DBC618 (Revised June 2024)

Land Judging in North Dakota


(NDSU photo)

Dave Franzen
Professor of Soil Science and
NDSU Extension Soil Specialist

This publication helps 4-H and FFA youth prepare for North Dakota land judging competition and for a lifetime of respect for land and its uses and conservation.

NDSU | EXTENSION

North Dakota State University
Fargo, North Dakota

Land is the principle natural resource in North Dakota. Although classified officially as an urban state due to the proportion of people residing in urban areas, compared with rural areas, agriculture is still a major source of income to North Dakotans.

Major topsoil losses in North Dakota have contributed to degradation of soil for use in growing crops and the increased use of fertilizer supplements to sustain agricultural production. However, there are many examples of topsoil restoration through persistent management of no-till cropping systems, diverse crop rotations and other soil health improvement practices.

This publication is designed to help young people have a greater appreciation of land and soil, so whether they return to the farm or have an interest in town or in the city, their life will be enriched with the knowledge acquired in the fun activity of land judging.

Importance of Soils

Soils are living systems composed of minerals, organic material, air, water and biological organisms. Most soils are about 50% mineral and organic, and about 50% pore space. Ideally for plant growth, about half of the pore space is water and half is filled with air.

The mineral portion of the soil is composed of different-sized particles of sand, silt and clay. Sand is the largest particle, clay is the smallest and silt is in between.

Sand is the gritty part of the soil. Soils with significant levels of sand, such as in the areas around Karlsruhe and many hilltops from Langdon to Wishek, feel gritty.

Soils with lots of clay, such as those around Fargo and Bottineau, are sticky feeling and difficult to mold in your hands. Silty soils, such as some just west and east of the Missouri River and in the Minot area, feel silky when wet. All soils are a combination of these particle sizes and are classified as seen in **Figure 1**.

Soil texture names such as silt loams, sandy loam, loams and clay loam all have limits of sand, silt and clay that define them. Skilled soil scientists can estimate the levels of sand, silt and clay to within a couple of percentage points of each just by feel. This takes years to perfect, however.

In this land judging activity, the levels of texture that contestants should learn are wider in scope. The judging categories are fine, moderately fine, medium, moderately coarse and coarse.

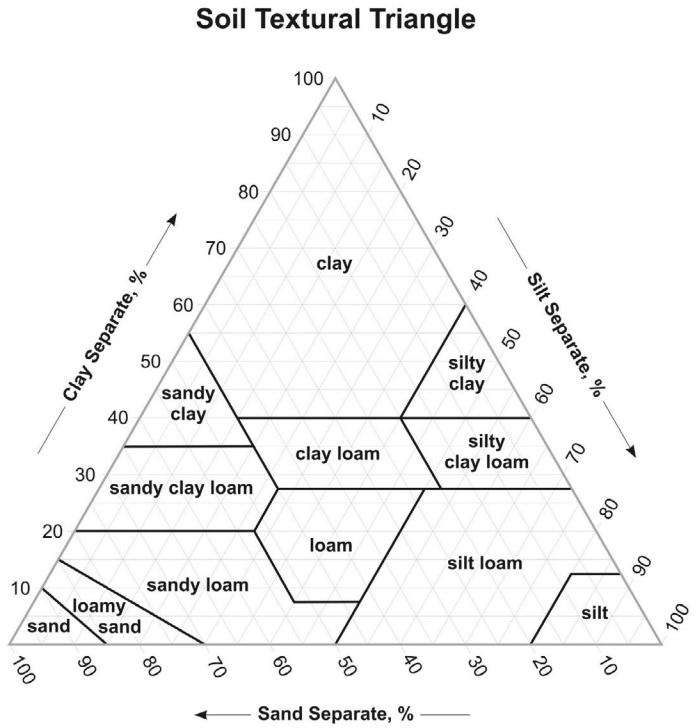

Figure 1. Sand, silt and clay in different soil textures.

The development of soils usually is continuous. Soils constantly are changing due to five soil-forming processes: living organisms (vegetation, bacteria, bison and more), topography (landscape structure), parent material, climate and time.

With variations in climate and time, soils change. Soils in North Dakota developed on parent materials consisting of residual rock remains west of the Missouri River, glacial drift in the central and northwest, lakebed sediments in the east and north-central, and small areas of wind-blown sediments and stream/riverbed sediments. Parent materials may be 60 million years old west of the Missouri River or as young as 5,000 years old in the east. With a healthy amount of development from hundreds to thousands of years, a typical soil may look like **Figure 2**:

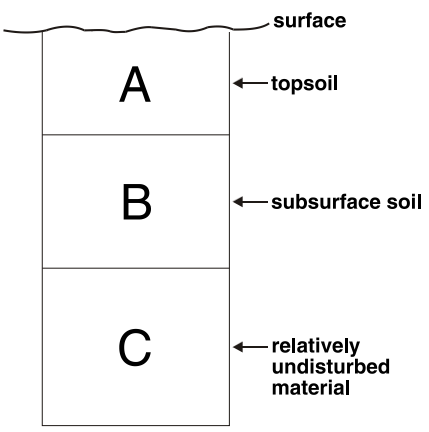

Figure 2. A generalized soil.

