Ciha Fen Group Mapping Project

University of Iowa
Soils Class
Fall 2012

Authors:
Katie Lazzara
Samuel Saltzman
Megan Schettler
Allen (Red) Vote
Kenneth Wacha

I. Location and general description of the project area

The Ciha Fen is an 80-acre wildlife preserve located near Sutliff, Iowa in Johnson County (Figure 1). The area contains a forested area & grassland savanna, sand prairie, and several fens, or wetlands (Iowa NHF). The largest of these wetlands is a rare nutrient-poor (slightly acidic) fen, covered with a thick floating peat mat. Our soil mapping project focused on another lowland area, located adjacent to this fen (see Figure 1).

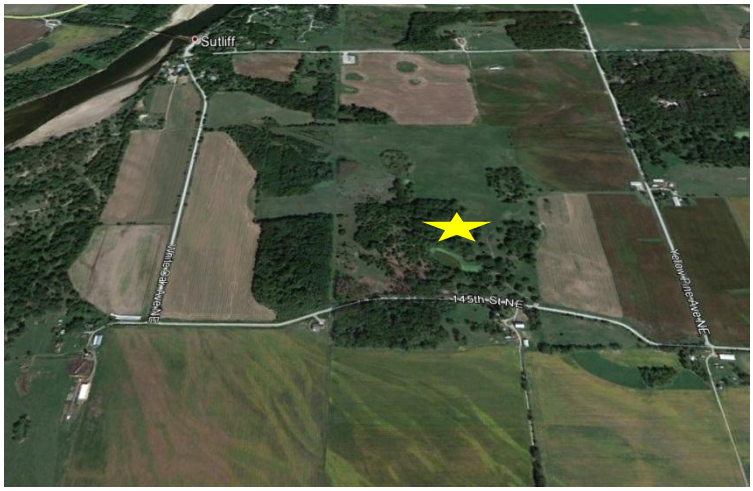


Figure 1: Ciha Fen Preserve located near Sutliff, Iowa. *Note: Yellow star denotes study site.

The topography of the area consists of two main drainage basins that accumulate flow within the fens. The average slope of the area is around 5%, with moderate to steep slopes (Figure 2). Bedrock at the site is a Silurian-age dolomite, the Scotch Grove Formation. Bedrock is covered with ~50-60 feet of eolian sand and silt interbedded with loess. The loess is a result of glacial grinding of underlying rock, and subsequent wind transport of the silt-sized particles.

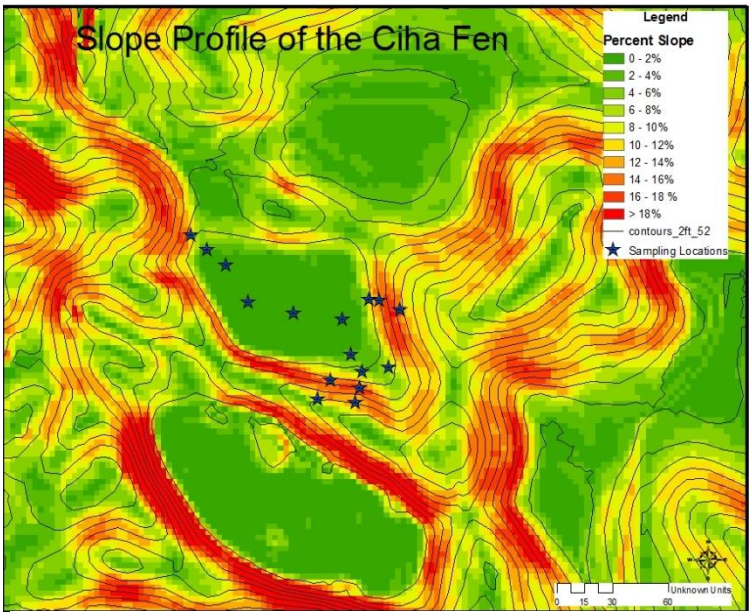


Figure 2: Map showing slope profile of the Ciha Fen. Note: Blue stars denote soil sampling locations.

