

NEBRASKA TECHNICAL NOTE

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The attached Agronomy Technical Note is on Planning Considerations for Establishing Continuous No-till Cropping Systems on Highly Erodible Land and is intended to provide guidance to conservation planners working with landusers who are implementing no-till farming practices on highly erodible land. This information is provided in order that planners can determine if the residue management system being considered by the landuser meets the NRCS requirements for no-till as documented in the 329 standard; if the no-till residue management system by itself will adequately control ephemeral erosion as described in Section I, Erosion Prediction of the FOTG; and additional considerations which the planner should discuss with the landuser concerning implementation of the system, such as: use of cover crops, soil fertility and operation and maintenance considerations.

Planning Considerations for Establishing Continuous No-till Cropping Systems on Highly Erodible Land.

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What is a No-till Cropping System?

A **No-till Cropping System** is any low disturbance cropping system where the Soil Tillage Intensity Rating (STIR) value as calculated by RUSLE2 including all field operations that are performed from harvest to harvest has an annual value of no greater than 10 for no-till and no greater than 15 for strip-till or direct seed. The tillage system used may not include any full-width tillage or row cultivation. Planting or fertilizer placement operations will not disturb more than 1/4 of the row width (1/3 of the row width for strip-till or direct seed).



Crop Sequence

Any sequence of crops is allowable in a no-till cropping system provided that the Soil Conditioning Index as calculated by RUSLE2 is positive.

Establishment -- General

The preferred method of establishing any cropping system on a sodbusted field is with little or no land shaping and native vegetation left intact in concentrated flow areas.

When existing vegetation has been disturbed to prepare a seedbed on sodbusted fields, cover conditions on critical slopes need to be analyzed using RUSLE2 to determine if additional treatment is required prior to planting the first crop.

If the calculated soil loss exceeds the allowable level, which typically must average to "T" for the sodbuster year and subsequent 2 years of crop production, then additional land treatment needs to be indicated in the

conservation plan. This could be a Cover Crop, Mulch or planting of a close-sown crop the first year of the rotation. The resulting soil loss with the additional treatment must not exceed the acceptable soil loss level.

If soil loss is still excessive, the planned crop sequence for the first 3 years may need to be modified, or, additional structural treatment, such as terraces, may be required.

Concentrated Flow areas

Concentrated flow areas may require treatment to control ephemeral erosion. This is especially true if they have been de-vegetated due to land shaping activities, or if, for any other reason, the existing vegetation is not clearly adequate to prevent gullying. Ephemeral gully erosion characteristics and prediction methods are described in FOTG: Section I: Erosion Prediction. In all cases where concentrated flow areas are present, it is advisable during the conservation planning process to conduct a field visit in order to determine actual site conditions including, channel slope, cross-section (channel capacity) and drainage area in order to complete the erosion analysis using either the Ephemeral Gully Erosion Prediction Worksheet or the Ephemeral Gully Erosion Look-up Tables.



For larger drainages or small channels where excessive flow rates are likely, concentrated flow areas should be seeded to a cover crop as soon as possible after de-vegetation occurs. Mulching in preparation of seeding Grass Waterways is another option. Channel shaping to produce a broad, shallow flow condition will reduce the potential for ephemeral erosion.

Cover Crops

The preferred cover crop for both concentrated flow areas and critical overland flow areas requiring treatment is fall-seeded rye, but other winter small grains may be substituted. Small grain should be seeded at a rate of 1 bu/ac drilled or 2 bu/ac broadcast no later than September 15 in Veg. Zones I & II and October 15 in Veg. Zones III & IV. If sodbusting is done in the spring, oats may be used at the same rate and should be planted as soon as possible following the sodbusting, but generally not earlier than March 15.

Cover crops may be chemically destroyed (glyphosate) when they have produced adequate growth to stabilize critical areas (12+ inches is optimal). In some cases, it will be necessary to apply the chemical after the first crop has been planted. Appropriate crop varieties need to be selected to allow for this scenario.