Soil usually develops in layers, called horizons. We call the upper surface, usually enriched in organic matter from decayed plant and animal materials, the A horizon, or in the contest, surface soil. Below this layer, a zone often enriched in clay, salts, carbonates or changed in some manner chemically is called the B horizon, or in the contest, subsurface soil. Below this, occasional roots may be found, but the soil is largely unaltered parent material — the C horizon.

Soils are essential for plant life. Soils provide the means to store and release water through a growing season, serve as a reservoir for plant nutrients such as nitrogen and phosphorus, and provide a means of support so plants can grow upright and capture sunlight and air.

Well-structured soil also is important because it provides the right amount of strength to resist wind and rain from carrying away the productive part of the soil. Well-structured soil also provides pore space for water to enter the soil and for air exchange so that roots can breathe.

Land Judging

Land is evaluated based on land capability classes used by the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS). The U.S. has eight land classes, seven of which can be found in North Dakota.

Cropland

Class I	Few limitations, level, deep, well-drained
Class II	Gentle slopes, moderate management limitations, including climate
Class III	Moderate slopes, severe management limitations
Class IV	Very severe management limitations

Wetland

Class V	Wetland, woodland, wildlife habitat

Pastureland

Class VI	Improved range, pastureland
Class VII	Range and pastureland, severe limitations

Badlands

Class VIII	Rock outcrops, marshes, barren lands, wildlife, recreation

The competition may have Classes II, III, IV and VI, but not Class I, V, VII and VIII.

Preparation for Competition

Contestants must be competent in three skills: texturing, estimating slope, and determining the depth of soil and topsoil thickness. The contest components are derived from these three skills.

A. Topsoil and Subsoil Texture

A container of topsoil and a container of subsoil will be provided at each pit for the contest. Regardless of what the contestant finds in the pit, these are the textures from which the rest of the card answers will be based. Fourteen soil textures are recognized in the USDA NRCS Soil Survey Manual. **For the contest, these are combined into the following larger groupings:**

Textural Group	USDA-NRCS Classification
Coarse	Includes sands, loamy sands
Moderately coarse	Includes sandy loam, fine sandy loams
Medium	Includes very fine sandy loams, loam, silt loam, silt
Moderately fine	Includes clay loam, sandy clay loam, silty clay loam
Fine	Includes sandy clay, silty clay, clay

The texturing procedure: Each participant should work out a method he/she is comfortable with and can perform consistently.

Generally, texture is conducted on moist soil. Moisten soil a little as you work it with your fingers in one hand. Feel for grittiness, smoothness or stickiness. Try to form a mudball.

Then try to ribbon the soil with your fingers by pressing the mudball out between your thumb and forefinger. You can estimate the texture by evaluating how the mudball forms and how well it makes a ribbon.

Estimating Soil Texture by Feel

Start: Take about 1 tablespoon of soil and wet it by adding water in small amounts (don't drown it). Knead it with your fingers in one hand until the soil is plastic-like and moldable (if possible) like moist putty.

Contestant determines textures. (NDSU photo)

Step 1. Try to form a ribbon of uniform thickness and width by gently pushing the soil between the thumb and forefinger. Allow the ribbon to emerge and extend over the finger until it breaks from its own weight (if it will).

A: Soil does not ribbon – coarse texture

B: Soil does ribbon – what is the length before it breaks?

B1: More than 2 inches long – ***fine texture***

B2: 1 to 2 inches long – ***moderately fine texture***

B3: Less than 1 inch long – go to Step 2

Step 2. Excessively wet a small pinch of soil in your palm and rub with your forefinger.

C: Is the soil gritty?

C1: Yes – ***moderately coarse texture***

C2: No – ***medium texture***

More Texture Hints

Coarse-textured soils are loose and friable (easily crumbled), and individual grains can be seen and felt easily. When squeezed between the thumb and forefinger, the soil feels gritty and will not ribbon or stain fingers. Squeezed when dry, it will fall apart as pressure is released. When moist, a mold may form like a sand castle, but it is unstable and crumbles as the soil is handled further.

Moderately coarse-textured soils feel gritty but contain enough silt and clay to make moist soil hold together. The individual sand grains can be seen and felt. Squeezed when dry, it will form a mold that breaks easily upon further handling. If squeezed when moist, it forms a mold that can be handled carefully without breaking. It forms no ribbon, or if it does, the ribbon is very poor.

Medium-textured soils have a slightly smooth or velvety feel when moist. Squeezed when dry, the soil forms a mold that will bear careful handling. The mold formed by squeezing when moist can be handled freely, without breaking. When moistened soil is squeezed out between thumb and forefinger, it will form a poor ribbon with a dull surface.

Moderately fine textured soils usually break into clods or lumps when dry. When moist soil is squeezed out between the thumb and forefinger, it crushes with some effort. It will form a short (1- to 2-inch-long), well-formed ribbon with a shiny surface; the ribbon will tend to break or bend downward. The sandy clay loam texture has a slightly gritty feel when moist.

