Stutsman County SCD

Stutsman County Soil Conservation District August 2021 www.stutsmanscd.net

Soil Movement

Soil Erosion Event Darkens the Skies

Local SCD Works With Producers to Improve Soil Health

By the Stutsman County Soil Conservation District

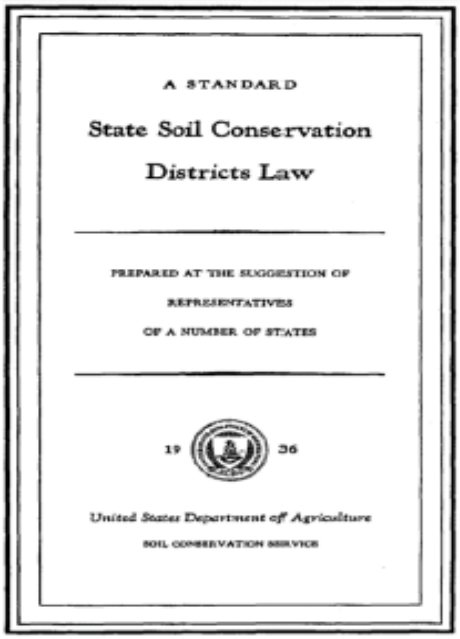
March 30, 2021 the winds came and soils left unprotected blew - relocated across the county's landscape including vegetated areas, farmsteads, streams, rivers and lakes….and even highway rest stops.

Sediment and nutrients are deposited in road ditches becoming a barrier to water flow.

Wind erosion is not a new problem for fields in the county. In 1937, because of severe wind erosion across the United States, President Franklin Roosevelt sent a letter to all governors. It included proposed legislative language called the "*Standard State Soil Conservation Districts Law*". One month later the 1937 Legislative Assembly adopted the language and the local conservation movement began.

Unfortunately, eighty-four years later, soil erosion is still a significant problem for Stutsman County and the state. The rich topsoils found across the state are being lost. In some areas, over fifty percent of topsoil is gone. In addition, the erosion carries away organic matter and essential nutrients like nitrogen and phosphorus, which can reduce productivity of the remaining soils. Eventually some of the eroded soils and nutrients are deposited in streams and lakes. The soils fill up the waterbodies and the nutrients feed blue-green algae that cause harmful algal blooms (HABs). HABs can make people ill and can kill pets and livestock that ingest the toxins produced by the algae. Locally, Spiritwood Lake is one of several lakes in the state that experience frequent algal blooms that limit recreation activities.

The Stutsman County Soil Conservation District (SCD) is one of 53 districts created by county residents. The 1937 law gives the SCD the mission to "*provide for the conservation of the soil and soil resources of this state and for the control and prevention of soil erosion.*" To achieve this mission, the SCD supervisors and staff work with partnering agencies, such as the Natural Resources Conservation Service (NRCS), to address local soil and water resource concerns.



A STANDARD

State Soil Conservation Districts Law

PREPARED AT THE SUGGESTION OF REPRESENTATIVES OF A NUMBER OF STATES

19 36

United States Department of Agriculture

SOIL CONSERVATION SERVICE

To specifically address soil erosion, the SCD recommends producers practice the five principles of soil health:

- soil armor
- minimizing soil disturbance
- plant diversity
- continual live plant/root
- livestock integration.

Practices that build soil health should be managed as a system that leaves previous crop residue on the soil, minimizes tillage, increases the number of crops in a rotation and incorporates cover crops into the annual crop rotations. The most difficult principle to incorporate into a soil health management system can often be the addition of livestock grazing on the cover crops and crop residues. However, the SCD can help match livestock and cropland producers to benefit both.

SCD staff stand ready to help provide technical assistance and to help identify potential financial assistance to help producers begin improving soil health. To find out more contact the Stutsman County SCD at 252-1920 ext. 3.

Photo Credit: Stutsman County Soil Conservation District..

