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Land AND Homesite Judging in North Dakota

A handbook of instruction for 4-H and FFA participants in the North Dakota Land and Homesite Judging Contest in preparation for a lifetime of respect for land, its uses and its conservation.

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Introduction

Land is the principle natural resource in North Dakota. Although now classified officially as an urban state due to the proportion of people residing in urban areas compared to rural, agriculture is still a major source of income to North Dakotans. In addition, land is also important in all people's everyday life. Land makes a significant contribution to the successful siting of homes, businesses and the infrastructure, and services that make up modern life, such as roads, sewers and city sanitary lagoons. 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 and homesite judging.

Importance of soils

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

The mineral portion of the soil is composed of different sized particles, sand, silt and clay. The sand is the largest particle, clay is the smallest and silt is in between. Sand is the gritty part of the soil and soils with significant levels of sand, such as the areas around Karlsruhe and many hilltops from Langdon to Wishek, definitely feel gritty.

Soils with lots of clay, such as those around Fargo and Bottineau, are very sticky feeling and difficult to mold in your hands. Silty soils, like 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 like 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 percentage points of each just by feel. This takes years to perfect, however. In this land judging activity, the levels of texture that should be learned are wider in scope; the judging categories are fine, moderately fine, medium, moderately coarse and coarse.

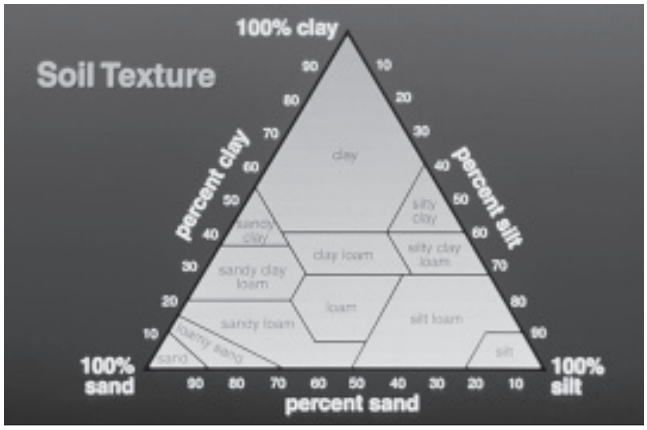


Figure 1. Sand, silt and clay in different soil textures.

The development of soils is not a stable thing. Soils are continually in development because of the five soil forming processes of vegetation, topography (landscape structure), parent material, climate and time. With variations in climate and certainly with time, soils change. Soils in North Dakota are situated on parent materials consisting of residual rock remains west of the Missouri River, glacial drift in the central and northwest, lake bed sediments in the east and north-central and small areas of wind-blown sediments and stream/river bed 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 this:

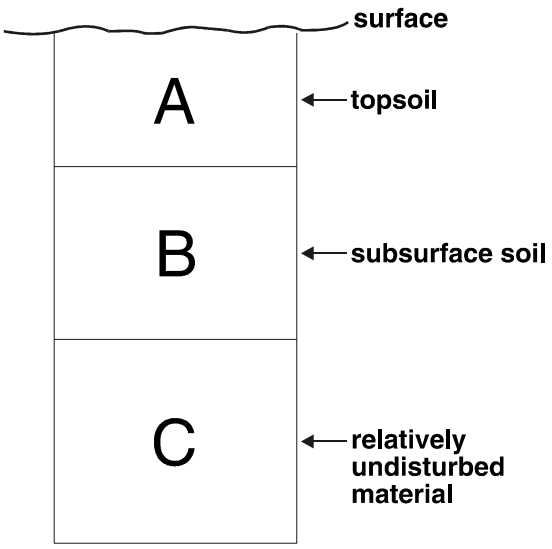


Figure 2. A generalized soil.

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 "Sub-surface 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 like nitrogen and phosphorus, and provide a means of support so plants can grow upright and capture sunlight and air. Well-structured soil is also important, because it provides the right amount of strength to resist wind and rain from carrying away the productive part of the soil, and also provides pore space for water to enter the soil and for air exchange so that roots can breath.

Soils are also important for building homes and businesses. Soils make it easier or more difficult to build and maintain foundations, conduct landscaping around homes and golf courses, dig and maintain sewer systems, and site lagoons which help to clean the environment and don't leak back into the groundwater. Knowing where to build saves many dollars in terms of construction and maintenance costs, as well as the market value of the property.