Fine-textured soils form very hard, massive lumps or clods when dry and are quite plastic and sticky when wet. When the moist soil is squeezed out between the thumb and forefinger, it crushes with considerable effort and will form a long ribbon (2-plus inches) that will support itself. The sandy clay texture also may have a slightly gritty feel when moist.

B. Permeability (Internal Drainage)

Permeability always is based on the soil texture of the subsoil. Internal drainage is important because it is an indication of the ease of the downward flow of water. Poor internal drainage means that runoff potential is high and soils may be saturated with water for long periods of time. In contrast, excessive drainage promotes groundwater contamination with pesticides and nutrients, and the soils tend to be droughty and require more irrigation water than other less permeable soils.

- **Very slow**

  Dull olive or gray subsoil, mottling or blotching in the surface 10 inches of soil, fine soil texture, evidence of platy structure in the surface horizons and/or an impermeable limiting layer. Soils of this drainage class usually occupy level areas or depressions that are ponded frequently. Any soil with fine texture also falls within this class.

- **Slow**

  Moderately fine to fine-textured subsoil, evidence of platy structure in surface horizons, slowly permeable limiting layer and mottling or blotches of red, brown or gray occurring within 20 inches of the surface

- **Moderate**

  Soil profile has bright colors throughout, not gray or dull olive, moderately coarse to moderately fine textures, blocky or prismatic structure in subsoil, granular structure in surface soils, absence of a limiting layer

- **Rapid**

  Coarse-textured, loose, open structure and bright colors. A shallow soil with a limiting layer of clean sand or gravel may be classified as excessively drained if, under normal conditions, the soil would not be able to hold enough water for good crop production (no evidence of a perched water table; no floor exists under the coarse layer that would hold water in the root zone).

C. Depth of Soil

Depth of soil refers to the total thickness of the surface and subsurface horizons (A, B and C) that are favorable for plant roots. The distance from the soil surface to any limiting layer determines effective depth. If none exists, the assumption is that the depth is the depth of the pit.

- **Limiting Layers**

  The presence of a limiting layer is indicated by the absence of roots below a certain depth. The North Dakota contest is conducted the first week in August, so pasture grasses, forbs and annual crops root to at least 3 feet in depth, and many root far below that. The absence of roots and particularly an accumulation of roots above a depth are clear indications that the root depth is restricted, giving the depth of productive soil.

- **Gravel Layers**

  A layer of loose sand or gravel – A discontinuity more than 3 inches thick will be dry enough in many years to restrict and limit root growth to deeper depths.

- **Clay Pans**

  In the development of North Dakota soils, some clay particles move downward to form a clay pan (argillic) horizon. The clay pan is usually underneath a more friable surface soil from which the clay was removed.

- **Presence of Columnar Structures**

  In some soils, the presence of sodium destroys the productive structure of clays, dispersing them and forming columnar structures. These structures often are overlaid with a thin, platy structure layer. Columns often are quite massive but difficult to see when wet. Root growth often will be restricted to the outer surface of the column, being unable to penetrate the interior of the structures.

- **Bedrock**

  Any bedrock (shale, sandstone, limestone, other) beneath a surface/subsurface soil is a limiting layer. Depth of soil for the land judging is determined in the following categories:

  1. **Deep:** Soils deeper than 36 inches
  2. **Moderately deep:** Soils between 20.1 and 36 inches deep
  3. **Shallow:** Soils with an effective depth of 10 to 20 inches
  4. **Very shallow:** Soils less than 10 inches deep

Hints for Soil Depth

Look for roots or evidence of old root channels. What might look like a limiting layer because of stratified gravel or other textural layers may or may not be root-limiting. A true limiting layer will have roots concentrated at its surface and no roots penetrating through it or into it, or at least only a rare root, compared with the root density above it.

D. Slope

For the contest, stakes will be placed 100 feet away from each other. The slope from the lowest stake to the highest stake will be estimated. No transits or other commercial slope-determining devices may be used except by the contest judges. Participants must determine a method comfortable for them to use to estimate slope consistently.

The following are designations for contest purposes in North Dakota:

1. Nearly level 0%–3%
2. Gently sloping 3.1%–6%
3. Moderately sloping 6.1%–9%
4. Strongly sloping 9.1%–12%
5. Steep 12.1%–15%
6. Very steep ..... 15.1% or higher

E. Present Topsoil Thickness

Contestants should carry a pocketknife, nail or other similar implement to estimate the present topsoil thickness. By slicing the soil face from the surface downward, a difference in resistance is encountered when passing from the surface to the subsurface layer of soil.

Sometimes this resistance is quite obvious and strong, while in other soils, it is more subtle. This information then is used along with the original topsoil thickness given at the pit on the large information card to estimate the past erosion.

Topsoil is important because it is much more productive than subsoil. Topsoil has been altered by plants, animals and microorganisms into a rich, relatively permeable livable environment for plants. When erosion takes away this productive capacity, crop growth, along with the value of the land, is greatly reduced.

