	**Woven Wire**	**Barbed Wire**	**Wooden Board**	**Electric High Tensile Smooth Wire**
Horses and Foals	Minimum of 6 strands - spaced at 10, 20, 30, 40, 50, and 60 inches above the ground. To increase visibility of the fence, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.	Minimum of 48 inches high - 5 horizontal wires woven, plus at least one additional electrified smooth wire at the top. Alternatively, a wooden rail (board) plus an electrified smooth wire may be added at the top of the woven wire to prevent horses from stretching the fence.	Not recommended.	Minimum of 3 and a maximum of 4 boards. Boards spaced on 16-inch centers; bottom board at approximately 16 inches above the ground. 3-board fence - top board at 48 inches above the ground 4-board fence – top board at 64 inches above the ground.	Horses only (no foals) - Minimum of 3 strands - spaced at 30, 40 and 50 inches above the ground. With Foals - Minimum of 5 strands - spaced at 10, 20, 30, 40, and 50 inches above the ground. To increase fence visibility, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.
Beef – Steers, Cows and Calves	Minimum of 6 strands - spaced at 10, 18, 26, 36, and 46 inches above the ground.	Minimum of 48 inches high - 5 horizontal wires woven, plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 3 strands - spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.	Minimum of 3 and a maximum of 4 boards. Boards spaced on 16-inch centers; bottom board at approximately 16 inches above the ground. 3-board fence - top board at 48 inches above the ground. 4-board fence – top board at 64 inches above the ground.	Minimum of 3 strands (all electrified) – spaced at 18, 30, and 42 inches above the ground. Or a minimum of 4 strands (only 2 electrified) - spaced at 10, 22, 34, and 46 inches above the ground.
Dairy Cows and Heifers	Minimum of 6 strands - spaced at 10, 18, 26, 36, and 46 inches above the ground.	Minimum of 48 inches high 5 horizontal wires woven plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 3 strands - spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.	Minimum of 3 and a maximum of 4 boards. Boards spaced on 16-inch centers; bottom board at approximately 16 inches above the ground. 3-board fence - top board at 48 inches above the ground 4-board fence – top board at 64 inches above the ground	Dairy Cows only - Minimum 2 strands (2 electrified), spaced at 20 and 34 inches above the ground. With Heifers – Minimum of 3 strands (2 electrified), spaced at 18, 30, and 42 inches above the ground.

TABLE 2: Non-Critical Confinement/Exclusion Livestock Fence: Recommendations for the Number of Strands and Spacing (Electric Fence)	
Type of Livestock	**Recommended Number of Strands and Spacing 1/**
Mature Horses	Minimum of 1 strand – spaced at 28 to 34 inches above the ground.
Horses and Foals	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground.
Cows and Calves	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground.
Mature Beef and Dairy Cattle	Minimum of 1 strand – spaced at 28 to 34 inches above the ground. For hard to hold animals, use: Minimum of 3 strands – spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.
Goats and Kids	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. For kids, an additional wire may be needed and the bottom wire should be set at 10 inches above the ground.
Sheep and Lambs	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. Minimum of 3 strands for lambs – spaced at 8, 20 and 32 inches above the ground.
Hogs	Minimum of 2 strands – spaced at 10 inches and 18 inches above the ground for sows and growing-finishing pigs, or spaced at 6 inches and 18 inches above the ground for nursing pigs.

TABLE 2 NOTE:

1/ Electric fence materials for non-critical confinement may consist of high tensile smooth wire, electroplastic twine (polywire), electrified ribbon, or other materials as specified by the manufacturer. Based on the type of livestock, use the information in this table as a guide to determine the number of strands and spacing. Adjustments to the number of strands and spacing may be made based on the fence manufacturer's recommendations and landowner preference for non-critical confinement/exclusion fences.

TABLE 8: Summary of Fence Types and Selected Materials [1/]

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	**Line Post Type**	**Line Post Size**	**Line Post Spacing**	**Corner, End, Gate, and Brace Post Type**	**Corner, End, & Gate Post Size**	**Brace Post Size**	**Brace Intervals**
Barbed Wire	ASTM Class 3 galvanized, double-strand, min. 12½-gauge with 4-point barbs spaced no more than 6 inches apart, or 15½-gauge for high tensile.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts: min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2 at the end of this table.) Steel posts: min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 16 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent).	Min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Single span braces: use when the run of fence is less than 300 feet between corner, end, and/or gate posts. Double span braces: use when the run of fence is 300-700 feet between corner, end, and/or gate posts. Use line braces at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 700 feet long.
Wooden Board	Wood rails – use well seasoned or kiln-dried wood to minimize warping. Rails are min. 1-inch thick x 6 inches wide, and at least 8 feet long.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts min. 4 inches diameter or 4 inches square. Length sufficient to support desired height of fence and be set in the ground a min. of 2½ feet deep. (See Note 2 at the end of this table.)	Max. 8 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent).	Wooden posts min. 6 inches diameter or 6 inches square. Length sufficient to support desired height of fence and be set in ground to min. depth of 3 feet. (See Note 2 at the end of this table.)	Not applicable.	Not applicable.