LAND JUDGING

Land is evaluated based on Land Capability Classes used by the USDA-NRCS. There are eight possible land classes in the United States, 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
Pasture land	
Class VI	Improved range, pasture land
Class VII	Range and pasture land, severe limitations
Badlands	
Class VIII	Rock outcrops, marshes, barren lands, wildlife, recreation

Preparation for competition

It is important for contestants to be competent in three skills- Texturing, estimating slope, and determining the depth of surface and subsurface horizons. The remaining portions of the contest are derived from these three skills.

A. Topsoil and subsoil texture

At the contest, a box of topsoil and a box of subsoil will be provided at each pit. Regardless of what the contestant finds in the pit itself, 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 larger groupings as shown in the following:

Textural group	USDA-NRCS classification
Coarse	Sands, loamy sands
Moderately coarse	Sandy loam, fine sandy loams
Medium	Very fine sandy loams, loam, silt loam, silt
Moderately fine	Clay loam, sandy clay loam, silty clay loam
Fine	Sandy clay, silty clay, clay

The texturing procedure: each participant should work out a method they are comfortable with and can consistently perform.

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 out the mudball

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 by adding water in small amounts (don't drown it!). Knead it with your fingers in one hand until the soil is plastic and moldable (if possible) like moist putty.

Figure 3. Making a mud ball.

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: Over 2 inches long – ***fine texture***

B2: From 1-2 inches long – ***moderately fine texture***

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

Figure 4. Ribboning in fine textured soil.

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, friable and individual grains can be easily seen and felt. 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 readily be seen and felt. Squeezed when dry, it will form a mold which breaks easily upon further handling. If squeezed when moist, a mold can be formed which can be carefully handled 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, it 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 thumb and forefinger, it crushes with some effort. It will form a short (1-2 inch long) well-formed ribbon with a shiny surface which will tend to break or the ribbon will 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 inch+) which will support itself. The sandy clay texture may also have a slightly gritty feel when moist.

B. Permeability (Internal drainage)

Internal drainage is important because it is an indication of the ease of 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, while 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 colors, mottling or blotching in the upper part of the 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 frequently ponded. 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 or red, brown, or gray occurring within 15-20 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 it is determined that under normal conditions the soil would not be able to hold enough water for good crop production (no evidence of a perched water table-there is no "floor" 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 and B) that are favorable for plant roots. The distance from the soil surface to any limiting layer determines effective depth. If none exists, it is assumed that depth is the depth of the pit.

- **Limiting 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 structure**

  In some soils, the presence of sodium destroys the productive structure of clays, dispersing them and forming columnar structures. These structures are often overlain with a thin, platy structure layer. Columns are often quite massive but difficult to see when wet. Root growth will often 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 10.1 to 20 inches
4. **Very Shallow:** Soils less than 10 inches deep.

Hints at 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 to the root density above it.

D. Slope

At 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 judges of the contest. Participants must determine a method comfortable for them to use to consistently estimate slope.

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%+

Figure 5. Contestants determine slope.

E. Present Topsoil Thickness

Contestants should carry a pocket knife, nail or other similar implement to estimate present topsoil thickness. By slicing down the soil face from surface downward, a difference in resistance is encountered 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 is then 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 is greatly reduced along with the value of the land. In NDSU testing in similar original soils, soils with no topsoil yielded about 50 percent 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 is a great tragedy.

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+ inches

F. Past Erosion

Past erosion is determined by dividing present topsoil thickness (E) by the "Original Topsoil Thickness" information for the pit given at the site.

Erosion may be caused by either 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 subject to almost every year.

1. **None to slight** – Less than 25 % of the surface soil removed. No gullies present.
2. **Moderate** – 25-75 % 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.

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 easily break down into fine particles or sand grains when subjected to wetting and drying, freezing and thawing or through tillage are easily moved 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 without carbonates present
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 then 6 inches)

Figure 6. Example of wind erosion.

H. Water Erosion Hazard

Steepness, length of slope, shape of landscape, past erosion and surface texture are all 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	Over 9% with severe or very severe past erosion

Figure 7. Example of water erosion.

I. Presence of Soluble Salts

Soluble salts greatly influence the productivity of North Dakota soils. Salts are present because of the generally poor drainage within many North Dakota soils, high water tables and their geologically young age. Climate is also a major factor. Evaporation and transpiration of water during the growing season is usually 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 that the water table is only about 3-5 feet deep.

In the contest, salts in the topsoil and subsoil count towards 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 there is a whitish cast 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.