In NDSU testing in similar original soils, soils with no topsoil yielded about 50% compared to land with some topsoil remaining. Given the shallow nature of much of the topsoil in North Dakota, the loss of even an inch affects production.

Categories of topsoil thickness for the land judging contest:

1. 0–6 inches
2. 6.1–12 inches
3. 12.1–18 inches
4. 18.1–plus inches

F. Past Erosion

Past erosion is determined by dividing present topsoil thickness (A horizon) by the original topsoil thickness information for the pit given at the site.

Erosion may be caused by wind or water. In North Dakota, most erosion in the past 120 years has been due to wind. Locally, however, poor choices of tillage options and overgrazing have contributed to water erosion from the heavy thunderstorms the area is subjected to almost every year.

1. **None to slight** – Less than 25% of the surface soil removed; no gullies present
2. **Moderate** – 25% to 75% of the surface soil removed; no gullies present
3. **Severe** – Greater than 75% of the surface soil removed; gullies may be present
4. **Very severe** – Greater than 75% of the surface soil removed, with frequent uncrossable gullies present

Contestants determining slope. (NDSU photo)

Formula for determining percent erosion on the judging card:

$$\% \text{ Erosion} = \frac{\text{Original topsoil depth} - \text{Present topsoil depth}}{\text{Original topsoil depth}} \times 100\%$$

G. Wind Erosion Hazard

Soils that break down easily into fine particles or sand grains when subjected to wetting and drying, freezing and thawing or through tillage are moved easily by wind and thus subject to wind erosion. In addition, the presence of carbonates at the soil surface will cause soil not to aggregate into larger, more stable structural units and will increase the hazard of wind erosion.

Susceptibility	Texture and Soil Condition
1. Low	Medium, moderately fine
2. Moderate	Medium, moderately fine with presence of surface carbonates, moderately coarse, fine
3. High	Coarse
4. Very high	Coarse with thin surface soil (less than 6 inches)

H. Water Erosion Hazard

Steepness, length of slope, shape of landscape, past erosion and surface texture all are involved in the rate of water runoff and the susceptibility of land to water erosion. For the contest, only the following need be considered:

Susceptibility	Slope and Condition
1. Low	0%–3%
2. Moderate	3.1%–6%
3. High	6.1%–9% or greater than 9% with none to moderate past erosion
4. Very high	More than 9%, with severe or very severe past erosion

Smoothing of soil after a dust storm in the Red River Valley due to soil movement and soil loss. (Photo courtesy of A.C. Cattanach, retired head agriculturalist, American Crystal Sugar Co.)

I. Presence of Soluble Salts

Soluble salts greatly influence the productivity of North Dakota soils. Salts are present because of the generally poor drainage in many North Dakota soils, high water tables and the soil's geologically young age.

Climate also is a major factor. Evaporation and transpiration of water during the growing season usually are higher than rainfall, so salts tend to be drawn to the soil surface. The water evaporates, but the salts do not. Salts come and go, depending on the depth of the water table. If salts are near the surface of the soil, it means the water table is only about 3 to 5 feet deep.

In the contest, salts in the topsoil and subsoil count toward the presence of soluble salts. Look around the contest-staked area for indicator plants. These plants, such as kochia and foxtail barley, thrive in these soils when other plants do not. Also look for soil pore space and root channels filled with whitish minerals. Sometimes a whitish cast is visible at the soil surface. If this whitish layer has depth, it is called a crust. If the whitish cast has no depth, it is not a crust.

Salt-affected soil with indicator plants and surface whiteness. (NDSU photo)

Guidelines to Aid in Judging Presence and Severity of Salinity

Classification	Condition
1. Not affected	No evidence of salinity
2. Slight	A few whitish crystals detected at the soil surface or in the surface soil profile; few indicator plants
3. Moderate	Whitish crystals or crusts present commonly at the soil surface or in the soil surface profile and/or patches of indicator plants in the contest area
4. Severe	Whitish crystals and crusts abundant at the soil surface and/or in the soil surface profile and/or numerous indicator plants

J. Surface Runoff

This is an estimate of the runoff potential for the soil from precipitation. It is based on slope and surface texture.

Runoff Potential	Condition
Very slow.....	Water moves off the land so slowly that crops may drown out in heavier soils. In coarse-textured soils, runoff is slow due to the extreme permeability of the soils. Very slow landscapes include those that are nearly level or have depressions (concave areas) with 0% to 1% slopes. Coarse topsoil textures also put the soil into this category at any range of slope because of excessive permeability.
Slow.....	Water moves off the land slowly; crops occasionally are damaged with standing water. Landscapes are nearly level on 0% to 1% slopes.
Moderate	No standing water problems. Found on 1.1% to 9% slopes.
Rapid.....	Water runs off at an excessive rate. Excessive runoff is a high erosion hazard and does not allow water to infiltrate soil to sustain plant growth well. Landscapes have greater than 9% slopes. Also includes fine-textured soils with greater than 3% slopes.