TABLE 8: Summary of Fence Types and Selected Materials [1/]

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	**Line Post Type**	**Line Post Size**	**Line Post Spacing**	**Corner, End, Gate, and Brace Post Type**	**Corner, End, & Gate Post Size**	**Brace Post Size**	**Brace Intervals**
Electric High Tensile Smooth Wire *(4 strands or fewer)*	ASTM Class 3 galvanized, min. 12½-gauge 140,000 PSI, 1,000 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent), or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts: min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2, below.) Steel posts: min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated (0.40 lbs./cu. ft. CCA or equivalent).	Min. 8 feet long, min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	Min. 8 feet long, min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	*3 or 4 strand fences:* Single span braces: use when the run of fence is less than 1,300 feet between corner, end, and/or gate posts. Double span braces: use when the run of fence is 1,300-1,700 feet between corner, end, and/or gate posts. Use line braces at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 1,700 feet long.
Electroplastic Twine (Polywire) and Electrified Ribbon	Polywire: min. 7 stainless steel strands running through the fabric.	Manufactured fiberglass, plastic, or other suitable material as approved by NRCS.	Min. 4 feet long, set deep enough in the ground to withstand livestock. Can use "step-in" posts.	Use spacing specified by the manufacturer to control livestock.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated.	Diameter sufficient to anchor the wire. Posts must be long enough to allow them to be set at least 1½ feet in the ground.	Not applicable.	Not applicable.

TABLE 8 NOTES:

1/ This table briefly summarizes some of the major components and installation requirements for each fence type. Refer to Tables 1 – 7 for more detailed criteria.

2/ Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post.

FIELD BORDER

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 386

DEFINTION

A strip of perennial grass or shrubs established at or around the edge of a field.

PRACTICE INFORMATION

The field containing the border is usually but not necessarily cropland. The border is generally converted from cropland but may have been covered by trees or other vegetation. Field borders are functional and aesthetically pleasing. Field borders provide both on-site and off-site benefits to soil, water ,air, plants and animals. Multiple objectives including erosion protection, wildlife cover, forage, or pollution control, should be considered when selecting the plant specie for the border area of a field.

The major purposes of a field border include the following:

1. Provide erosion protection by stabilizing the field edge(s).
2. Provide a buffering effect around the perimeter or at least one side of the field for improved water quality and other environmental benefits.
3. Reduce competition from trees that may be bordering the field.
4. Provide wildlife food and cover.
5. Provide a protected turnrow or travel lane.
6. Improve landscape aesthetics.

FILTER STRIP

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 393

DEFINITION

A filter strip is an area of vegetation established for the purpose of removing sediment, organic material, and other pollutants from runoff and waste water.

PRACTICE INFORMATION

Filter strips are generally located at the lower edge (s) of a field. This will vary somewhat with land use, topography and objectives. A filter strip removes pollutants from runoff before the material enters a body of water. It also serves as a setback buffer between water and the fields above the water so that pesticides and other chemicals are not applied directly adjacent or into the water body. Filter strips also reduce sedimentation of streams, lakes and other bodies of water.

Plant species selected for planting in a filter strip requires careful planning. There may be multiple objectives that can be accomplished by proper plant selection.

In addition to the above functions, filter strips can be designed to provide one or more of the following secondary benefits:

1. Improved fish and wildlife habitat.
2. Improved aesthetics
3. Improved equipment operations such as field access and turn rows or head lands.
4. Improved recreation opportunities.
5. Improved livestock forage source.

DESIGN HIGHLIGHTS

Overland flow entering the filter strip shall be primarily uniform sheet flow. Concentrated flow shall be dispersed using level spreaders before it enters the filter strip. The leading edge of the filter strip shall be approximately on the contour.

The filter strip shall be located immediately downslope from the source area of contaminants. The drainage area above the filter strip shall have a slope of 1% or greater.

The minimum flow length through the filter strip shall be 35 feet.

The filter strip shall be protected from uncontrolled livestock access and frequent vehicular traffic. Noxious weeds shall be controlled as required by state law.

Grade Stabilization Structure

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 410

DEFINITION
A grade stabilization structure is used to control the grade and head cutting in natural or artificial channels.

PRACTICE INFORMATION
Grade stabilization structures are installed to stabilize the channel grade and control erosion to prevent the formation or advance of gullies and headcuts. The practice is used in areas where structures are necessary to stabilize the site. Grade stabilization structures are not designed to regulate flow or water levels in a channel area.

Special attention is given to enhancing fish and wildlife habitat where enhancement is practical. The practice is also helpful in reducing pollution from sedimentation.

Grade stabilization structures are located so that the elevation of the inlet of the spillway is set at an elevation that will control upstream headcutting.

A wide range of alternative types of structures are available for this practice and an intensive site investigation is required to plan and design an appropriate grade stabilization structure for a specific site.

Additional information including design criteria and specifications are in the local NRCS Field Office Technical Guide.

GRASSED WATERWAY

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 412

DEFINITION

A grassed waterway is a natural or constructed channel established to suitable vegetation for safe water disposal.

PRACTICE INFORMATION

Waterways are constructed to convey runoff from terraces, diversions, or other concentrated flow areas where erosion control is needed.

The most critical time for successful installation of a grassed waterway is immediately following construction when the channel is bare and unprotected from runoff. Waterways are generally planted to perennial grass. It is critical during the vegetative establishment period to restrict outside water from flowing through the channel.

Another critical consideration is the outlet at the lower end. If water quality or protection of riparian vegetation (streambank) is an issue, the outlet end may need to widen significantly or another buffer or filtering type practice may be necessary.

In addition, the waterway installation must assure that the runoff from the waterway does not cause gullies and/or overfalls to develop.

Grassed waterways are multipurpose and provide one or more of the following benefits:

1. Safe disposal of runoff water
2. Erosion control is concentrated flow areas of a field
3. Improved water quality
4. Improved wildlife habitat
5. Reduced sediment damage
6. Improved landscape aesthetics

DESIGN HIGHLIGHTS

Waterways and outlets shall be either parabolic or trapezoidal in cross section.