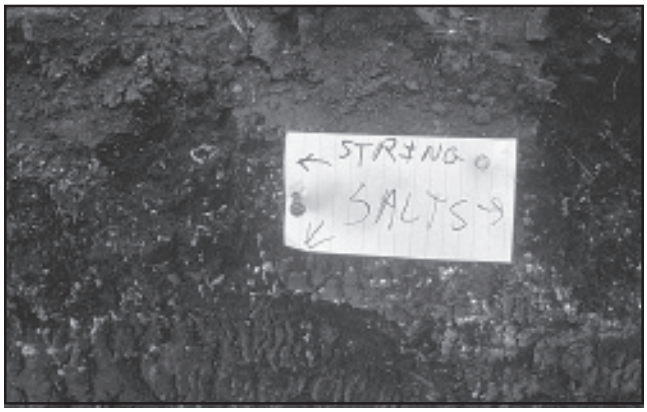


Figure 8. Vertical soil slice showing white "string salts" in the topsoil.

Figure 9. Soil with surface salts.

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. Indicator plants few.
3. Moderate	Whitish crystals or crusts present. Some indicator plants.
4. Severe	Whitish crystals and crusts abundant. 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 extreme permeability of the soils. Very slow landscapes include those that are nearly level or depressions (concave areas) with 0-1% 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 are occasionally damaged with standing water. Landscapes are nearly level on 0-1% slopes.
Moderate	No standing water problems. Found on 1-9% 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

It is the job of some soil scientists to classify land into capability classes to guide people into making better decisions regarding potential land use. It is possible for example to build a house on the side of a steep hill, but it may not be there after the next rainy season. News stories are filled with information regarding poor judgement on the use of land for cropping and housing decisions.

On the scoring card for Land Judging, only one capability class is marked. The class of a soil is usually the lowest class contained within 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.

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 will probably be an issue.

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 (20-36 inches)	II
	Shallow (10-20 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
	Not practical to surface drain, cropping possible less than 50% of the time.	V

General guide for selecting land capability classes

Cultivated Land

Class I

Soils in Class I are suited for cultivation over 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 are in a climate which will support long-season (greater than 110 degree days) crops consistently.

Figure 10. Class I soils. Corn in Central Illinois, nearly level, deep silt loam loess derived soils.

Class II

Soils in Class II are suited for cultivation over 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.

Figure 11. Class II soils – wheat in North Dakota, 1-3% slope, slight erosion, loam soils. Occasional wetness.

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. Terracing and other water control measures will be needed.

Figure 12. Class III soils – Palouse area, Washington State. Slope greater than 9%, conservation practices required.

Class IV

Soils in Class IV have little or no erosion hazards but have other limitations that make them unsuitable for cultivation. Limitations are impractical to overcome. Land is restricted to use as pasture, wildlife habitat or woodland. Cultivated areas should have intensive conservation practices such as strip tillage, terracing or contour farming.

Figure 13. Wise use of Class IV land, north of Bowman, N.D. Thin, sandy soils, moderate past erosion.

Non-Cultivated Land

Class V.

Soils in Class V have little or no erosion hazards, but have other limitations that make them impractical for cultivation. Limitations are impractical to overcome. Land is limited for use as pasture, woodland, range or wildlife habitat. Limitations include very poor surface and internal drainage or frequent flooding. Wetland soils are Class V.

Figure 14. Class V soils – frequently flooded soils make for poor cultivated cropland.

Class VI

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

Figure 15. Class VI soils.

Class VII

Soils in Class VII have many severe limitations similar to Class VI that make them unsuitable for cultivation and restricts their use to wildlife habitat, range, or woodland.

Figure 16. Class VII soils.

Class VIII

Soils and land formations in Class VIII have limitations that prevent them from being considered for crop, pasture or timber production. Their use is restricted to wildlife, recreation or aesthetic landscapes. The land has little or no harvestable economic value.

Figure 17. Class VIII soils – Theodore Roosevelt National Park.

Interpretations of land treatments

Explanation of scoring of 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 minimum score is still zero (0). No negative scores are given.

1. **Use soil conserving and/or soil improving crops**

   This should be checked on all Class I, II, III or IV soils.

   Soil improving crops are those which are grown continually, without fallow, and include crops which contain high levels of residue, such as corn or wheat, but also crops which provide nitrogen to subsequent crops, such as soybeans, field peas and lentils. These kinds of crops help replenish the soil with carbon, nitrogen and the organic matter that results from the introduction of these nutrients into the soil.

   - Every fourth or fifth year – Class I and Class II, climate restriction only.
   - Every third or fourth year – Class II, two or more major factors which define Class II.
   - Every second year – Class III
   - Every year – Class IV

2. **Manage residue**

   This should be used on all crop land, classes I-IV. Commonly used practices include no-till, stubble mulching, no stubble burning, no straw removal, minimum tillage, 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 is most disruptive.