Soil Movement

May 25th 2021 picture taken

May 25, 2021 also saw soil moving by blowing, the sky filled with fine soil particles blowing away into another part of the nation. Soil movement from wind erosion seen in the ditches, farmsteads, soil particles left on cars and homes brings back and eerie feeling from droughts many of us have never seen. This spring we saw DOT cleaning out rest areas hauling out 30 loads of soil, we saw producer trying to pull the soil out of ditches and putting it back on there farm ground. By this time the damage has already been done. Soil seen in the ditches is movement from Saltation or Soil Creep. We also experienced soil erosion from Suspension, its amazing how you can see a cloud of soil in the atmosphere when these soil particles are less then 0.1 mm. Through out our newsletters we are going to learn what soil is, how we can try and to protect it and hopefully provide multiple sources of information and agencies to find more information.

May 25th 2021

Saltation: is the movement of particles by a series of short bounces along the surface of the ground, and dislodging additional particles with each impact. The bouncing particles ranging in size from 0.1 to 0.5 mm usually remain with in 30 cm of the surface. Depending on conditions, this process accounts for 50 to 90% of the total movement of soil by wind.

Soil Creep: The rolling and sliding of larger soil particles along the ground surface. The movement of these particles is aided by the bouncing impacts of saltating particles described above. Soil creep can move particles ranging from 0.5 to 1 mm in diameter, and accounts for 5 to 25% of total soil movement by wind.

Suspension: Fine particles less than 0.1mm in size are moved parallel to the surface and upward into the atmosphere by strong winds. The most spectacular of erosive processes, these particles can be carried high into the atmosphere, returning to earth only when the wind subsides or they are carried downward with precipitation. Suspended particles can travel hundreds of miles.

If you would like to visit about erosion and what you can do on your operation to protect and build that soil up Contact us at 701-252-1920 ext. 3. Anyone in the office would love to come out to your operation and listen to what you have going on.

Did You Know We Have a State Soil?

Because, I did not. Here is an article about our State Soil.

WILLIAMS SERIES

North Dakota State Soil

SOIL SCIENCE SOCIETY OF AMERICA

Introduction

Many states have a designated state bird, flower, fish, tree, rock, etc. And, many states also have a state soil–one that has significance or is important to the state. The Williams is the state soil of North Dakota. Soils form the foundation of North Dakota, which is firmly recognized in the state's motto "Strength from the Soil" that appears on the state's coat of arms and the governor's flag **(Fig.1)**.

In North Dakota, the Williams soil series is among the most extensive and economically important soils in the state. The native vegetation of the Williams series includes species such as western wheatgrass, blue grama, needle-andthread, green needlegrass, and prairie junegrass. These soils have high natural *fertility* and their content of *organic matter* creates highly productive landscapes. Most level to gently rolling areas of Williams soils are used for growing small grain crops such as wheat, barley, oats, flax, and sunflowers, whereas the steeper rolling and hilly areas are used as rangeland.

Fig. 1. The North Dakota coat of arms emphasizes the importance of soils (credit: http://ndstudies.gov/nd_coat_arms).

History

The soil name is derived from Williams County, North Dakota, although the type location is in Mountrail County, near the town of White Earth. In 1900, the Williams series was recognized as an official soil series for North Dakota.

William soils formed under short grass *prairies* and were mostly converted to small grain production and working rangelands upon settlement. These working landscapes are still present today, although more recently the region where these soils predominant has been focused on great amounts of oil and gas extraction.

What is Williams Soil?

The Williams soil profile **(Fig. 2)** is very deep, meaning there is no bedrock within 6 feet of the surface. These soils formed in *calcareous tills* (meaning that high levels of *carbonates* are naturally present) that were deposited by *glaciers*. These very deep soils also usually contain *water tables* that are more than 4 feet below the surface. However, water moves only moderately slowly through Williams soils.

Every soil can be separated into three separate size fractions called sand, silt, and clay, which makes up the soil texture. They are present in all soils in different proportions and say a lot about the character of the soil.

Photo: Chip Clark/Smithsonian Institution

Fig. 2 This shows a profile of a Williams soil, the state soil of North Dakota (USDA-NRCS Soil Survey Staff).Credit: Smithsonian Institution's *Forces of Change*.

The surface layer, or A horizon, is the darkest layer due to enrichment with organic matter. The texture is typically loam. Beneath the surface layer are the B horizons, layers where changes occur. They are the brown and yellow layers immediately below the surface, and are loam or clay loam. Lowest in the soil profile is the C horizon, the material deposited by the glaciers and from which the Williams soil developed. It is loam or clay loam and likely contains some pebbles or cobbles.