The bottom width of trapezoidal waterways shall not exceed 50 feet unless multiple or divided waterways or other means are provided to control meandering of low flows. Side slopes shall not be steeper than a ratio of two horizontal to one vertical.

All grassed waterways shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, a stream channel, an earthen ditch, a grade stabilization structure, or other suitable outlet.

HEAVY USE AREA PROTECTION

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 561

DEFINITION

Heavy use area protection is protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.

PRACTICE INFORMATION

Heavy use area protection is a practice used primarily in urban areas and land used for recreation purposes. However, the practice may be used on any land area frequently and intensely used by people, animals, or vehicles. Treatment provided by this practice is primarily for erosion control but also addresses other types of natural resource degradation including aesthetics.

The prescribed surface treatment is designed to accommodate the specific type of traffic expected to occur. Surface treatment may involve pavement for vehicle traffic or vegetation may provide sufficient protection for people and animal traffic.

Impermeable surfaces such as pavement increase runoff. Therefore, provisions for drainage are always considered when planning this practice.

DESIGN HIGHLIGHTS

Surface Materials:

Concrete – Minimum thickness of 5 inches

Gravel – 6 inch base, No. 4 stone or CR-6, with a minimum 3 inch surface layer of fine stone dust or sand (maximum particle size less than ¼").

Other Materials – Fly ash, asphalt millings, etc. must have a minimum thickness of 6 inches.

NUTRIENT MANAGEMENT

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 590

DEFINITION

This practice involves managing the amount, placement, and timing of plant nutrients to obtain optimum yields and minimize the risk of surface and groundwater pollution.

PRACTICE INFORMATION

Nutrient management may be used on any area of land where plant nutrients are applied to enhance yields and maintain or improve chemical and biological condition of the soil. The source of plant nutrients may be from organic wastes, commercial fertilizer, legumes, or crop residue. The objective is to apply the proper amount of nutrients at the proper time to achieve the desired yield and minimize entry of nutrients into surface or groundwater supplies.

Planning Nutrient Management involves the following considerations:

1. National, state and local water quality standards
2. Sources and forms of plant nutrients available to the farmer
3. Amounts and timing of nutrients based on soil testing, planned yield and growing season of target plants
4. Evaluate use of crop rotations that enhance efficiency of nutrient utilization and improve soil tilth
5. Consider waste storage requirements and land area requirements for proper management of plant nutrients.
6. Others

Additional information including standards and specifications are filed in the local NRCS Field Office Technical Guide.

PRESCRIBED GRAZING

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 528

DEFINITION

Prescribed grazing is the controlled harvest of vegetation with grazing animals, managed with the intent to achieve a specific objective.

PRACTICE INFORMATION

This practice may be applied on all lands where grazing and/or browsing animals are managed. Removal of herbage by the grazing animals is in accordance with production limitations, plant sensitivities and management goals. Frequency of defoliations and season of grazing is based on the rate of growth and physiological condition of the plants. Duration and intensity of grazing is based on desired plant health and expected productivity of the forage species to meet management objectives. In all cases enough vegetation is left to prevent accelerated soil erosion.

Application of this practice will manipulate the intensity, frequency, duration, and season of grazing to:

1. Improve water infiltration
2. maintain or improve riparian and upland area vegetation
3. Protect stream banks from erosion
4. Manage for deposition of fecal material way from water bodies
5. Promote ecological and economically stable plant communities which meet landowner objectives

A prescribed grazing schedule will be prepared for all fields and pastures and recorded in a manner that is readily understood and useable by the decision maker. The grazing schedule should include the following information:

1. Expected forage quality and quantity for all lands providing forage.
2. Numbers and kinds of animals utilizing available forage on the unit.
3. Inventory of all sources of forage and supplemental feed including documentation of surpluses and deficiencies.
4. A planned grazing schedule for livestock showing periods of grazing, rest, and other activities for all fields and pastures included in the grazing plan.
5. A contingency plan that details potential climatic problems and a guide for adjusting to insure proper management of forage resources.

Additional information including practice specifications are available in the local NRCS Field Office Technical Guide.

RESIDUE MANAGEMENT, MULCH-TILL

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 345

DEFINITION

This practice is managing crop residue on a year round basis to provide an acceptable erosion rate, conserve moisture and maintain or improve soil tilth.

PRACTICE INFORMATION

This practice generally applies to cropland but may also be used on other areas where field crops are grown such as wildlife or recreation lands.

Mulch tillage is a term used when referring to non-inversion tillage such as chiseling and disk harrowing to partially incorporate organic material left on the soil surface.

Mulch tillage includes at least the following:

1. Uniformly spreading the residue on the soil surface to accommodate planting the following crop.
2. Use non-inversion tillage tools that only partially incorporate surface organic material.
3. Plan the number, sequence, and timing of tillage operations to achieve the prescribed amount of surface residue needed to accomplish the objectives of the practice.
4. Use planting equipment designed to operate in high residue situations .
5. Minimize removal of organic residue by burning, baling or grazing.
6. Additional criteria is provided in the practice standard and specifications contained in the NRCS Field Office Technical Guide.

The benefits of this practice are significant. Soil slowly but steadily improves when erosion is reduced and organic matter increases. Soil tilth improves and productivity increases as the constant supply of organic material left on the soil surface is decomposed by a healthy population of earth worms and other organisms.

RESIDUE MANAGEMENT, NO-TILL/STRIP TILL/DIRECT SEED

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 329

DEFINITION

This practice is managing the amount, orientation and distribution of crop and other plant residue on the soil surface year-round. Crops are planted and grown in narrow slots or tilled strips established in the untilled seedbed of the previous crop.