Classification of Soils in Land Classes

Some soil scientists are responsible for classifying land into capability classes to guide people into making better decisions regarding potential land use. For example, performing tillage on the side of a steep hill is possible, but the topsoil may wash away after the next rainy season. A sandy, high-carbonate soil can be plowed in preparation for seeding, but if the weather is dry and the wind is strong, huge amounts of topsoil can be lost in a matter of hours.

On the scoring card for land judging, only one capability class is marked. The class of a soil usually is the lowest class contained in the following nine factors. The only exception is a moderately coarse texture on a moderate slope, both of which are Class III designations, but when present together result in a Class IV soil.

In North Dakota, the best class possible is Class II because of our short growing season. In the national contest in Oklahoma, Class I soils are possible because of the long growing season.

Wetness will be stated if appropriate on the contest pit. If no wetness is indicated, ignore it as a relevant factor. If the North Dakota contest is held along a river or in the Red River Valley, wetness probably will be an issue.

General Guide for Selecting Land Capability Classes

Cultivated Land

Class I

Soils in Class I are suited for cultivation during long periods of time and have no limitations that restrict their careful use. They are deep, nearly level, well to moderately well drained, subject to no more than slight erosion and in a climate that will support long-season (greater than 110 growing degree days) crops consistently.

The best North Dakota soils have no restrictions keeping them out of Class I except climate. Climate is a restriction that keeps all North Dakota soils from achieving Class I on a national scale. Class I soils are possible in the national competition.

Major Factors Keeping Land From Being Class I

Factor	Condition	Best Possible Class in U.S.
Climate	North Dakota climate factors	II
Surface texture	Fine	II
	Moderately fine	I
	Medium	I
	Moderately coarse	III*
	Coarse	IV
Depth	Deep (>36 inches)	I
	Moderately deep (20.1-36 inches)	II
	Shallow (10.1-20 inches)	III
	Very shallow (0-10 inches)	VI
Slope	Nearly level (0%-3%)	I
	Gently sloping (3.1%-6%)	II
	Moderately sloping, (6.1%-9%)	III*
	Strongly sloping (9.1%-12 %)	IV
	Steep and very steep (>12.1%)	VI
Past erosion wind or water	Low	I
	Moderate	II
	Severe	IV
	Very severe	VI
Erosion hazard wind or water	Low	I
	Moderate	II
	High	IV
	Very high	VI
Saltiness (Salinity)	Not affected	I
	Slight saltiness	II
	Moderate saltiness	III
	Severe saltiness	VI
Surface runoff	Very slow	II
	Slow	I
	Moderate	I
	Rapid	IV
Permeability	Very slow	II
	Slow	I
	Moderate	I
	Rapid	IV
Wetness	With surface drainage or possible surface drainage	II
	Not practical to surface drain, cropping possible greater than 50% of the time	IV
	If a site has a wetness issue, wetness specifically will be stated on the site card.	
	Wetness with no reference to probability of cropping will refer to a surface drainage.	
	Class II. Probability of cropping indicated on the site card should be used to determine whether the site is Class IV or not.	

* Moderately coarse texture plus moderate slopes in a soil result in Class IV soil.

Class II

Soils in Class II are suited for cultivation during a long period of time, but they may have some hazards and limitations, such as gentle slope, slight erosion, moderate wetness and shorter growing season, and require moderate conservation practices to sustain soil health. These are excellent soils for crop production in North Dakota.

Class III

Soils in Class III are good for cultivated crops but have severe limitations that reduce the choice of crop and/or require special conservation practices that are more difficult to apply. Special conservation measures will be needed to limit erosion.

Class IV

Soils in Class IV may or may not have erosion hazards, but they have other limitations that make them unsuitable for crop production. Limitations are difficult to overcome. If the soils are planted to annual crops, the soils should be managed with intensive conservation practices such as strip tillage or no-till systems.

Noncultivated Land

Class V

Wetland soils are Class V and will not be in the competition.

Class VI

Soils in Class VI have severe limitations, such as steep slopes, severe erosion, shallow soils and rockiness. They are unsuitable for cultivation, and their use is limited to pasture, range, woodland or wildlife habitat.

No-till

(Photo courtesy of Boomer Patterson, Bottineau, N.D.)

Interpretations of Land Treatments

Explanation of Scoring for Part 2 of the Land Judging Contest

Part 2 of the land judging contest is worth 30 points. These are divided equally into three 10-point sections: vegetative treatments, mechanical treatments and fertility. If only the correct recommendations are checked, full credit is given. If an incorrect recommendation is checked, 2 points are deducted from the score. If a correct recommendation is not checked, 2 points are deducted from the score. If more than five recommendations are missed, the score is zero. No negative scores are given.

1. **1. Use soil-conserving and/or soil-improving crops**
   This should be checked on all Class I, II, III or IV soils. Check every fourth or fifth year for Class I, every third year for Class II, every second year for Class III and every year for Class IV.