The annual precipitation in areas with William soils is about 14 inches per year, which is not enough water to flush the calcareous materials from the soil profile. As you can imagine, the temperature regime in North Dakota is frigid with soils commonly freezing to several feet below the surface during winter months.

Where to dig a Williams

With more than 2.2 million acres of Williams soils in North Dakota, they can be found in twenty counties across the state **(Fig. 3)**. The acreage of Williams is about 7% of the total area of North Dakota.

The Missouri *Coteau* cuts through North Dakota diagonally, bordered by the James River on the east and the Missouri River to the west. Williams soils are located predominantly in this glaciated Missouri Coteau region **(Fig. 3)**. They occupy higher, rolling convex areas as opposed to depressional swales, or concave areas.

Fig. 3 The range of the Williams soil across North Dakota (credit: Smithsonian Institution's Forces of Change, http://forces.si.edu/soils/interactive/statesoils/html/State-Soils/Default.aspx?selection=NorthDakota&tab=where).

Fig. 4 Harvested wheat on a Williams soil in North Dakota (credit: USDA-NRCS Soil Survey Staff).

Importance

North Dakota has some of the greatest natural resources in North America with Williams soils among the most extensive and economically important soils in the state. For example, the prairie pothole region, bisecting North Dakota, is the primary nesting ecosystem for migrating waterfowl, producing ~50% of the ducks in North America (Smith et al., 1964). Additionally, North Dakota ranks first in the US for 12 commodities including honey, and first in the country for hard red spring wheat and durum. On average, North Dakota grows nearly one-half of the nation's hard red spring wheat (250 million bushels) and two-thirds of the durum (50 million bushels), with over 100 nations importing red spring wheat and durum from North Dakota **(Fig. 4).**

Uses

Due to the natural fertility and high organic matter content of these soils, they are used for cropland in areas that are gently rolling or level. Wheat, barley, oats, flax, and sunflowers are the principal crops. In contrast, in areas that are mostly rolling and hilly, Williams soils are used as rangeland. The native range vegetation consists of western wheatgrass, blue grama, needle and thread, green needlegrass, and prairie junegrass.

Limitations

Although Williams soils can be highly productive, the climate is the major limitation for agricultural uses. Because they are located in a region that has moderately low precipitation and a short growing season (110–130 frost free days), crop selection has its limitations. Crops, such as durum and spring wheat, that do not have excessive water demands and require shorter growing seasons, can thrive, while growing corn can have its challenges. In general, Williams soils are not limited for building construction, although special considerations are needed for road construction. Additionally, use of these soils for septic systems is limited due to low water flow. Although these limitations can restrict some agricultural crops and construction designs, Williams soils are excellent for supporting natural grassland ecosystems.

Management

Williams soils are highly calcareous, which can affect micronutrient availability to crops. For example, soybeans grown in these soils may suffer from iron nutrient deficiencies. Although plenty of iron is present in the soil, the forms of that iron are not readily available for plants to use. The region's low precipitation is another consideration for managing these soils. Farming methods that optimize the retention of soil moisture, such as conservation tillage to reduce soil water evaporation, are essential. Additionally, wind and water can increase loss of topsoil, decreasing the tilth of Williams soils. Management methods that provide soil protection from erosion are also essential.

Soil Formation

Before there was soil there were rocks and in between, ClORPT. Without ClORPT, there will be no soil. So, what is ClORPT? They are five major factors that are responsible for forming a soil like the Williams series. These are **cl**imate, **o**rganisms, **r**elief, **p**arent material, and **t**ime. ClORPT is responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Williams soils (and all other soils) are determined by the influence of ClORPT. Weathering takes place when environmental processes such as rainfall, freezing and thawing act on rocks causing them to dissolve or fracture and break into pieces. ClORPT now acts on rock pieces, marine sediments, and vegetative materials to form soils.

Climate–Temperature and precipitation influence the rate at which parent materials weather and dead plants and animals decompose. They affect the chemical, physical, and biological relationships in the soil. Williams soils developed under cold and subhumid (low to moderate precipitation) climatic conditions. The combination of these two resulted in the prairie vegetation that developed on these soils, with high organic matter content, whereas the low precipitation did not allow the carbonates to be *leached* from the soil profile.