4. **Establish recommended grass mixture**

   This is appropriate for Class VI and VII soils and all other soils with severe erosion.

   To be severely eroded, soils must have had 75 percent or more of the original topsoil removed since bringing the land into cultivation.

5. **Use proper pasture and range management**

   This is appropriate for Class VI and VII 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 on moderately coarse textured soils and soils which have a high wind erosion hazard. The practice includes the use of several types of tree and shrub species within plantings and using 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 moderately coarse soils with a history of summer fallow or in certain lower residue contributing crops, such as dry edible beans, potatoes, corn for silage and sugarbeets. Planting corn buffer strips is often practiced in dry beans, since there are herbicides used on dry beans that do not affect the corn and the standing corn after dry bean harvest provides wind erosion protection after harvest. Seeding cover crops following potatoes or sugarbeets helps to 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, coarse, or has any texture with carbonates at the surface.

Figure 18. Flax strips.

8. **Use only for wildlife or recreation**

   Appropriate for Class VIII land.

9. **Use tame-grass crop rotation**

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

Mechanical Treatments

10. **Use no summer fallow**

    Choose this option on all moderately coarse or 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 is also appropriate for the following conditions:

    a. Saline soils or soils with high water tables. Use of fallow under these circumstances results in even higher salinity and higher water tables. The two are usually linked together.
    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 and all Class IV soils. These are extremely fragile soils with little additional productive soil to lose.

11. **No fall tillage recommended**

    Whether or not to till depends on the conservation practices necessary to sustain the soil, and also 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 which 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 or higher soils
d. Coarse textured soils subject to wind erosion
e. Soils with carbonates at the surface

12. Fill, shape, seed grass waterways.

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 over are not considered in need of control.

13. Establish diversion terraces

Appropriate where overhead water is a problem. A diversion terrace is constructed to handle a large flow of water and divert it to reduce the power of the water the and erosion it might produce. This information will be given on the site card.

14. Practice wind strip cropping

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 wind.

15. Practice contour strip cropping

Appropriate if the slope of the landscape where the site is placed is long and even. Best suited on medium, moderately-fine and fine-textured soils in slopes from 3.1-9%. This is the only category where consideration of the topography outside of the staked area is important and the information is not provided on the site card.

16. No-till production recommended

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 for which we have specifically recommended this practice are most in need of this system of tillage.

Fertility

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, it is not practical to lower pH if the pH is over 7. The result of 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 – If the pit information shows nitrogen is deficient AND a non-legume 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 ppm for phosphorus

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

Figure 19. Strip cropping.

Figure 20. Using a soil probe for soil sampling.

HOMESITE

A home is a major investment for most people. Individual families and communities can avoid construction and maintenance problems if the soil is understood before construction begins. Soil information can be used to predict potential problems associated with planned or existing homesites. **Before** building or buying a home, consider if:

- There is a flood hazard. Avoid homes in a flood plain unless there is adequate flood protection.
- Drainage is a problem, and if it is, do precautions such as land-shaping, tiling, sump pumps and possibly eliminating basements need to be considered?
- Do the soils have high shrink-swell properties?
- Slope and unstable soil make erosion and soil movement a problem that might influence the foundation and landscaping in the future.
- Soil conditions exist that corrode pipes easily, resulting in frequent replacement or utility hazards.
- Grading and soil removal was extensive. Was the surface soil replaced to enable ground cover and other plants to grow?
- The soil properties are favorable for lawn, shrubs, trees, flowers, and vegetables without extensive soil modification.

This section of the state land/homesite evaluation is designed to give students and 4-H participants an understanding of the importance of soils in home-siting, landscaping and real estate and community development. Many young people may not be going back to the farm in the future, or might be living their life in a more urban setting than their grandparents did, but still need an appreciation and working knowledge of soils.

You will find that the basic properties of soils for agricultural use are the important properties that urban people must also consider, although the criteria for rating the land are somewhat different.

Figure 21. New home construction.

Definitions of limitations

Soils are rated as having **slight, moderate, severe**, or **very severe** limitations.

Slight

Land with properties favorable for the planned, intended use and present few if any problems for home-siting. Low maintenance and construction costs are anticipated.

Moderate

Land has one or more properties considered restrictive for the intended use. Limitations may be overcome or modified with special planning, design, treatment or maintenance.