Most of Iowa was originally tall grass prairie with numerous prairie wetland areas, but in the past 160 years almost all of it has been converted to agricultural or urban use. Land use at Ciha Fen is split between an open, formerly agricultural "buffer" area on the north half (which will be converted to native vegetation) and the recreational forested wetland and temperate perennial grassland on the south half (INHF, 2012). The white and black oak forest and deep vegetation mat on the fen indicate that the majority of this land has been largely undisturbed for a long period of time. The fen also houses a biodiverse mixture of rare, endangered, and threatened species (Iowa NHF).

Iowa has four distinct seasons in the year, with cool, dry winters and hot, humid summers. The Ciha Fen receives on average 37 inches of precipitation per year over about 100 days. The majority of rainfall occurs in June, allowing for ideal growing conditions for vegetation. Additionally, there is an average of 28 inches of snowfall per year (), and soils are generally frozen from December to late March (NOAA, 2006). Temperatures range from 10^{O} F to 84^{o} F, with an average annual temperature of around 50°F. There are periodic droughts.

II. Methods

To be able to map the soils for the Ciha Fen, two separate site visits were conducted. First, sampling locations were marked out to allow soil cores to be extracted for classification. The decisions for core locations were made as a whole class. A catena approach was used, taking a total of four soil cores, one at each of the following locations: located at the summit, backslope, toeslope and in the center of the wetland (Figure 3). The summit core was found on a narrow ridge with a 2-5% slope, with grassland vegetation. The backslope core was taken on 5-9% slope, located in savanna conditons (i.e., oak trees and grassland). Continuing down the hillslope profile, the toeslope core was taken on a 2-5% slope, while the wetland core was on a negligible slope (0-2%). These samples were used to complete the soil descriptions and classifications.

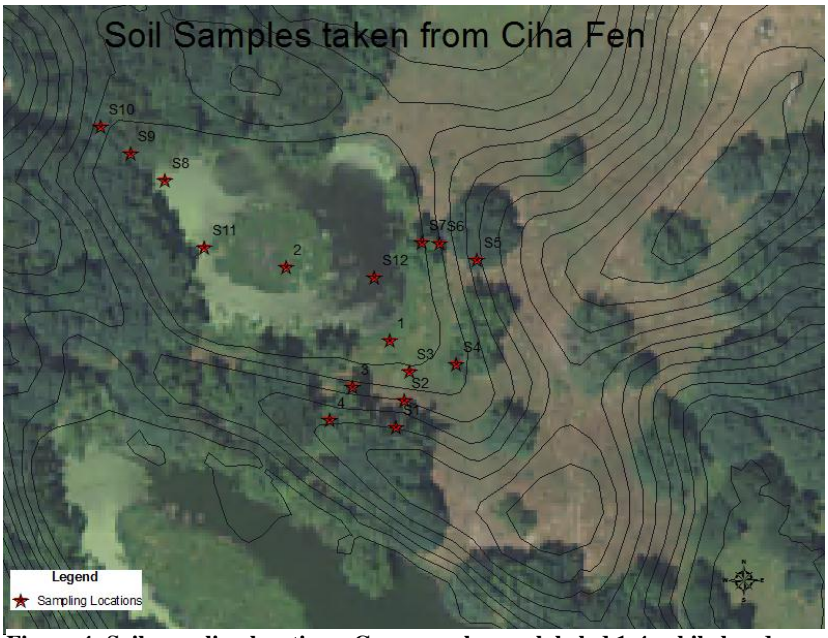


Figure 4: Soil sampling locations. Core samples are labeled 1-4, while hand probe samples are denoted by an 'S" in front of it.


Figure 3: Soil samples taken for use in soil classification and mapping.

