NORTH DAKOTA
ENGINEERING PRACTICE PLANNING GUIDE
GRASSED WATERWAYS

PRACTICE STANDARDS: 412 (Grassed Waterway), 410 (Grade Stabilization Structure), 362 (Diversion)

REFERENCES

In addition to Section IV of the Field Office Technical Guide, the following are recommended technical references for planning Grassed Waterways:

- NRCS Engineering Field Handbook, Part 650, Chapter 2: Estimating Runoff, Chapter 6: Structures, Chapter 7: Grassed Waterways, Chapter 9: Diversions.
- ND NRCS Hydrology Manual for North Dakota.
- Design of Rock Chutes, ASAE Robinson, Rice, Kadavy, 1998.
- NRCS Hydrology Manual for North Dakota.
- NRCS Soil Survey
- Manufacturer provided permissible shear stress/velocity data for turf reinforcement mat and erosion control fabric alternatives.

RESOURCE INVENTORY CONSIDERATIONS

1. Evaluate the extents and causal factors of the cropland erosion area. How long as erosion been occurring and at what rate has it progressed? Spend time onsite looking at adjacent surface drainages in the field, is it apparent why this particular drainageway is eroding and others aren't? Can it be attributed to changes in the drainage area, or changes in farming practices? Are there seasonal or perennial sources of water, such as springs or canal leakage, contributing baseflow? Has erosion progressed to the point where a grassed waterway is required, or would agronomic practices or some minor shaping/critical area planting be feasible alternatives?

2. Determine if a diversion upslope of the eroded area may be a practical alternative to route water to a stable area that has adequate capacity for additional flows. As outlined in the diversion standard, a quantitative evaluation of stability is typically required.

3. Complete an onsite investigation of soils within the potential extents of the grassed waterway. To determine an approximate size for the waterway during planning will require knowledge of USCS soil classification, and an estimate of plasticity index for cohesive soils. Field verification of Soil Survey data for engineering work is always necessary. Onsite work should also include an assessment of whether wetlands or cultural resources occur within the planned extents and if salinity issues may impact the feasibility of a waterway. Consider consulting with a soils scientist on larger, or more complex, sites during planning work.

4. Locate a suitably stable location for an outlet, or determine if a constructed grade stabilization structure will be required such as a rock chute or drop structure.

5. Evaluate the potential for vegetation reestablishment at the site. Is there adequate topsoil and moisture available to reestablish sod to the densities described in EFH Chapter 7? Will it be necessary to utilize mulch, import topsoil, incorporate composted manure, or utilize other amendments to ensure successful grass establishment at the site?

6. On particularly flat fields, it may be most accurate to measure the drainage area onsite with a GPS rather than utilizing electronic topographic data (LIDAR data ND NRCS has available is +/- 2 feet, USGS topographic data is +/- 20 feet).

<u>DEVELOPING AND EVALUATING ALTERNATIVES</u>

1. Complete a profile and cross section survey in adequate detail for preliminary sizing of the waterway and quantity estimates. At some locations, just a few cross sections with a hand level and tape combined with a centerline profile will generate adequate information. On larger projects, completing a full design survey at the planning phase of the project may be necessary to be able to adequately evaluate feasibility of the project.

2. Roughly determine the size of the drainage area using a topographic map, LIDAR data, GPS measurements in the field, or the current tool for watershed area in ArcMap. Determine the average watershed slope using the same data source. If the drainage area is 40 acres or less, no additional computations may be necessary if the criteria in the ND 412 standard is utilized directly. As with all of this computational work, input data may be refined in the final design so figures in the +/-20% range are acceptable for planning.

3. Compute an estimated 10-year frequency, 24-hour duration storm peak flow, typically utilizing the EFH-2 methodology on watersheds of less than 2000 acres (see documentation for other limitations).

4. Utilizing either the permissible velocity or the effective stress methodology, determine a preliminary stable cross section and slope that will match existing site conditions to minimize earthwork. Calculate approximate quantities utilizing an average end area method, EFT software, or Civil3D depending on the intensity of data collection determined adequate for planning work.

5. If a grade stabilization structure is required, complete preliminary computations as necessary to confirm feasibility and to complete quantity estimates. In the case of large waterways, multiple alternatives may exist with combinations of lower earthwork in the waterways with a larger grade stabilization structure versus more substantial earthwork with a smaller outlet structure. In those cases, several alternatives should be provided to the producer for their consideration.

6. Prior to sharing engineering alternatives with the producer, determine the engineering job approval authority for the practices involved. If you do not have adequate Planning (I&E) JAA for the practices, have your work reviewed by another individual in the NRCS who does to make sure you have correctly evaluated all of the options and determined feasible and implementable alternatives. At the point those are presented to a producer, the planner is making a commitment on behalf of the agency that we have provided technically sound, implementable engineering plans.

ASSISTING THE PRODUCER TO MAKE AN INFORMED DECISION

1. Put together some example detail drawings, photos, and/or portions of construction specifications that would be similar to the proposed project. Explaining exactly what following NRCS standards means in relation to construction of a particular project is very important, and anything you can use to communicate those to the producer is very helpful.

2. Estimate actual construction costs for the project, based on your knowledge of similar past projects (consult with other individuals as necessary). Calculate expected cost share, if planning is being done in conjunction with a program application.

3. Meet with the producer, and go through feasible alternatives discussing factors that will be important to them in their decision: installation requirements, initial investment, impacts on farming operations, lifespan, and maintenance needs. Certainly discuss potential for sediment inputs, and whether additional measures to control sediment deposition into the waterway are warranted. Encourage them to talk with potential contractors at this point, and offer your assistance, to estimate their potential out of pocket costs more accurately.

4. In the case of a program application, it is important that producers understand exactly how implementation would proceed and what restrictions they will operation under. Ensure that they understand that used materials are not acceptable, no construction may proceed until they have received final design drawings and specifications, and that NRCS will be onsite inspecting during construction to ensure compliance with the design.

5. Provide adequate time for the producer to make an informed decision. If they don’t have time to meet to discuss alternatives, they likely haven’t had time to adequately complete a good decision making process resulting commitment to implement the plan. Offer and be willing to defer an application, to allow time for a quality planning process and good decision making on the part of the producer.

Provide documentation of above steps in the conservation plan narrative, assistance notes, and/or in separate documentation in Part 5 of the plan folder. Job class for each practice involved, and the approving individual for planning work, needs to be included.