Organisms–This refers to plants and animal life. In the soil, plant roots spread through, animals burrow in, and bacteria eat plant and animal tissue. These and other soil organisms speed up the breakdown of large soil particles into smaller ones. Plants and animals also influence the formation and differentiation of *soil horizons*. Plants determine the kinds and amounts of organic matter that are added to a soil under normal conditions. Animals breakdown complex compounds into small ones and in so doing add organic matter to soil.

Williams soils developed under perennial prairie grasses that supported large numbers of native herbivores, such as bison. Annually, prairie grasses died back leaving their roots and above-ground vegetation to decompose and contribute to the large organic matter pool that contributes to the high natural fertility of these soils.

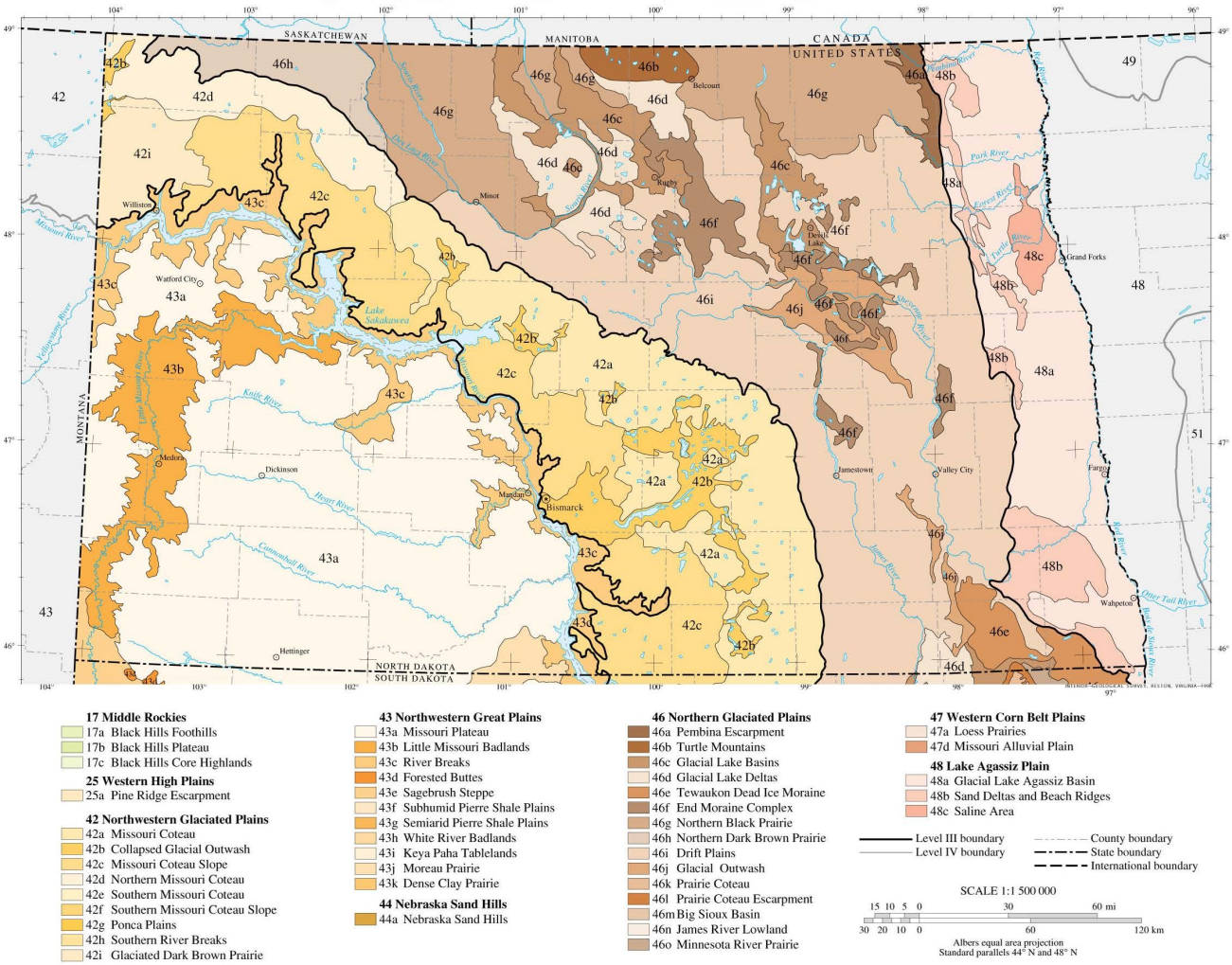
Relief–Landform position or relief describes the shape of the land (hills and valleys), and the direction it faces makes a difference in how much sunlight the soil gets and how much water it keeps. Deeper soils form at the bottom of the hill rather than at the top because gravity and water move soil particles downhill. Williams soils are well drained because they formed on the higher positions of the landscape.

