



Cooperative Extension Service

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THE ESTABLISHMENT AND MAINTENANCE OF GRASSED WATERWAYS

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INTRODUCTION

GRASSED WATERWAYS are broad, shallow drainageways covered with erosion-resistant grasses. Their primary purpose is to remove surface water without erosion to the land.

BE ALERT! Early detection of soil erosion by water and application of soil management practices will aid in preventing serious soil losses. Soil management practices applied on fields above the natural drainage channels will reduce the amount of surface runoff reaching these channels. Grassed waterways, used with other conservation practices such as residue management, strip-cropping, contour tillage, diversions, terraces, proper grazing use, and reseeding rolling cropland to grass, will provide safe removal of runoff water.

Grassed waterways may serve as outlets for excess water from terraces, diversions or contour rows and provide a means of conveying runoff water that enters a farm from adjoining land.

LOCATION AND SIZE OF WATERWAYS

Over the years, natural drainage patterns have developed on the landscape. These natural drainage patterns are usually followed in developing erosion-free water channels. Grassed waterways may be established on cropland to prevent gully formation or on range and pasture land to heal an existing gully.

Grassed waterways should be designed wide enough and deep enough to carry the largest flow of runoff water expected in a 10-year period. The water should not be permitted to overflow onto bare, unprotected soil near the edge of the waterway.

The size of waterway required to carry the water will depend on the soil, land slope, land cover, land use and size of the area that will drain into the waterway.

SHAPING A WATERWAY

The ideal time to shape a waterway is in the spring. Shaping should be completed early enough to obtain a good vegetative cover.

A waterway must be shaped so it will spread and slow the water flow. Water moving in the waterway must not be too deep at any one point. A wide, saucer-shaped or parabolic-shaped ditch, slightly deeper in the center than on the sides, is desirable (Figure 1). A flat-bottomed waterway with sloping sides or trapezoidal-shaped is also acceptable provided the sides have a gentle slope to allow machinery to cross (Figure 2).



Figure 1 - Parabolic or saucer-shaped waterway cross section.



Figure 2 - Trapezoidal or flat-bottomed waterway cross section.

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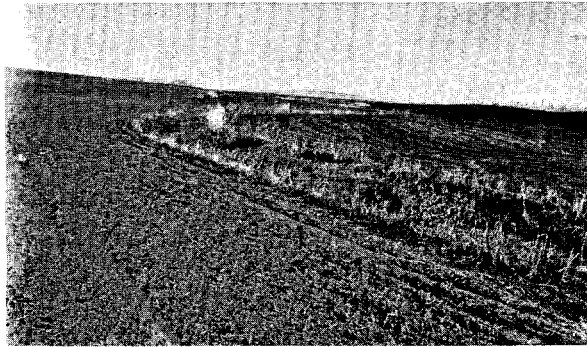


Figure 3 - Eroded water channel which will require shaping and straightening with large earth moving equipment.

When a deep, narrow, meandering gully has formed in part of a drainageway (Figure 3), the banks will need considerable shaping and the gully may need straightening. If the eroded area is shallow (Figure 4), regular tillage implements can be used for filling in the eroded area. If the eroded area or gully is deep, a large tractor and scraper and a blade grader may be required to shape and fill the drainage channels.



Figure 4 - Early stage in gully formation. Regular farm equipment could be used to shape this waterway.

Remember, you can cross a properly shaped waterway with farm equipment, but you may have to farm around a poorly-shaped waterway.

SEEDBED PREPARATION

Seedbed preparation is the key to establishing a stand of grass in a waterway. It is difficult to prepare too firm a seedbed for grass. Tillage and packing operations should be used that will provide a smooth, firm seedbed that permits grasses to be seeded at a depth of 1/2 to 3/4 inches.

The fertility may be low on a newly-constructed waterway, especially if subsoil is exposed. Replace the topsoil over cut areas where subsoil is exposed. Barnyard manure applied at the rate of 10 to 20 tons per acre and worked into the soil is an effective way to provide needed fertility. A commercial fertilizer may also be applied at rates to obtain up to 50 pounds of phosphate (P_2O_5) per acre. Barnyard manure or commercial fertilizer should be applied and worked into the soil before seeding the grass.

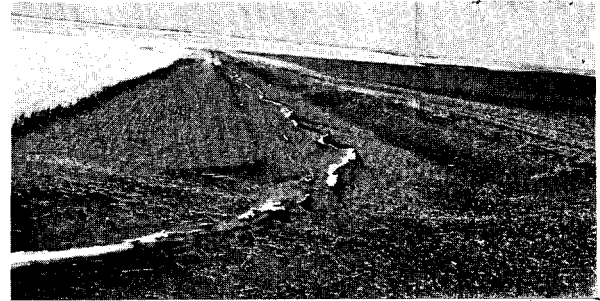


Figure 5 - Establish temporary cover as soon as possible after waterway is completed to provide protection against erosion until grass is established. Re-enforcement seeding of grass and cover crop desirable to prevent erosion.