Severe

Land has one or more properties unfavorable for the intended use. Limitations may be very difficult and expensive to overcome. A severe rating indicates that extensive, costly work is needed to overcome the limitation in construction and/or continued maintenance.

Very Severe

Land has properties so unfavorable for construction and/or maintenance that overcoming them is very difficult and extremely expensive and generally should not be used for the intended purpose, and another site should be selected.

Land use definitions

Limitation ratings will be made for four home-site uses.

1. Building foundations
2. Lawns and landscaping
3. Septic system absorption fields
4. Sewage lagoons

Building foundations

This determination is based on the suitability of the soil to support the building, considered to be a single family dwelling. Important properties that affect foundations are soil depth, slope, shrink-swell potential, water table and flooding potential.

Figure 22. Concrete basement construction.

Lawns and landscape plantings

This rating is based on the use of the soil for growing lawns, shrubs, trees, vegetable and flower gardens. Important properties affecting the establishment and maintenance of these plants include soil texture, permeability, soil depth, runoff potential, water table, plant response to fertilizer, and the presence or absence of high levels of soluble salts.

Figure 23. Home landscaping.

Septic tank absorption field

Subsurface systems of tile or perforated pipe distribute waste water through gravity from a septic tank into the soil for purification by microorganisms and the filtering affect of the soil itself. Properties that affect absorption of the effluent are permeability, water table, soil depth, and flooding potential.

Sewage lagoon

Around municipalities, pits are dug, and the sides elevated to hold the city sewage effluent for bacterial degradation of wastes. The ability of the soil to hold the liquids without discharge into the groundwater and surrounding land must be considered. Properties important in this consideration are soil texture, permeability, soil depth, water table, slope and flooding.

Figure 24. Sewage lagoon, West Fargo.

Factors affecting suitability

Texture

This refers to the combination of sand, silt and clay of the soil. See the textural discussion in the land-judging section of this publication. The same designations are used in land and home-site for soil texture determination.

Coarse: Moderate limitations for all uses

May require stabilization with organic materials and/or heavier topsoil to improve moisture and nutrient holding capacity for desired plant growth. Water and wind erosion may be a problem during construction.

Moderately coarse, medium, moderately fine: None to slight limitations for all uses.

Care should be used during construction to be sure the surface soil is not covered by less desirable material.

Fine: Severe limitations for all uses, except none to slight limitations for sewage lagoons.

Soil is sticky when wet, hard when dry, and difficult to work with in flower beds and gardens. The soils crack when dry and swell when wet, requiring frequent and low rate of watering for plant growth and particular problems for maintaining foundations. Sewage lagoons, however, are always wet, so cracking is not a problem for them. Septic tank fields need good permeability, something not found in fine-textured soils.

Permeability

Permeability is the rate at which water and air move through the most restrictive layer in the soils. This is also called, internal drainage. Laterals for septic system fields may be located below restrictive layers in some soils. Final design should be based on a detailed study of permeability, water tables and a standard percolation test to determine infiltration rates where soils are slow or very slow in permeability. These considerations are important factors in deciding between septic tank absorption field, sewage lagoon siting, or a community sewer system. For septic systems, evaluate the permeability of soil layers below 30 inches and for sewage lagoons the layers between 12 and 60 inches.

For purposes of the contest, permeability will be determined from the subsoil texture box.

Rapid permeability

- *Slight limitations* for septic system absorption fields
- *Moderate limitations* for lawns and landscaping
- *Severe limitations* for sewage lagoons.

To be in a rapid category, soils are coarse textured. Permeability of coarse textures is about 2 inches/hour. This is too rapid for sewage lagoons. Lagoons in these types of textures need to have the facings covered with special clays, such as bentonite, or expensive liners. Some soils have permeabilities of up to 6 inches/hour. These soils have Very Severe limitations for sewage lagoons and need very expensive engineering to make them adapted to the use.

Moderate permeability

Moderate limitations for septic system absorption fields and sewage lagoons. Permeability ranges from 0.6-2 inches/hour. Soils are moderately coarse and medium textured, with weak prismatic to blocky or strong granular structure.

None to slight for lawns and landscaping.

Slow permeability

Severe limitations for septic system absorption fields. Soils are generally moderately fine textured with subangular blocky structure. Problems are very similar to the very slowly permeable soils, but modifications required for use are less intense. Permeability ranges from 0.06-0.6 inches/hour. Percolation tests should be run to design a suitable septic system. At the 0.06 inch/hour rate, which equals 1 ½ inches/day, cost of modifications and size of a filter field would be prohibitive.