PRACTICE INFORMATION

The objective of this practice is to maintain most of the crop residue on the soil surface throughout the year. The practice may be referred to as no-till, zero-till, slot plant, row-till, strip-till or just the generic term conservation tillage. The common characteristic of this practice is that the only tillage performed is a very narrow strip prepared by coulters, sweeps, or similar devices attached to the front of the planter. Weeds and other pests are generally managed by using agriculture chemicals. The chemicals used are approximately the same as those used with a tillage based system, but a "no-till" residue management system requires a higher level of technology and management than a more conventional tillage system. The fields must be scouted on a regular basis and the farm operator must be very familiar with the pests and understand the concept of threshold populations and other Integrated Pest Management technologies. The benefits of this practice are significant. Erosion is usually reduced to an acceptable level due to the protective residue left o the surface. Soil organic matter increases and soil organisms such as earth worms increase progressively. The soil tilth improves, and productivity increases as the constant supply of organic material left on the surface is decomposed by a healthy population of soil organisms.

RESIDUE MANAGEMENT, SEASONAL

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service, practice code 344

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface during a specified period of the year, while planting annual crops on a clean tilled seedbed, or when growing biennial or perennial seed crops.

PRACTICE INFORMATION

This practice may be applied for one or more of the following purposes:

1. To reduce sheet and rill erosion;
2. To reduce wind erosion;
3. To reduce off-site transport of sediment, nutrients or pesticides;
4. To manage snow to increase plant available moisture;
5. To provide food and escape cover for wildlife.

This practice applies to all cropland and other land where crops are grown.

Seasonal residue management includes managing residues of annual crops from harvest until the residue is:

1. Buried by tillage for seedbed preparation;
2. Removed by grazing; or,
3. Mechanically removed.

Seasonal residue management also includes the management of residues from biennial or perennial seed crops from the time of seed harvest until regrowth begins the next season.

Adequate amounts of crop residues are essential for the proper functioning of this practice. Consider using high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacing to enhance residue production.

USDA NRCS
U.S. Department of Agriculture
Natural Resources Conservation Service

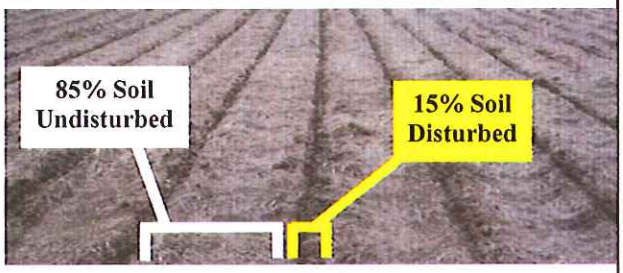
Maryland Tillage Practice Guide

This guide is designed to provide conservation planners with a quick reference for NRCS Residue and Tillage Management Practices — No-Till/Strip-Till/Direct-Seed (Code 329), Mulch-Till (Code 345), and Residue Mgt.-Seasonal (Code 344).

Practice Standard 329 — Residue & Tillage Management, No-Till/Strip-Till

No-Till
Stir Value* <10

No-Till Planter.



1 Pass
Strip-Till or
Zone-Till
Stir Value* 10-15

Zone-Till Planter-makes narrow strips and plants in one pass.

1 Pass
Vertical-Till or
Turbo-Till
High residue crop
STIR Value* <30

Turbo-Tiller.

This practice leaves the soil and crop residue mostly undisturbed except where seed and fertilizer are placed in the ground. Disturbance may include soil moved in the crop row plus soil dispersed or splashed. Approved implements include no-till and strip-till planters; drills and air seeders; strip-type fertilizer and manure injectors and vertical tillage or other similar implements that only minimally disturb residue from previous crops. Implements that result in significant disturbance cannot be used in this system. Weeds are controlled primarily with herbicides. Row cultivation is not used except in emergency situations.

In order for this practice to be applicable, the criteria must be met for all crops in the cropping system. The STIR value in a no-till system cannot exceed a value of 10 in any year of the rotation. Full benefits from no-till are accomplished after five continuous years of this practice. In a strip-till system, the STIR value cannot exceed a value of 15 in any year of the rotation. If vertical tillage is used to chop stalks or minimally incorporate manure with surface residue, the STIR value cannot exceed 30, only one pass can be made in the field, and only on a high residue crop.

Advantages: Provides maximum erosion control, conserves soil moisture, improves soil organic matter, sequesters carbon, has lowest fuel and labor input costs.

Management Challenges: May limit the incorporation of nutrients and other soil amendments, may increase dependence on herbicides, and may slow soil warming in the Spring, especially on poorly-drained soils with heavy residue levels.

* **STIR Value:** "Soil Tillage Intensity Rating," which is a factor from RUSLE2 (Revised Universal Soil Loss Equation, 2nd version). STIR values provide relative measures of the amount of soil disturbance when comparing different tillage systems. A low STIR value (e.g., less than 30) indicates minimal soil disturbance, which is desirable for soil quality and erosion control. A high STIR value (e.g., more than 70) indicates significant disturbance.

RIPARIAN FOREST BUFFER

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 391

DEFINITION

A riparian forest buffer is an area of trees and/or shrubs located adjacent to a body of water. The vegetation extends outward from the water body for a specified distance necessary to provide a minimum level of protection and/or enhancement.

PRACTICE INFORMATION

This practice applies to areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands and areas associated with ground water recharge.