   Soil-improving crops are those that are grown continually (without fallow) and include crops containing high levels of residue, such as corn or wheat, but also crops that provide nitrogen to subsequent crops, such as soybeans, field peas and lentils. These kinds of crops help replenish the soil with carbon and nitrogen, which results in greater organic matter.

2. **Manage residue**
   This should be used on all cropland, classes I-IV. Commonly used practices include no-till, stubble mulching, no stubble burning, no straw removal, minimum tillage and one-pass seeding operations with minimal soil disturbance.

3. **Practice conservation tillage**
   This is appropriate on Class II, III and IV soils. These practices leave the largest amount of residue possible on the soil surface to help prevent and slow erosion due to wind and water. No-till is the ultimate conservation tillage. Plowing and deep-ripping are most disruptive.

4. **Establish recommended grass mixture**
   This is appropriate for Class VI soils and all other soils with severe erosion. To be severely eroded, soils must have had 75% or more of the original topsoil removed since the land was brought into cultivation. Original topsoil depth will be provided at the contest pit site sign.

5. **Use proper pasture and range management**
   This is appropriate for Class VI soils. Proper pasture and range management includes protection from burning, using proper stocking rates, rotational grazing, and controlling brush and trees.

6. **Plant pattern type tree windbreaks**
   This is recommended for Class III and IV soils with moderately coarse textures and soils having a high wind erosion hazard. The practice uses several types of tree and shrub species within plantings and multiple-row belts of trees and shrubs.

   Exceptions:
   – Coarse textures in the subsoil
   – Moderate or severe salinity

7. **Use cover crop or annual buffer strips**
   This practice is recommended on Class III or IV moderately coarse soils with a history of summer fallow or in certain lower-residue-contributing crops, including dry edible beans, potatoes, corn for silage and sugarbeets. Planting corn buffer strips often is practiced in dry beans because some herbicides used on dry beans do not affect the corn, and the standing corn after dry bean harvest provides wind erosion protection. Seeding cover crops following potatoes or sugarbeets helps hold soil in place in the late fall, winter and early spring. Flax, corn or sunflower strips should be seeded about every 80 feet apart.

   Mark this practice if use of the field is summer fallow (not chem-fallow), potatoes, dry beans, corn for silage or sugarbeets, which have a potential for wind erosion, and any field whose surface texture is moderately coarse or coarse, or has any texture with surface carbonates.

8. **Use only for wildlife or recreation**
   This recommendation is appropriate for Class VIII land. Class VIII land will not appear in the North Dakota competition.

9. **Use tame-grass crop rotation**
   This is appropriate to choose on moderately coarse or coarse Class IV soils. These soils have erosion hazards great enough only to be solved by including a grass in the rotation two years out of five, or four years out of 10. No-tillage is the recommended tillage practice on all Class IV soils.

Mechanical Treatments

Do not mark any mechanical treatments for Class VI soils.

10. Use no summer fallow

Choose this option on all moderately coarse or moderately coarse-textured soils. The probability of any meaningful, profitable water storage or nitrogen contribution from fallowing these texture categories is minimal.

Use of no summer fallow also is appropriate for the following conditions:

a. **Any soil with evidence of salinity or soils with wetness indicated on pit site sign** – Use of fallow under these circumstances results in even higher salinity and higher water tables. The two usually are linked.
b. **Soils with high susceptibility to erosion** – These include soils with carbonates at the surface and steeply sloping soils.
c. **Soils with poor moisture storage** – These include soils with moderately coarse or coarse surface and subsurface textures and shallow soils.
d. **Soils with severe past erosion** – These are extremely fragile soils with little additional productive soil to lose.

11. No fall tillage recommended

Whether to till depends on the conservation practices necessary to sustain the soil and on the texture of the soil, which might prevent highly disruptive spring tillage, such as spring chisel plowing, from being effective.

No fall tillage is recommended under the following circumstances:

a. A field that will be summer fallow the following year
b. From Bismarck west, where stubble is needed to hold snow on the field for moisture
c. Class IV soils
d. Coarse-textured soils subject to wind erosion
e. Soils with carbonates at the surface

12. Fill, shape, seed grass waterways

This recommendation is appropriate to choose when active gullies are within the marked fields. Gullies should be at least 6 inches deep and 12 inches wide. Irregularities in fields that are grazed or cultivated are not considered in need of control.

13. Establish diversion terraces

This recommendation is appropriate for steep slopes. Diversion terraces reroute water from higher elevations to well-established and constructed waterways, reducing the power of the water and the erosion it might produce.

14. 14. Practice wind-strip cropping

This recommendation is appropriate for moderately coarse or coarse soil types and soils with free carbonates at the surface. Strips of crop alternate with fallow or crops with low residue so that during the growing season and following harvest, the taller residue crop protects the low-residue strips from the power of the wind.

15. Practice contour-strip cropping

This recommendation is appropriate if the slope of the landscape where the site is placed is long and even. It is best suited on medium, moderately fine and fine-textured soils in slopes from 3.1% to 9%.