Parent material (C horizon)–Just like people inherit characteristics from their parents, every soil inherited some traits from the material from which it forms. Some parent materials are transported and deposited by glaciers, wind, water, or gravity. Williams soils developed from highly calcareous till deposited from glaciers that cut across the *Canadian Shield*.

Time–All the factors act together over a very long time to produce soils. As a result, soils vary in age. The length of time that soil material has been exposed to the soil-forming processes makes older soils different from younger soils. Generally, older soils have better defined *horizons* than younger soils. Williams soils formed in a more recent glaciation called the late-Wisconsin, about 10-12 thousand years ago. Comparatively, there are regions of western North Dakota that were glaciated 1-2 million years ago and regions of southwestern North Dakota that have never been glaciated with parent materials that are about 65 million years old. The soils of these regions are older and more highly developed.

Fig. 5 Typical till plain in production and demonstrates relief as a soil forming factor. Note the differences in A horizon thickness across landscape positions. (credit: USDA-Soil Survey).

Ecoregions of North Dakota



Ecoregions, Soils and Land Use in North Dakota

Red River Valley (ecoregion 48) – Lake Winnepeg is the reminant of glacial lake Agassiz, which extended south all the way to the border of South Dakota. The Red River Valley on the far eastern portion of North Dakota was formed from the sediments of this ancient glacial lake. The Red River is one of very few rivers in the US that flows north. Soils formed in the Red River basin are very clayey and experience extreme shrinking and swelling, but are among some of the most productive in the state and nation.

Till Plain (ecoregions 46, 42) – As you move west from the Red River Valley, you may see reminants of ancient sandy beaches that formed the shores of glacial lake Agassiz, transitioning to the rolling till plains. These till plains were formed from glaciers that brought materials from the Canadian Shield. Many important glacial processes that form different land features can be observed in this till plain area. *Moraines* tend to be loamy textured, while outwash features formed from glacial meltwaters tend to have soil textures that are sorted from gravels to sand to finer textures.

Unglaciated Southwestern (ecoregion 43) – The southwest of North Dakota has been left unglaicated over time. Parent materials in this region are quite old, about 65 million years old. Buttes and badlands can be observed in these regions, and many of the state's famous fossils have been discovered here.

Fig. 6
Typical till plain of the region. (credit: USDA-Soil Survey).

Glossary

Calcareous: The presence of carbonates.

Canadian Shield: A large area in northern and central Canada of exposed Precambrian igneous and metamorphic rocks.

Carbonates: A salt mineral that contains an ion composed of one carbon and three oxygen atoms. The most common types are calcite ($CaCO_3$).

Clay: A soil particle that is less than 0.002 mm in diameter. Clay particles are so fine they have more surface area for reaction. They hold a lot of nutrients and water in the soil. A clay soil is a soil that has more than 40% clay, less than 45% sand, and less than 40% silt.

Coteau: A hilly upland or divide between valleys.

Ecoregion: Represents areas with similar biotic and abiotic characteristics which determine the resource potential and likely responses to natural and man-made disturbances. Characteristics such as climate, topography, geology, soils, and natural vegetation define an ecoregion. They determine the type of land cover that can exist and influence the range of land use practices that are possible.

Fertility: A soil's ability to supply nutrients and support plant growth.

Glacier: Related to a slowly moving mass of ice formed by the accumulation and compaction of snow.

Horizon: see Soil horizons

Leach: The removal of soluble material from soil or other material by percolating water.

Moraine: The sediments carried by a glacier and deposited when the glacier melts.