The riparian forest buffer is a multi-purpose practice design to accomplish one or more of the following:

1. Create shade to lower water temperatures and improve habitat for aquatic animals.
2. Provide a source of debris necessary for healthy robust populations of aquatic organisms and wildlife.
3. Act as a buffer to filter out sediment, organic material, fertilizer, pesticides and other pollutants that may adversely impact the water body, including shallow ground water.

Dominant vegetation consists of existing or planted trees and shrubs suited to the site and purpose (s) of the practice. Grasses and forbs that come in naturally further enhance the wildlife habitat and filtering effect of the practice.

Headcuts and streambank erosion should be assessed and treated appropriately before establishing the riparian forest buffer.

Specifications for each installation are based on a thorough field investigation of each site.

DESIGN HIGHLIGHTS

Minimum width of buffer is 35 ft. or greater

RIPARIAN HERBACEOUS BUFFER

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 390

DEFINITION

Grasses, grass-like plants and forbs that are established or managed to provide a herbaceous buffer in the transitional zone between terrestrial and aquatic habitats.

PRACTICE INFORMATION

This practice may be applied for one or more of the following purposes:
1. Provide food and cover for wildlife and aquatic organisms;
2. Protect and improve water quality;
3. Reduce erosion from wind and water;
4. Increase carbon storage in biomass and soils.

This practice may only be applied on land adjacent to water courses, water bodies and wetlands where bank stability is adequate to support the practice.

This practice does not apply to:
1. Plantings that will be established on eroding streambanks or shorelines, for which the conservation practice standard Streambank and Shoreline Protection, Code 580, is applicable;
2. Plantings that are intended to intercept significant amounts of sediment or other pollutants, for which the conservation practice standards for Filter Strip, Code 393; or Vegetated Treatment Area, Code 635, are applicable.

Livestock shall be controlled or excluded as necessary so that the vegetative cover can be established and maintained to meet its intended purpose.

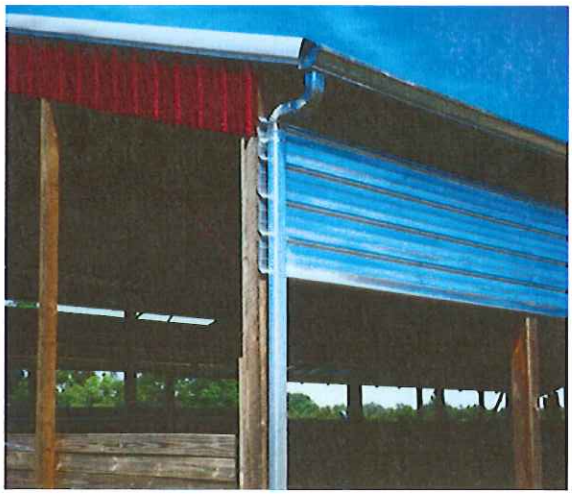
DESIGN HIGHLIGHTS

Minimum width of buffer is 35 ft. or greater

ROOF RUNOFF STRUCTURE

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 558



DEFINITION

Roof Runoff Structures are facilities for collecting, controlling, and disposing of runoff water from roofs.

PRACTICE INFORMATION

The purpose of this practice is to prevent roof runoff water from flowing across concentrated waste areas, barnyards, roads, and alleys. The practice reduces pollution, flooding, and erosion. It also improves water quality, drainage, and the overall efficiency of a waste management system. The water from roof runoff can be stored and reused for cleaning and other purposes. The practice also reduces the volume requirements of lagoons and waste storage facilities, and reduces the volume of effluent water requiring treatment or land application.

Additional information including design criteria and specifications for installing roof runoff management facilities are filed in the local NRCS Field Office Technical Guide.

DESGIN HIGHLIGHTS

Use K-style, half round, or box type roof gutter. The minimum top width for roof gutters is 5-inches.

Position downspout outlets so as to avoid contamination with animal waste.

Mount roof gutters on fascia boards using hidden hangers, bolts and ferrules, gutter screws and ferrules, cradles, or by other approved methods. Spikes and ferrules are not acceptable. Use a maximum spacing of 24 inches.

Roof gutters and downspouts may be made of aluminum, galvanized steel, wood or plastic. Aluminum gutters and downspouts shall have a nominal thickness of at least 0.027 inch and 0.020 inch respectively.

All lumber used for fascia board and rafter end repair or replacement shall have a minimum nominal thickness of 2 inches.

SPRING DEVELOPMENT
PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 574

DEFINITION
Spring Development is improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

PRACTICE INFORMATION
The purpose of the practice is to improve distribution of water for livestock, recreation and wildlife. The practice also applies to irrigation when the quantity and quality are suitable for irrigating crops.

Spring development involves cleaning and/or enlarging the discharge opening of the spring. Other appurtenances might be needed such as a collection device to channel the water, and a spring box to provide a small amount of storage as well as a sediment trap and connection point for an outlet pipe (s). The outlet pipe (s) may then lead to a storage facility (s) such as a trough or tank.

DESIGN HIGHLIGHTS
Spring Box – The spring box may be constructed of reinforced concrete, steel, fiberglass, plastic or other equally durable material. The minimum thickness for galvanized steel is 20 gage.

The minimum cross sectional area for spring boxes is 3 square feet. Locate the floor of the spring box a minimum of 6 inches below the invert of the collection line. Construct the spring box so that the top extends a minimum of 6 inches above the ground line.

Outlets – Place overflow pipes at least 6 inches above the floor of the collection box to allow for sediment collection. Provide measures to protect the spring development from damage by freezing, flooding, contamination and livestock.

The outlet pipe must have positive grade away from the spring box or collection system unless vent pipe(s) are added to prevent air locks.

The minimum diameter for the outlet pipe is 2 inches.