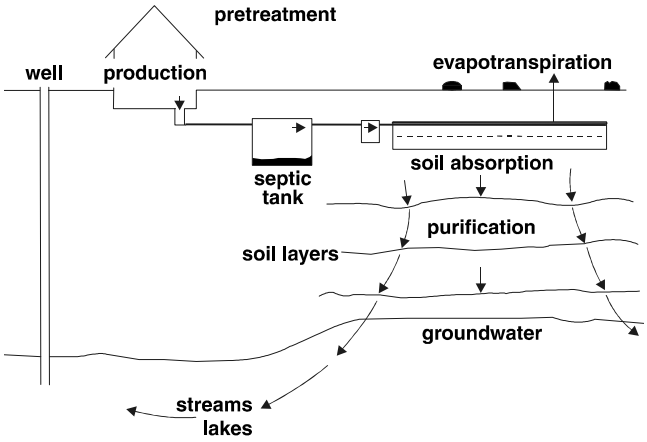
Moderate limitations for lawns and landscaping.
None to slight for sewage lagoons.

Very slow permeability

Very severe limitations for septic system absorption fields. Permeability is less than 0.06 inches/hour, with fine textured soils. This would require a prohibitively large field of lateral tile, or costly modifications would be necessary to effectively dispose of effluent. Septic systems are generally not recommended.

Severe limitations for lawns and landscaping.
None to slight for sewage lagoons.

Soil disposal of septic tank effluent



Soil depth

Soil depth is the vertical depth from the soil surface to a limiting layer such as bedrock, clay pan or sodic layer. This restricts root growth and excavations. Severity of limitations varies greatly depending on the intended use. Use the following table to determine limitations with depth.

Slope

Slope refers to the change in elevation with distance, or the steepness of the land. This is measured at the contest on a predetermined transect of 100 feet. Since this distance is always 100 feet at the contest, participants and coaches may determine many ways to estimate closely the slope with only a clipboard, a pencil and their wits. No commercial slope determining devices are allowed in the contest. The following table contains the criteria for determining limitations for use based on slope.

Erosion

Erosion can increase the expense of landscaping and require additional topsoil to be brought onto the site. Severe gullies will impose additional limitations on septic tank absorption fields. Gullied areas require filling and leveling.

- **None to Slight** – *None to slight limitations* for all uses.
- **Moderate** – *None to slight limitations* for all uses.
- **Severe** – *Moderate limitations* for all uses.
- **Very Severe** – *Severe limitations* for all uses.

Effect of soil depth on land use

Depth Category	Depth, inches	Foundations for Buildings	Lawns and Landscaping	Septic System Absorption Field	Sewage Lagoon
V. Shallow	less than 10	V. Severe	V. Severe	V. Severe	V. Severe
Shallow	10.1-20	Severe	Severe	V. Severe	V. Severe
Mod. Deep	20.1-40	Moderate	Moderate	Severe	Severe
Deep	40.1-72	None to slight	None to slight	Moderate	Moderate
V. Deep	greater than 72	None to slight	None to slight	None to slight	None to slight

Effect of slope on land use limitations

Slope Category	Percent Slope	Foundations for Buildings	Lawns and Landscaping	Septic Tank Absorption Field	Sewage Lagoons
Nearly level to gently sloping	0-3	None to slight	None to slight	None to slight	None to slight
Mod. sloping	3.1-5	None to slight	None to slight	None to slight	Moderate
Strongly sloping	5.1-8	None to slight	None to slight	None to slight	Moderate
Steep	8.1-15	Moderate	Moderate	Moderate	Severe
Very steep	greater than 15	Severe	Severe	Severe	Severe

Surface runoff potential

Surface runoff potential is important in drainage, permeability, and erosion. In actual building siting, not only is the site itself important for runoff consideration, but the surrounding area as well. Surface runoff is not a factor for sewage lagoons, as they are protected from outside surface water by a large dike.

- **Rapid** – Slopes greater than 5%
  None to slight building foundations and septic system absorption fields.
  Severe for lawns and landscaping (additional irrigation required and possible soil amendments.)

- **Moderate** – Slopes 3-5%
  None to slight for foundations and septic system absorption fields.
  Moderate for lawns and landscaping.

- **Slow** – Slopes 0-3%, and deep coarse textured soils
  None to slight, sewage lagoons and lawns, landscaping.
  Moderate building foundations, septic system absorption fields.

Shrink-swell

Shrink-swell is a characteristic of clay minerals, which expand when wet and contract when dry. Clay minerals also react to freezing and thawing, a property very important in North Dakota. Clays expand when frozen and contract when they thaw due to water expanding when it becomes a crystal as a solid. Shrinking and swelling is not regarded a factor for lawns and landscaping.