Organic Matter: Material derived from the decay of plants and animals. Always contains compounds of carbon and hydrogen.

Prairie: A large open area of grassland.

Sand: A soil particle between 0.05 and 2.0 mm in diameter. Sand is also used to describe soil texture according to the soil textural triangle, for example, loamy sand.

Soil Horizon: A layer of soil with properties that differ from the layers above or below it.

Soil Management: The sum total of how we prepare and nurture soil, select type of crops that are suitable for a type of soil, tend the crop and the soil together, type of fertilizer and other materials added to soil so as to maintain productive and preserve soil.

Soil Profile: The sequence of natural layers, or horizons, in a soil. It extends from the surface downward to unconsolidated material. Most soils have three major horizons, called the surface horizon, the subsoil, and the substratum.

Soil Texture: The relative proportion of sand, slit, and clay particles that make up a soil. Sand particles are the largest and clay particles the smallest. Learn more about soil texture at www.soils4teachers.org/physical-properties

Till: The sediments deposited by glaciers.

Topsoil: (A horizon) The horizon that formed at the land surface. Mostly weathered minerals from parent material with a little organic matter added.

Water Table: The top layer of ground water where the soil is filled with standing water.

Additional Resources

Lindbo, D. et al. 2008. *Soil! Get the Inside Scoop*. Soil Science Society of America, Madison, WI.
Lindbo, D. L., D. A. Kozlowski, and C. Robinson (ed.) 2012. *Know Soil, Know Life*. Soil Science Society of America, Madison, WI.

Web Resources

SOIL SCIENCE LINKS:

Soil Science Society of America—http://www.soils.org/

Soils4Teachers—http://www.soils4teachers.org/

Soils4Kids—http://www.soils4kids.org/

Smithsonian Soils Exhibit—http://forces.si.edu/soils/

Have Questions? Ask a Soil Scientist—https://www.soils.org/ask

https://soilseries.sc.egov.usda.gov/OSD_Docs/W/WILLIAMS.html

Natural Resources Conservation Service—http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/

Natural Resources Conservation Service, Educational Resources—http://soils.usda.gov/education/resources/k_6/

References

Smith, A.G., J.H. Stoudt, and J.B. Gollop, Prairie potholes and marshes, in Waterfowl Tomorrow, J.P. Linduska, Editor. 1964, U.S. Gov. Printing Off.: Washington, D.C. p. 395-50.

National Cooperative Soil Survey U.S.A. Soil Series Description. https://soilseries.sc.egov.usda.gov/OSD_Docs/W/WILLIAMS.html

ND Game and Fish Geographic Regions. http://gf.nd.gov/wildlife/plants-habitat/habitats/regions

USDA-SCS. Soil Survey of Mountrail County, ND

http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_dakota/ND061/0/mountrail.pdf

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This state soil booklet was developed under the auspices of the Soil Science Society of America's K-12 Committee—their dedication to developing outreach materials for the K-12 audience makes this material possible.

Trees of the Letter

American Linden (Basswood)

- Native, 50-70ft tall with a canopy 30-50 ft
- Medium growth rate, life span of more than 50 years
- Intermediate tolerance to flooding, prefers well drained soil

Common Chokecherry

- Native, 12-2ft tall with medium growth rate
- Life span is 20-50 years, providing wildlife cover and food source
- Fruits commonly used for jams jellies, wines, and syrups
- Moderate tolerance to drought and shade tolerant
- Adapted to wide variety of soils

OHF-Outdoor Heritage Fund

Cost share for tree plantings but must meet these requirement:

- Trees suitable for the soil type
- Minimum of 2,000 ft -
- Follow NRCS Spec's

Cost share for this project at 75% the producer will need to cover 25% of the tree planting, which includes trees, weed barrier fabric and tree tubes. Tree plans need to be made by August 18th with the SCD as we will then turn them in. trees will be planted 2022. Please call 701-252-1920 and ask for Kylee or stop in soon to get your tree plan together.

Cost Share on trees

NORTH DAKOTA Outdoor HERITAGE FUND

NRCS News

Hello everyone! Darin here from the NRCS. Just wanted to give you a heads up that if you are looking to improve your pastures with water developments (springs, pipelines, wells, tanks) or maybe cross fencing. Or you would like to try cover crops on your fields our EQIP (Environmental Quality Incentives Program) batching deadline for 2022 is September 24 of this year. We would love to meet with you and look at what you would like to do before the deadline so please contact us 701-252-1920 ext. 3.