STREAM CROSSING

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – practice code 578

DEFINITION

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

PRACTICE INFORMATION

The purpose of a stream crossing is to:

1. Improve water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
2. Reduce streambank and streambed erosion.
3. Provide crossing for access to another land unit.

The practice applies to all land uses where an intermittent or perennial watercourse exists and a ford, bridge, or culvert type crossing is desired for livestock, people, and /or equipment.

Locate stream crossings where adverse environmental impacts will be minimized. Take the following into consideration:

1. Effects on up-stream and down-stream flow conditions that could result in increases in erosion, deposition, or flooding.
2. Short term and construction-related effects on water quality.
3. Effects on fish passage and wildlife habitats.
4. Effects on cultural resources.
5. Overall effect on erosion and sedimentation that will be caused by the installation of the crossing and any necessary stream diversion.

DESIGN HIGHLIGHTS

The minimum width of livestock only crossings is 6 feet. The minimum width of multi-use crossings is 10 feet.

Areas adjacent to the stream crossing shall be permanently fenced or otherwise excluded as needed to manage livestock access to the crossing.

Culvert crossings must have at a minimum one 30-inch diameter pipe. When using multiple pipes the additional pipes may be less than 30 inches in diameter but not less than 18 inches in diameter.

Install culvert pipe with both upstream and downstream inverts submerged below channel grade one foot. When using multiple pipes only one pipe, the largest of the series, requires submergence.

Metal culvert pipes require a minimum 16 gage.

STRIPCROPPING, CONTOUR & FIELD

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 585 (Contour) & 586 (Field)

DEFINITION

Stripcropping is growing crops in a systematic arrangement of strips across the field to reduce soil erosion by water and/or wind.

PRACTICE INFORMATION

This practice is used on cropland and certain recreation and wildlife lands where field crops are grown. The crops are arranged so that a strip of grass or close-growing crop is alternated with a clean tilled strip or a strip with less protective cover. Generally the strip widths are equal across the field. On sloping land where sheet and rill erosion are a concern, the strips are laid out on the contour or across the general slope. Where wind erosion is a concern, the strips are laid out as close to perpendicular as possible to the prevailing erosive wind direction.

Stripcropping is a multi-purpose practice that has one or more of the following effects:

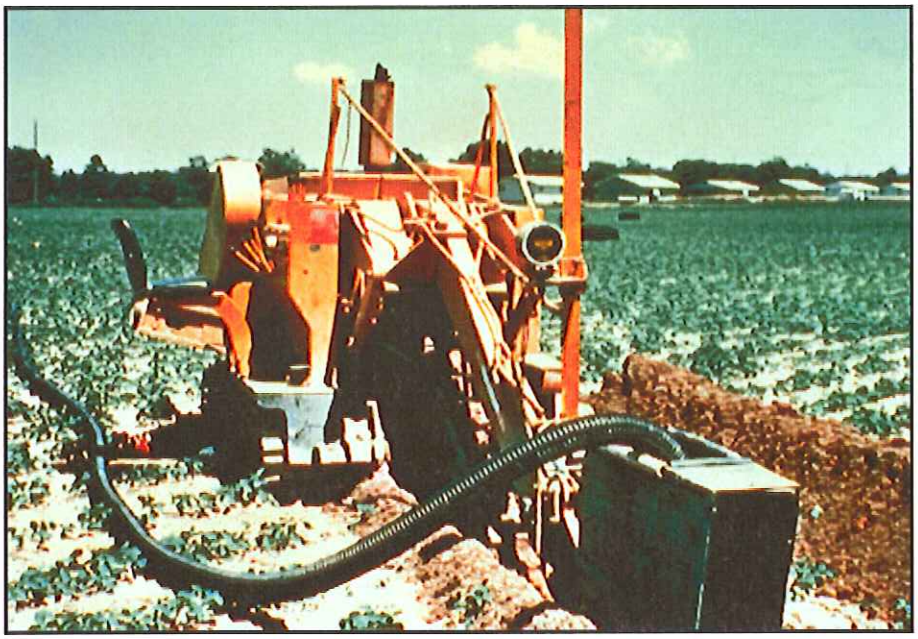
1. Reduced sheet and rill erosion.
2. Reduced wind erosion
3. Increased infiltration and available soil water.
4. Reduced dust emissions into the air.
5. Improved water quality.
6. Improved visual quality of the landscape.
7. Improved wildlife habitat

Additional information, including standards and specifications for this practice, are on file in the NRCS Field Office Technical Guide.

Subsurface Drain

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 606



DEFINITION

A Subsurface Drain is a conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.

PRACTICE INFORMATION

The purpose of a subsurface drain is to:

- Improve the environment for vegetation
- Reduce erosion
- Improve water quality
    - Regulate ground water and water table flows
    - Relieve artesian pressures
    - Assist in leaching saline soil
    - Regulate subirrigated areas and waste disposal areas
- Collect ground water for beneficial use
- Remove water from heavy use areas such as recreation areas, or around buildings
- Regulate water to control health hazards caused by pests

The subsurface drain practice is used in areas having a high water table where the benefits of lowering the level are worth the expense. The practice also applies to areas that will benefit from controlling ground water and/or surface runoff. The soil must meet certain suitability requirements and an adequate outlet must be available to assure the drain will function properly.

Additional information including design criteria and specifications are in the local NRCS Field Office Technical Guide.

Surface Drainage - Main or Lateral

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 608

DEFINITION

A Main or Lateral drainage ditch is an open drainage ditch constructed to a designed size and grade.