ESTABLISHED TEMPORARY COVER

Temporary cover is necessary to control erosion in the waterway until the grass becomes established (Figure 5). Oats or barley may be seeded at the rate of 1½ to 2½ bushels per acre if the waterway is completed before July 1. Seed Sudangrass at a rate of 25 to 30 pounds per acre if waterway is completed during the month of July. Waterways shaped after August 1 should be seeded to winter wheat or winter rye to establish a winter cover. Clip the small grain cover crop in the late boot stage of growth, leaving a six- to 10-inch stubble. Clip Sudangrass only if too rank to seed through.

Critical areas (steep slopes) of late fall-shaped waterways (after September 15), will require sodding or mulching. The mulch should consist of two tons of clean straw and/or hay per acre anchored with a netting. The sod or mulch will protect the soil from erosion through the fall and winter months. Late fall-shaped waterways should be seeded with temporary cover and grass the following spring.

SELECTING ADAPTED GRASSES

Sod-forming grasses are preferred for seeding in waterways because they spread by underground root-stalks and provide more protection than grasses which have a bunch-type growth habit. If grasses with the bunch-type habit of growth are included in the mixture, they should account for 20 per cent or less of the total mixture. Seed simple mixtures consist of two or three grasses. Legumes such as alfalfa and sweet clover should not be included in a waterway seed mixture.

Grass species are adapted to particular soil types and sites. The following table is a guide to the adapted species by site:

| SPECIES | SITE ADAPTATION ^{1/} | | | | | |
|--------------------------------|-------------------------------|--------------|------------|---------------------|----------------|-----------------|
| | Coarse Soils | Medium Soils | Fine Soils | Imperfectly Drained | Poorly Drained | Moderate Saline |
| Sod Formers, Native | | | | | | |
| Western wheatgrass | - | G | G | G | F | G |
| Reed canarygrass | - | F | F | G | G | F ^{3/} |
| Switchgrass ^{2/} | G | G | F | G | - | F |
| Big bluestem ^{2/} | G | G | F | G | - | - |
| Prairie sandreed ^{2/} | G | F | - | - | - | - |
| Side-oats grama ^{2/} | F | G | G | - | - | - |
| Sod Formers, Tame | | | | | | |
| Smooth bromegrass | G | G | G | G | - | F |
| Garrison creeping foxtail | F | G | F | G | G | - |
| Kentucky bluegrass | - | G | G | G | - | - |
| Intermediate wheatgrass | F | G | F | F | - | F |
| Pubescent wheatgrass | F | G | F | F | - | F |
| Bunchgrass, Native | | | | | | |
| Slender wheatgrass | F | F | F | F | - | G |
| Green needlegrass | F | G | G | F | - | - |
| Little bluestem ^{2/} | G | G | F | F | - | - |

ADAPTED FROM: U.S.D.A. - S.C.S. - North Dakota Waterway Standards and Specifications, 12-68.

^{1/} Legend: G = Good, F = Fair, - = Unsuitable ^{2/} Warm-Season Grass ^{3/} Wet Site

SEEDING THE WATERWAY

Use good quality seed when sowing your waterway. Seed at double or triple the rates for ordinary field planting. The recommended grass seeding rate is 15 pounds of Pure Live Seed (PLS) per acre.

Recommended seeding rates are based on a pure live seed index of 1.0. In other words, every seed is assumed to be viable and capable of producing a plant. The rate of planting for seed with an index less than 1.0 must be adjusted upward. To determine the adjusted rate of seeding for a particular seed lot of a given purity and germination percentage follow the steps listed below. The per cent purity and germination of your seed should be listed on the seed tag.

STEP 1

$\% \text{ Purity} \times \% \text{ Germination} = \text{Pure Live Seed index (PLS)}$

STEP 2

$\text{PLS Seeding Rate/Acre} \div \text{PLS index} = \text{Seeding Rate/Acre}$

The following examples show how to determine the seeding rate of a single grass variety and a mixture of two grasses to obtain 15 pounds of Pure Live Seed per acre.

Example: Single variety – Purity 90%, Germination 90%.

Step 1: $.90 \times .90 = .81$ PLS index

Step 2: $15 \div .81 = 18.6$ pounds seed/acre

18.6 pounds of seed will provide 15 pounds PLS/acre

Example 2: 50-50 mixture of two grass varieties.

Note: 7.5 pounds pure live seed required of each variety.

A. Variety #1 – Purity 85%, Germination 80%.

Step 1: $.85 \times .80 = .68$ PLS index

Step 2: $7.5 \div .68 = 11$ pounds seed/acre

B. Variety #2 – Purity 90%, Germination 85%.

Step 1: $.90 \times .85 = .765$ PLS index

Step 2: $7.5 \div .765 = 9.8$ pounds seed/acre

C. Total Seeding Mixture Per Acre

1. Variety #1 (A2 above) = 11.0 pounds seed/acre

2. Variety #2 (B2 above) = 9.8 pounds seed/acre

Total 20.8 pounds seed/acre

20.8 pounds of seed will provide 15 pounds PLS/acre.