16. No-till production

This recommendation is appropriate for Class IV soils, and moderately coarse and coarse-textured Class III soils. Checking this box for certain Class III and Class IV soils does not mean that in real life no-till production would not be useful for many other soils in Class I, II or III, but only that the soils with this specific recommendation are most in need of this system of tillage.

Fertility

These recommendations apply to the intended crop/crop to be planted, not the present crop.

17. Use soil amendments; check if any of the following are less than adequate.

pH – If soil pH is below 6.3, the use of finely ground limestone would be appropriate to increase soil pH. In North Dakota, lowering the pH if it exceeds 7 is not practical. The result of the application of acid-producing substances in high-pH soil would be gypsum, which would create a salt problem and poorer crop growth than the original soil condition.

N – This recommendation is appropriate if the pit information shows nitrogen is deficient and a nonlegume crop is indicated. Legume crops include alfalfa, soybeans, field peas, lentils, chickpeas and dry edible beans. These crops, properly inoculated with nitrogen-fixing bacteria at seeding, produce their own nitrogen and for contest purposes do not require supplemental nitrogen.

P – Check if soil test levels are below 16 parts per million (ppm) for phosphorus.

K – Check if soil test levels are below 150 ppm for potassium.

Setting Up and Holding a Land Judging Contest

Planning

The coordinator needs to meet with interested leaders and agencies. Determine who is willing and able to help, and assign tasks. As soon as the contest date is set, contact judges, helpers and scorecard graders. When planning, consider the number of contestants, teams, coaches and helpers who will be participating.

A team consists of three, four or more contestants, with the three highest scores from a team tabulated as the official team score.

Site Selection

Two sites should be selected for the judging contest. The sites should be all-weather, allowing easy walking for the participants, even if a downpour occurs the day before the event. The sites also should be accessible to vehicles, including buses, in wet conditions .

The first site is used for practice the morning of the contest. The second is used for the contest. The contest pits should be away from view of a main road so that they are not available for practice until the time of the contest.

Locate farms where different soils are present to judge. The more diversity, the better, but all pits, particularly contest pits, must be within an easy, 5-minute walking distance of each other. Obtain permission from the landowner and also the tenant if the land is leased.

Preparing the Field Sites

For the practice site, try to select pit sites that are similar in some respects to the contest pits. Select four to six practice pits.

A perfect pit is about 16 feet long, 3 to 4 feet wide and 4 feet deep. The pit should slope up at each of the long ends. If the land has a limiting layer such as bedrock, a smaller area is appropriate. A pit should accommodate at least two contestants simultaneously.

In addition, because the soil texture of the practice site might not reflect soil textures at the contest site, the contest organizers are charged with providing a bucket of each possible soil texture – coarse, moderately coarse, medium, moderately fine and fine textures – and make these available near Pit 1 of the practice sites.

Preparing a contest pit. (NDSU photo)

For the contest site, dig four pits, similar to the design of the practice pit. The judges should come to the sites within two days of the contest and select a relatively uniform soil profile about 1 foot wide somewhere in each pit. This area is designated off limits to contestants with string or tape affixed to the left and right side of the area with nails or stakes. Contestants may dig, scrape, cut or otherwise physically investigate any area to the left or right of the off-limits area, but they are not allowed to do anything but view the area itself.

Take representative topsoil and subsoil samples from the pit and place them in well-marked containers for the participants to texture. These should be sheltered from the weather or taken off-site until the contest day. Water bottles and a water refill supply should be available at each pit for use in texturing.

Practice pit. (NDSU photo)

The "field area" around each pit should be marked with flags or stakes and should be at least 100 feet by 100 feet, but it need not be square. Two especially well-marked stakes should be set 100 feet apart for estimating slope. Judges will determine slope exactly using a transect or another measurable, repeatable method and will record the slope in the official scorecard area. Before leaving the area, judges must fill out the official scorecard completely for each site.

Site Card

A card should be written and staked plainly near the pit with information not available to the contestants, such as site number, soil test levels, original topsoil thickness, frequency of flooding and water table depth.

Conducting the Contest

Register teams by using consecutive numbers and team members by using 1, 2, 3, 4. Have sets of land judging cards prepared ahead of time if you expect a large number of contestants. When the contest begins, contestant No. 1 will go to site 1, contestant No. 2 will go to site 2 and so on. Allow 20 minutes for each site.

An official should be at each site prior to the contest start. Use a signal to start. A car horn or another type of large noise producer that otherwise would not be heard in the area would be appropriate.

When the judging time limit is over, give the signal again. The contestants must turn in their cards to the official at the site, who keeps the cards until another official comes by to collect them.

Provide a 5-minute interval for travel between sites. Group 1 then goes to site 2. Group 2 goes to site 3, Group 3 goes to site 4 and Group 4 goes to site 1. This round-robin continues until each group has judged all four sites.