PRACTICE INFORMATION

The purpose (s) of a main or lateral drainage ditch is to:

- Dispose of excess surface and subsurface water
- Intercept and control ground water levels
- Provide leaching of saline or alkali soils
- Provide a combination of these functions

Sites for this practice are suitable for agriculture and have an outlet for the drainage water by either gravity or pumping.

This practice applies to ditches for disposal of surface and subsurface drainage water collected primarily by field ditches and subsurface drains.

Additional information including design criteria and specifications are in the local NRCS Field Office Technical Guide.

TRANSITION TO ORGANIC PRODUCTION

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 789

DEFINITION

This practice utilizes agricultural management strategies while transitioning from conventional to organic farming techniques.

PRACTICE INFORMATION

This practice is applied as part of a resource management system to minimize negative impacts of agricultural production on soil, water, air, plant, animal and social and cultural resources by transitioning to organic production. Organic production is a system that responds to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve and enhance biodiversity.

This practice applies:

1. Wherever the farming operation transitions to organic production;
2. To all practice components necessary to make a complete system are specified;
3. Where natural resources are/will be adequate to properly follow an organic production system;

All methods of organic production must comply with Federal, State, and local regulations, including the Organic Food Production Act of 1990, as amended (7 U.S.C. 6501 et seq.), and regulations with the National Organic Program final rule (7 CFR Part 205).

Tree/Shrub Establishment

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 612

DEFINITION

Tree and Shrub Establishment is establishing woody plants by planting or seeding.

PRACTICE INFORMATION

The purposes of the practice include:

- Forest products
- Beautification
- Erosion control
- Energy conservation
- Chemical/Nutrient sink for water quality improvements
- Wildlife habitat improvement
- Air quality improvements
- Wetland improvements

This practice is applicable on any area of land where woody plants are suited. Site adaptation is a major consideration for success in establishing trees and shrubs. Careful consideration should also be given to the suitability of the selected species for the planned purpose and available space for growth.

Additional information including design criteria and specifications are in the local NRCS Field Office Technical Guide.

UNDERGROUND OUTLET
PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 620

DEFINITION
An Underground Outlet (UGO) is a conduit installed beneath the surface of the ground to convey runoff to a suitable outlet.

PRACTICE INFORMATION
The purpose of the UGO is to carry excess water to a suitable outlet from terraces, water and sediment control basins, diversions, waterways, subsurface drains, surface drains or other similar practices without causing damage by erosion or flooding.

An underground outlet can be installed when surface outlets are impractical because of stability problems, climatic conditions, land use, farmability, or equipment traffic. A UGO can be used as the only outlet for a structure or practice or it may be used in combination with other types of outlets.

The conduit for a UGO can be either solid or perforated pipe depending on the site specific design. The inlet to a UGO can be constructed of many different types of materials but the most common are heavy duty perforated plastic risers. The outlet of a UGO should have either a 10 foot section of solid heavy duty pipe or headwall. The UGO must outlet into stable watercourse that is protected from erosion caused by flows from the UGO.

Both the inlet and outlet of a UGO should be protected from the entry of small animals. The outlet animal guard should be installed so that it does not impede the flow from the UGO.

UGOs can provide a direct conduit to receiving waters for contaminated runoff from crop land. UGOs and the accompanying structure or practice should be installed as part of resource management plan that addresses issues such as nutrient and pest management, residue management and filter areas.

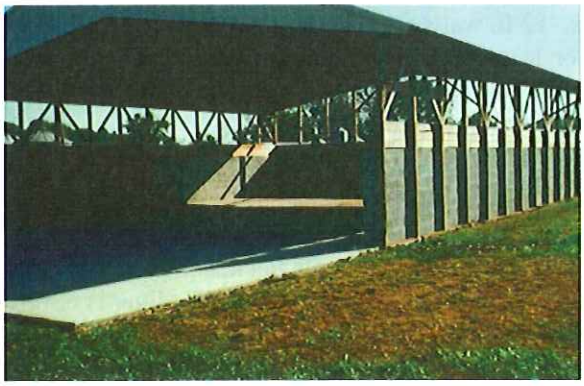
DESIGN HIGHLIGHTS
A minimum 10-foot section of steel, PVC, or metal conduit is required at the outlet.

All outlets must have animal guards to prevent the entry of rodents or other animals. Animal guards for any system with a surface inlet must be hinged to allow passage of debris.

WASTE STORAGE FACILITY

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 313



DEFINITION

A waste storage facility is a waste impoundment made by constructing an embankment, excavating a pit or dugout*, or by fabricating a structure.

PRACTICE INFORMATION

A waste storage facility is a component of a complete agricultural waste management system. The purpose of the practice is to provide temporary storage of waste material generated by production and/or processing of agricultural products. The waste material may be animal manure, wastewater, or contaminated runoff.

An operation and maintenance plan is developed to specify requirements for emptying the storage facility. The plan specifies timing, rates, and volume of waste applications. For ponds*, the plan also includes requirements for timely removal of waste material to accommodate subsequent storms.

Design criteria for this practice includes:

- Site location
- Design storage volume
- Storage period
- Inlet structures
- Safety features
- Pond criteria (see Practice Code 425)
- Emptying facilities
- Fabricated structure criteria

Additional information including detailed design criteria and specifications is in the local NRCS Field Office Technical Guide.

DESIGN HIGHLIGHTS

Location – Facility is located at least 100 feet from wells. When practical, it is located at least 100 feet from springs, wetlands, drainage ditches, streams, and ponds. Locate the waste storage facility and its appurtenances outside the 100-year floodplain when possible.