- **Low:** Coarse and moderately coarse textured soils.
  None to slight for all uses.

Figure 25. Porch problems due to shrink and swell.

- **Moderate:** Medium and moderately fine textured soils.
  Moderate for all uses, except *None to slight* for sewage lagoons.

- **High:** Fine textured soils
  None to slight for sewage lagoons (they are always wet, so no shrink).
  Severe limitations for building foundations and septic tank absorption fields.

Water table

Internal wetness is influenced by several factors. It is mostly a consequence of permeability. However, presence of a water table and its depth is a result of the climate, the season, and the landscape position of the site. Water table depth should be evaluated on the basis of depth to the seasonal high level and its persistence. This requires study of the site at different times of the year and under differing climate conditions, which is difficult. At the contest site, the water table depth will be given.

Depth to water table and degree of limitation

Degree of Limitation	Foundations for Buildings	Lawns and Landscaping	Septic System Absorption Fields	Sewage Lagoons
None to slight	greater than 30 inches	greater than 24 inches	greater than 72 inches	greater than 60 inches
Moderate	18.1-30 inches	12.1-24 inches	48.1-72 inches	40.1-60 inches
Severe	less than 18 inches	less than 12 inches	less than 48 inches	less than 40 inches

Flooding

The probability of flooding is a factor frequently ignored in planning use and management of land, particularly in the Great Plains. Flooding may not occur in an area for many years, then serious floods can occur because of changing weather patterns. The problems in Fargo and Grand Forks are two good recent examples. Urban development, and with it lack of permeability of concrete and asphalt as compared with natural soils results in increased runoff into streams and coulees up to 75 percent greater than before. Soils may give an indication of flooding, but records must be studied to determine the true conditions of probability. Position on the landscape of a site and its geographic relationship to nearby streams and rivers are good indicators of the frequency of flooding.

In the contest, this information will be provided at the pit.

- **None** – *None to slight* for all uses.
- **Occasional** – *None to slight* for sewage lagoons and lawns and landscaping.
  Moderate for septic tank absorption fields.
  Severe for building foundations.
- **Frequent** – *Severe* for all uses.

Setting Up and Holding a Land and Homesite 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 score card graders. When planning, be sure to 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

There should be two sites selected for the judging contest. The first is used for practice the morning of the contest. The second is used for the contest itself. The contest pits should be located away from view of a main road, so that they are not available for practice until the time of the contest.

Locate the 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 from each other. Obtain permission from the land owner and also the tenant, if the land is leased.

Preparing the field sites

For the practice site, try to select pit sites which are similar in some respects to the contest pits. Select four to six practice pits. A perfect pit is about 12 feet long and 2-3 feet wide. The pit slopes up at each of the long ends. If there is a limiting layer such as bedrock, a smaller area is appropriate. A pit should accommodate at least two contestants simultaneously.

For the contest site, four pits are dug, 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 by use of a string or tape affixed to the left and right side of the area by use of nails or stakes. Contestants may dig, scrape, cut or otherwise investigate physically any area to the left or right of the "off-limits" area, but are not allowed to do anything but view the area itself.

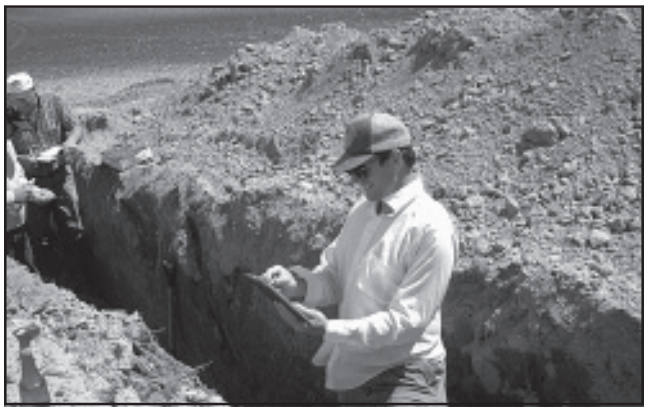


Figure 26. Dr. Hopkins prepares a contest pit.

Figure 27. A "no-touch" zone described in a pit.

Representative topsoil and subsoil samples are taken from the pit and placed in well-marked boxes or buckets for contestants to texture at the contest. 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.

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 specially well-marked stakes should be set 100 feet apart for use in estimating slope. Judges will determine slope exactly using a transect or another measurable, repeatable method and will record the slope in the official score card area.