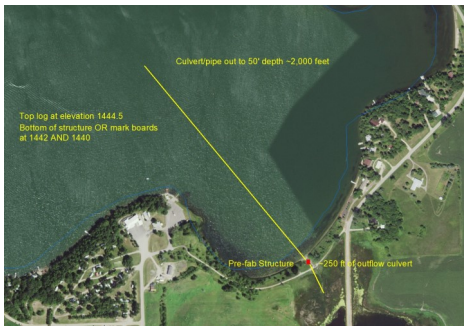
Hypolimnetic Drawdown information for Spiritwood Lake

Spiritwood Lake is a beautiful 488.8 acres lake with a max depth of 55.5ft. Volunteer water quality testing showed that nutrients and dissolved oxygen levels were a problem.

The last few years we have been working on securing a permit to install a low-level drawdown system that would remove nutrient rich water from the lake. Removing the excess nutrients can help lessen the chances of harmful algal blooms (HABs) and improve dissolved oxygen levels.

This concept is not new to Spiritwood Lake. In the early 80's a plan was developed to implement best management practices (BMPs) on agricultural lands and install a pump and pipe from the west end of the lake to the deepest point. Nutrient rich water was pumped over to Schock Lake. The project was a success with implementing grass waterways, trees and other practices. Unfortunately, pumping water into Schock Lake had to be discontinued as lake elevations had risen past the easements that were in place.

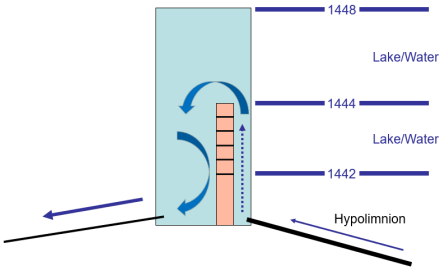
Today we are still dealing with nutrient rich water settling at the bottom of the lake and not being able to be removed. The lake inlet comes in from the North East and exits out the South East leaving the rest of the lake untouched with flow. Putting in a passive system will allow that nutrient rich water to be removed and blended with natural flowing water. Water samples will be monitored weekly during periods of discharge.



Proposed project

The new proposed plan is to put in a passive drawdown system, that would be going out the SE corner of the lake through Alkali Lake and down Seven Mile Coulee. A pipe will be placed at the deepest part of the lake run down to the SE corner outlet and into a passive system like the illustration. The system would have stop logs in place to only allow water to flow at levels chosen for the control structure.

Passive Drawdown - Stop Log Type



- The system will not quickly drain the lake and the maximum it can move is 10-15cfs
- The drawdown will not add any extra flow or water to any downstream areas
- The discharge water will enter a wetland, then Alkali Lake before flowing to Seven Mile Coulee and eventually the James River.
- Water quality of the discharge will be monitored to insure it will not affect water quality downstream.
- This is not a part of the study that the Water Resource Board has been doing with the State Water Commission. That study concerns potential outlet structures on Alkali and Spiritwood lakes to alleviate water quantity concerns.

Stutsman County Soil Conservation District
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Board & Staff Members

Stutsman SCD

Board of Supervisors

- Robert Hess, Jud
- Bernie Wanzek, Courtenay
- Cody Kreft, Streeter
- Gloria Jones, Jamestown
- Bob Martin, Jamestown

Find us on the web at:
www.stutsmanscd.net

We are located in the USDA Service Center

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NRCS

Darin Hirschkorn

District Conservationist

Marc Murdoff

Soil Conservationist

Shelby Larson

Soil Conservationist

Soil Conservation District

Amber Struxness

District Manager

Kylee Reiser

District Technician

Dustin Krueger

319 Watershed Coordinator

Cody Hoggarth

Farm Bill Specialist

Tree Planting!

It's never to early to start talking about tree plantings, stop in today!

The District was formed to assist people in Stutsman County through the District Mission:

"To take available technical, financial, and educational resources, whatever their source, and focus or coordinate them so that they meet the needs of the local land user for conservation of soil, water, and related resources."