Safety – Pushoffs must be structurally sound and have railings, safety bars, or other devices to prevent humans, animals, and equipment from falling into the facility. Provide warning signs, fences, ladders, ropes, bars, rails, and other safety devices and precautions as appropriate for safety of humans and livestock and to prevent use of the facilities for purposes other than intended. Ventilation and warning signs must be provided for covered waste holding structures, as necessary, to prevent explosion, poisoning, or asphyxiation.

When ramps are used for access into a storage facility provide a ramp slope no steeper than 4 horizontal to 1 vertical for liquid wastes. For other wastes provide a ramp slope no steeper than 10 horizontal to 1 vertical or flatter unless special traction surfaces, such as grooving or roughening, are provided.

Slabs on Grade - Where applied point loads are minimal and liquid-tightness is not required, such as barnyard and feedlot slabs subject only to precipitation, and the subgrade is uniform and dense, the minimum slab thickness is 4 inches with a maximum joint spacing of 10 feet. For applications where liquid-tightness is

WASTE STORAGE POND

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 425

DEFINITION

An impoundment made by constructing a dam or embankment, by excavation, or a combination thereof, for temporary storage of livestock or other agricultural wastes.

PRACTICE INFORMATION

The purpose of this practice is to store liquid and solid wastes and/or polluted runoff from concentrated livestock areas until they can be safely utilized, therefore, protecting the environment.

This practice applies where:

1. an overall waste management system has been planned
2. waste is generated by agricultural production or processing
3. storage is necessary to properly manage the waste
4. soils and topography are suitable for construction

An operation and maintenance plan is developed to specify requirements for emptying the storage facility. The plan specifies timing, rates, and volume of waste applications. The plan also includes requirements for timely removal of waste material to accommodate subsequent storms.

Waste storage ponds are located as near the source of waste as possible but as far from human dwellings as possible. The location should also be where prevailing winds will carry odors away from residences and public areas.

DESIGN HIGHLIGHTS

Location – Facility is located at least 100 feet from wells. When practical, it is located at least 100 feet from springs, wetlands, drainage ditches, streams, and ponds. Locate the waste storage facility and its appurtenances outside the 100-year floodplain when possible.

Liner Criteria:

clay liner – the minimum thickness of the liner is as shown below but in no case less than 12 inches:

1. That required by state regulatory rules; or
2. That given in the following table.

Water Depth (feet)	Liner Thickness (inches)
< 16	12
16.1 – 24	18
> 24	24

flexible membrane or geosynthetic clay liner - certified by the manufacturer to be suitable for the intended use. Pigmented polyvinyl or polyethylene plastics, rubber, and similar materials that are highly resistant to bacteriological deterioration are acceptable base materials.

Design with leak detection systems. Use a nonwoven geotextile pad or other flow medium to collect leakage from under the entire flexible membrane liner and direct it to a collection pipe. Slope the sides and bottom of the pond or lagoon to the trench containing the collection pipe. Outlet the collection pipe into an accessible sump or at the ground surface at least 100 feet from a stream or other water body. The leak detection system shall be separate and isolated from any drainage system that is installed around or under the facility.

concrete liner - minimum concrete thickness is 5 inches

Embankment Criteria:

Combined side slopes are minimum 5:1; no slope steeper than 2:1

The minimum embankment top width is according to the table to the right.

An auxiliary (emergency) spillway is at the high storage elevation or higher. The minimum bottom width of the spillway is 8 feet.

Top Width of Embankment

Total Height Embankment (feet)	Minimum Top Width (feet)
15 or less	8
15 – 20	10
20 – 25	12
25 – 30	14
30 – 35	15

WASTE UTILIZATION

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service - practice code 633

DEFINTION

Applying agricultural waste or other waste on the land in an environmentally acceptable manner while maintaining or improving the natural resources.

PRACTICE INFORMATION

This practice may be used on any land suitable for application of waste as a fertilizer. This includes waste from barnyards, feedlots, dairy operations and other agriculture sources. The waste material may also come from municipal treatment plants and food processing plants.

The purposes of applying this practice include the following:

1. Provide safe disposal of waste material
2. Provide fertility for food and fiber production
3. Improve soil tilth and fertility
4. Reduce erosion
5. Protect water and other natural resources

Additional information including specifications are filed in the local NRCS Field Office Technical Guide.

DESIGN HIGHLIGHTS

Waste utilization should be done in accordance with the farmer's Nutrient Management Plan.

WATERING FACILITY

PRACTICE INTRODUCTION

USDA, Natural Resources Conservation Service – Practice Code 614

DEFINITION

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

PRACTICE INFORMATION

To purpose of this practice is to provide access to drinking water for livestock and/or wildlife in order to:

1. Meet daily water requirements;
2. Improve animal distribution.

This practice applies to all land uses where there is a need for new or improved watering facilities for livestock and/or wildlife.

Facilities are located to promote even grazing distribution and reduce grazing pressure on sensitive areas.

Provide fencing as necessary to exclude livestock from protected areas, and encourage use of facility. Locate as far away from streams and drainage ways as practical.

The watering facility should provide adequate access to the animals planned to use the facility.

DESIGN HIGHLIGHTS

Watering Facility Materials: Use reinforced concrete, steel, fiberglass, plastic or other equally durable material. The minimum thickness for galvanized steel is 20 gage; concrete for concrete troughs is 4 inches; concrete culvert pipe used as a watering facility is 3 inches. The pipe is to be watertight and in good condition.

Use Pad: Provide gravel, stone, concrete, paving or otherwise provide for firm footing on the areas adjacent to the trough or tank. Extend the treatment out a minimum of 6 feet around the trough or tank for cattle and horses and 4 feet for all other animals.

Capacity: Provide adequate for number and type of animals.