When seeding your waterway, double drilling (Figure 6), across, diagonally, and/or in a “figure eight” pattern will help spread the water over the waterway as the new seeding is becoming established.

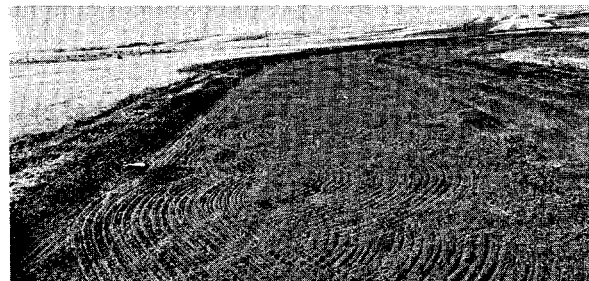


Figure 6 - A newly seeded waterway. Note the “figure eight” pattern and that a buffer strip was seeded along waterway edges.

SEEDING DATES

The best seeding date will depend on the area of the state in which you live, time of year waterway is completed and the variety of grass being seeded. In

general, cool-season grasses do best if seeded in early spring or very late fall. Warm-season grasses do best if seeded in late spring. Both cool- and warm-season grasses may be seeded in mid to late summer (August 10 to September 15) on summerfallow, or when the soil is moist to a minimum depth of six inches.

North Dakota is divided into two grass seeding areas (Figure 7). Note the area in which you live and use the following as a guide to your best grass seeding dates.

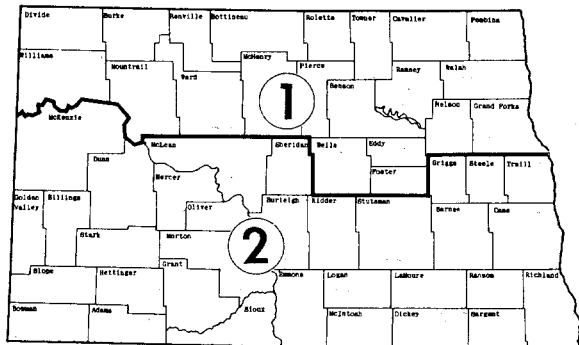


Figure 7 - Grass seeding areas.

AREA 1 - Spring Seeding:

Cool-season grasses — before May 1

Warm-season grasses — May 1 to June 1

Late Fall — Dormant Season Seeding:

Cool-season grasses only — after October 20

AREA 2 - Spring Seeding:

Cool-season grasses — before April 20

Warm-season grasses — April 20 to May 20

Late Fall — Dormant Season Seeding:

Cool-season grasses only — after November 1

WILDLIFE AND WATERWAYS

North Dakota's game bird populations have been greatly reduced because of intensive farming. This is partly due to a lack of safe nesting cover. Grassed waterways not only reduce water erosion, they can provide safe areas for nesting game birds. If used for hay, delay moving until July 15 or later. This will give most eggs a chance to hatch.

DO'S AND DON'TS OF WATERWAY MAINTENANCE

- DO - Reseed waterway or areas with poor grass stand (8 plants/sq. ft. minimum).
- DO - Fertilize with nitrogen fertilizer to maintain grass cover.

- DO - Spray for weed control.
- DO - Control burrowing animals.
- DO - Mow and remove clippings each season.
- DO - Graze moderately if used for pasture.
- DO - Lift plow to stagger furrows along waterway edge.
- DO - Maintain sod buffer strip along edge of waterway.
- DO - Plug small wash-outs (Figure 8), and spread water flow with strawy manure, portion of clean hay or straw bales, or sod strips placed at intervals of 50 to 100 feet across waterway.



Figure 8 - Small wash-outs should be repaired and reseeded or sodded immediately. Note staggered furrows along waterway edges.

- DON'T - Use waterway as a farm road.
- DON'T - Drop plows or other implements into sod.
- DON'T - Plow into waterway edges each year.
- DON'T - Overgraze.
- DON'T - Use waterway when wet.
- DON'T - Leave open tillage furrow along edge of waterway.
- DON'T - Cut hay until July 15th if wildlife nesting cover is desired.

WHY WATERWAYS FAIL

Some reasons why grassed waterways installed without technical assistance have failed to control soil erosion are:

1. Not big enough
2. Water runs down slopes too fast
3. Improper use by land owner
4. Improper maintenance
5. Failure to get quick cover.

OBTAIN PLANNING ASSISTANCE

Contact your local Soil Conservation District for assistance in planning and designing your waterway.

COST-SHARE ASSISTANCE

Cost-share assistance may be available through the Agricultural Stabilization and Conservation Service (ASCS) under the Rural Environmental Assistance Program (REAP). The Soil Conservation Service can cost-share waterway installation and seeding if you are located in a designated Great Plains Conservation Program county.

(Photos courtesy Soil Conservation Service)