Before leaving the area, judges must completely fill out the official score card 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 and 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 and home judging cards prepared ahead of time if a large number of contestants is expected. When the contest begins, #1 contestant will go to site 1, #2 to site 2 and so on. Allow 15-25 minutes for each site. If some teams choose to judge both Land and Homesite, the 25 minute time limit would be appropriate.

There should be an official at each site prior to the contest start. Use a signal to start. A car horn or another type of large noise producer which would not otherwise be heard in the area would be appropriate. When the judging time limit is over, the signal is given again. The contestants turn in their cards to the official at the site, who keeps the cards until another official comes by to pick them up. There should be a 5 minute interval for travel between sites. Group 1 then goes to site 2. Group 2 to site 3, Group 3 to site 4 and Group 4 to site 1. This round-robin continues until each group has judged all four sites.

Depending on the wishes of the organizations involved in the contest, the contest could be set up to merge Land and Homesite judging together, with two pits designated for each. Or an organization could elect to enter Land only, with the four sites used for Land, or Homesite only, with the four sites used to evaluate only Homesite. These options will be made clear before the information for each year's contest is distributed.

General contest rules

1. No talking when at an official site. No comparing cards or copying off anothers card. There will be 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.
6. The land and home-site 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 are 100 points for the Land Judging contest card and 97 for the Homesite contest card.

North Dakota Land Judging Score Card

Indicate your answer by placing an X in the proper space

Part 1 – Land Class Factors

SCORE	
	A. Surface Texture *(6 points)* ( ) 1. Coarse ( ) 2. Mod. Coarse ( ) 3. Medium ( ) 4. Mod. 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. Mod. deep ( ) 3. Shallow ( ) 4. Very shallow
	D. Slope *(6 points)* ( ) 1. Nearly level 0-3% ( ) 2. Gently sloping 3.1-6% ( ) 3. Mod. 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

SCORE	
	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

North Dakota Land Judging Score Card

Indicate your answer by placing an X in the proper space

Part II – Recommended Land Treatment

SCORE

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

1. Use soil conserving and/or soil improving crops

( ) a. every 4th or 5th year.
( ) b. every 3rd of 4th year.
( ) c. every 2nd 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 for recreation.
( ) 9. Use tame grass/crop rotation.

SCORE

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

SCORE

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

Site No. _____ Your name or number _____

Score Part I _____

Score Part II _____

Total score _____

North Dakota Homesite Evaluation Card

Part 1. Land factors.	**Part 2. Planned use.** Family dwelling site without basement. Inpretation of limitations in terms of: (2 points each)			
Score: Features of the site being considered. ***(3 points each)***	**Building Foundations**	**Lawns and Landscaping**	**Septic Systems**	**Sewage Lagoons**
	DEGREE of LIMITATION			
A. Surface texture ( ) Coarse ( ) Mod. coarse, medium mod. fine ( ) Fine	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe		
B. Permeability ( ) Very slow ( ) Slow ( ) Moderate ( ) Rapid		☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe
C. Depth of soil ( ) Very shallow ( ) Shallow ( ) Moderate deep ( ) Deep ( ) Very deep	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe
D. Slope ( ) N.L. or gentle 0-3% ( ) Moderate 3.1-5% ( ) Strong 5.1-8% ( ) Steep 8.1-15% ( ) Very steep 15.1+%	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe
E. Erosion ( ) None to slight/moderate ( ) Severe ( ) Very severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe
F. Surface runoff ( ) Slow ( ) Moderate ( ) Rapid	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	
G. Shrink-swell *(heaviest layer)* ( ) Low ( ) Moderate ( ) High	☐ Slight ☐ Moderate ☐ Severe		☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe
H. Water table *(permanent or temporary)* ( ) Deep (>72") ( ) Moderate deep (40-72") ( ) Shallow (<40")	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe	☐ Slight ☐ Moderate ☐ Severe
I. Flooding ( ) None ( ) Occasional (less than once in 2 years) ( ) Frequent (once or more in 2 years)	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe
Final Evaluation All factors none to slight One or more factors moderate, none severe One or more factors severe, none very severe One or more factors very severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe	☐ Slight ☐ Moderate ☐ Severe ☐ Very Severe

Score Part I _____ *(possible 27)* Score Part II _____ *18* _____ *18* _____ *18* _____ *16*

Part I and II – **TOTAL SCORE** _____ *(possible 97)*

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 and homesite judging.

Visit North Dakota 4-H on-line at: www.ext.nodak.edu/4h/4-H.htm

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