The effectiveness of cover crops planted on un-irrigated fields may be compromised if adequate soil moisture is unavailable (as may occur due to lack of rainfall).

Pest Management

Pest Management needs to be taken into consideration by the producer when implementing a no-till cropping system, especially if he/she is inexperienced with this approach.

Soil Fertility

Where **extensive earthmoving** is done to facilitate sodbusting activity, top-soil may be removed to some extent or totally lost. Unless top-soil is stockpiled and replaced, soil fertility becomes an important factor in cropping system (including cover crop) establishment.

Commercial and/or organic nutrients should be applied, as needed, based on a soil test and the recommendation of an agronomist.

Low disturbance fertilizer placement operations are required.

Off-site damages

Quality Criteria (FOTG Sec. III) requires that ephemeral gully and gully erosion be controlled to prevent off-site damages (due to sedimentation). The potential for off-site damages must be analyzed during the planning process. Consideration should be given to the following factors:

- Do concentrated flow channels leave the field at any point? (If not, no additional analyses is required)
- Is the drainage area above any concentrated flow channels excessive? (as per Ephemeral Gully Prediction worksheet or look-up table)
 - If yes, then one or more treatment options for controlling off-site damage must be included in the conservation plan (see **Treatment Options** below)
 - If not, then the No-till cropping system should be adequate conservation treatment for the unit; however, future modification of the conservation plan may be necessary as described in the **Maintenance** section of this note.

Treatment Options

Treatment options for controlling off-site damages:

- Grass Waterways
- Terraces
- Diversion
- Contour Buffer Strips
- Vegetative Barriers
- Filter Strip
- Field Border
- Sediment Basin
- Grade Stabilization structure

Choice of treatment option(s) will depend upon severity of the situation and landuser's preference.



Temporary measures to control off-site damages include cover crops, mulch and use of close-sown crops in rotation. The use of cover crops or mulch may be necessary during the initial implementation of a no-till cropping system (2-4 years) while crop residues accumulate and soil condition improves to the point that concentrated flow areas are stabilized.

The use of a close-sown crop, such as wheat, in rotation with row crops will accelerate residue accumulation and soil quality improvement and should be encouraged during the planning process.



Maintenance

During the implementation period the need for annual inspection and maintenance of critical eroding areas is required. Need for maintenance may be evidenced by the observation of reduced yield in critical areas, residue accumulations in depositional areas, and areas of crop loss or removal due to erosion.

Where the planting of the next crop will be possible without repairing damage from erosion, maintenance may consist of re-applying cover crops or mulch in critical areas.

Where erosion has occurred to the extent that it will hinder planting of the next crop, maintenance should be completed

immediately after harvest. This should be done with minimal tillage operations no deeper than the erosion which has occurred and no more than necessary to make planting possible followed immediately by drilling a cover crop (as above).

Use of a blade with rubber-tire compaction to shape critical areas followed by seeding is a preferred method to accomplish repair of damage from erosion.

Should annual maintenance needs still be required after the 3rd or 4th year of no-till implementation, the landuser should evaluate the cause and consider changes in the cropping sequence or additional treatment measures.

After the initial implementation period, if ephemeral gully erosion (typified by soil down-cutting greater than 4 inches deep) is occurring as the result of normal rainfall events (less than a 10-year storm), additional treatment is required. See **Treatment Options**. Additional treatment must be implemented by the end of the calendar year of the occurrence of ephemeral gullies. The conservation plan should be modified accordingly. If the result of a single, high-intensity storm event, ephemeral gullies should be shaped and seeded to a cover crop after harvest as described above (no plan modification needed).

Occasional maintenance activity (every 4-6 years) is to be expected even after the no-till system has been established.

Planning Documentation

Planning documentation should include the following:

- RUSLE2 documentation of soil loss, STIR and SCI
- Conservation plan map with critical areas identified
- Conservation plan and/or Planning Sheet 18
- Results of ephemeral gully analysis
- Design and installation requirements for structural practices
- Practice operation and maintenance requirements