A no-touch zone marked off in a pit. (NDSU photo)

General Contest Rules

1. No talking when at an official site. No comparing cards or copying off another's card. Contestants will face consequences for cheating.
2. Clear plastic clipboards are allowed.
3. No water bottles. Water will be provided.
4. No bubble vile, tape measure or other measuring devices are allowed.
5. Contestants can have the following pieces of equipment:
   a. soft lead writing pencil with a good eraser
   b. knife or nail
   c. towel or rag
   d. contest cards
   e. clipboard with no script written on it
6. The land judging handbook shall be used to resolve contest differences and should be used in setting up and conducting all contests.
7. **Decisions of the judges will be final.**

Scoring and Grading

Categories on the scorecard carry different values depending on the judges' evaluation of its relative importance. The total points possible for each pit is 100 points.

North Dakota Land Judging Scorecard

Part I - Land Class Factors

Indicate your answer by placing an X in the proper space.

A. Surface Texture *(6 points)*
( ) 1. Coarse
( ) 2. Moderately coarse
( ) 3. Medium
( ) 4. Moderately fine
( ) 5. Fine

B. Permeability (internal drainage) *(6 points)*
( ) 1. Very Slow
( ) 2. Slow
( ) 3. Moderate
( ) 4. Rapid

C. Depth of soil *(6 points)*
( ) 1. Deep
( ) 2. Moderately deep
( ) 3. Shallow
( ) 4. Very shallow

D. Slope *(6 points)*
( ) 1. Nearly level 0%-3%
( ) 2. Gently sloping 3.1%-6%
( ) 3. Moderately sloping 6.1%-9%
( ) 4. Strongly sloping 9.1%-12%
( ) 5. Steep 12.1%-15%
( ) 6. Very steep 15.1+%

E. Present topsoil soil thickness *(5 points)*
( ) 1. 0-6 inches
( ) 2. 6.1-12 inches
( ) 3. 12.1-18 inches
( ) 4. 18.1+ inches

F. Past erosion *(4 points)*
( ) 1. None to slight
( ) 2. Moderate
( ) 3. Severe
( ) 4. Very severe

G. Wind erosion hazard *(4 points)*
( ) 1. Low
( ) 2. Moderate
( ) 3. High
( ) 4. Very high

H. Water erosion hazard *(4 points)*
( ) 1. Low
( ) 2. Moderate
( ) 3. High
( ) 4. Very high

I. Saltiness (salinity) *(4 points)*
( ) 1. Not affected
( ) 2. Slight
( ) 3. Moderate
( ) 4. Severe

J. Surface runoff *(5 points)*
( ) 1. Very slow
( ) 2. Slow
( ) 3. Moderate
( ) 4. Rapid

K. Major factors that keep area out of Class I *(10 points)*
( ) 1. Climate
( ) 2. Surface texture
( ) 3. Depth of soil
( ) 4. Slope
( ) 5. Past erosion
( ) 6. Erosion hazard
( ) 7. Saltiness (salinity)
( ) 8. Surface runoff
( ) 9. Permeability
( ) 10. Wetness

L. Land Capability Class *(10 points)*
( ) 1. Class I
( ) 2. Class II
( ) 3. Class III
( ) 4. Class IV
( ) 5. Class V
( ) 6. Class VI
( ) 7. Class VII
( ) 8. Class VIII

SCORE _____

North Dakota Land Judging Scorecard

Part II – Recommended Land Treatments

Indicate your answer by placing an X in the proper space.

Vegetative Treatments – *10 points; 2 points deducted for each incorrect answer or omission*

1. Use soil-conserving and/or soil-improving crops
( ) a. every fourth or fifth year
( ) b. every third or fourth year
( ) c. every second year
( ) d. every year
( ) 2. Practice crop residue management
( ) 3. Practice conservation tillage
( ) 4. Establish recommended grass mixture
( ) 5. Use proper pasture and range management
( ) 6. Plant pattern-type tree windbreaks
( ) 7. Use cover crop or annual buffer strips
( ) 8. Use only for wildlife or recreation
( ) 9. Use tame grass/crop rotation

Mechanical Treatments – *10 points; 2 points deducted for each incorrect answer or omission*

( ) 10. Use no summer fallow
( ) 11. No fall tillage recommended
( ) 12. Fill, shape and seed waterways
( ) 13. Establish diversion terrace
( ) 14. Practice wind-strip cropping
( ) 15. Practice contour-strip cropping
( ) 16. No-till production recommended

Fertility – *10 points; 2 points deducted for each incorrect answer or omission*

( ) 17. Apply lime
( ) 18. Apply nitrogen
( ) 19. Apply phosphorus
( ) 20. Apply potassium
( ) 21. Fertilizer not needed

SCORE _____

Site No. _____ Your name or number _____

Score Part I _____

Score Part II _____

Total score _____

This handbook is designed to help young people have a greater appreciation of land and soil, so whether they return to the farm or have an interest in town or in the city, their life will be enriched with the knowledge acquired in the fun activity of land judging.

This publication was adapted from "Land and Home Judging in North Dakota," which was developed by Dave Franzen, NDSU Extension soil specialist, and Nels Peterson, a former NDSU Extension agent in Nelson County.

Visit North Dakota 4-H online at www.ag.ndsu.edu/4h

 600-5-04; web-7-17; web-8-17; web-8-19; 100-6-21; web-6-24