The second visit to the site allowed soil boundaries to be defined by describing hand-held probe samples. Hand-held probing was conducted separately by each group, in contrast to the four original cores collected previously. A total of twelve samples were taken and used to describe the spatial variability of any organic subhorizons, depth of A-horizons, and redoximorphic features that may be present due to water table fluctuations (Figure 3). The traverse aimed to both circle the wetland area of the fen, as well as cut a cross-section of a catena profile. New areas were sampled that had not been explored in the previous visit to the site. Variation in water content was also determined. These samples were then analyzed using a VNIR (visible and near-infrared) spectrometer to determine soil reflectance, which can be related to soil properties such as soil carbon and clay content through the use of a robust spectral library of verified samples (Figure 4). VNIR technology is based on wavelength absorbance that certain bonds (e.g., carbonic, hydroxyl) possess when high intensity light shines through (Figure 5). Since a verification of soil properties was not conducted in this study, a qualitative analysis is provided herein which will look at wavelengths 1400, 1900, and 2190 nm to compare soil carbon and clay contents of the various samples.

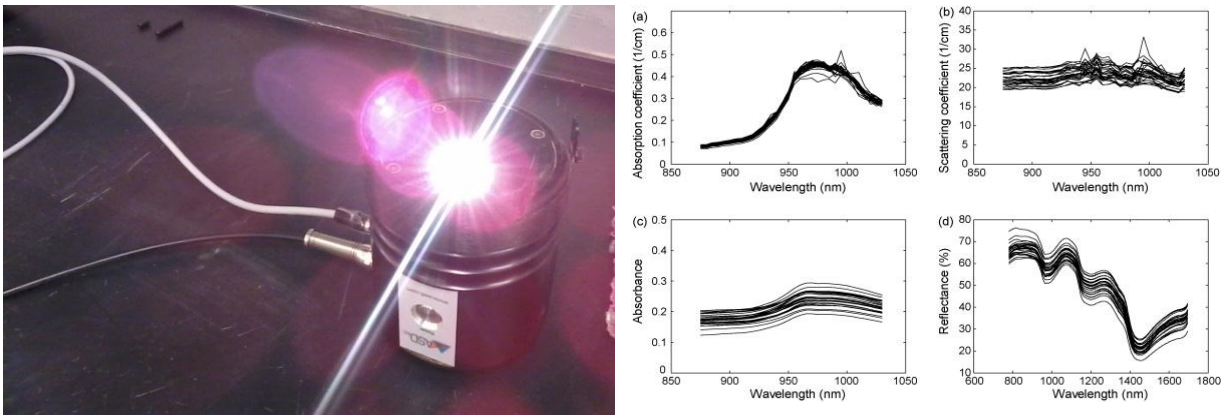
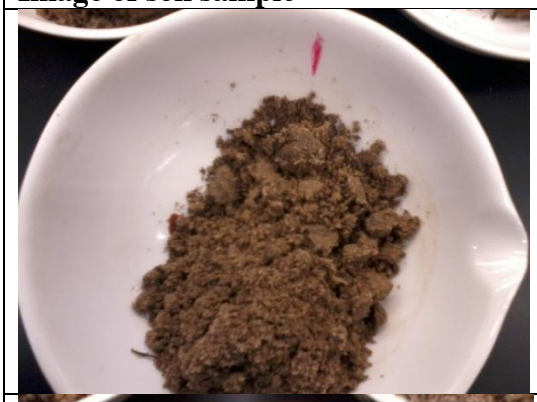


Figure 5: VNIR spectrometer used to measure total carbon and nitrogen for soil samples. Technology consists of sample signatures of absorbance and reflectance for various wavelengths.

Visual Inspection of cores:

Image of soil sample	Description
	**Sample ID:** S1 **O-horizon: none** **A-horizon: 2”** **Redox features:** **Soil Moisture: 6%** **Note: core 4**
	**Sample ID:**S2 **O-horizon: 1”** **A-horizon: 3”** **Redox features: mottles after 39”** **Soil Moisture: 11%** **Note: core 3**
	**Sample ID:**S3 **O-horizon:** 1/2” **A-horizon: 2”** **Redox features: mottles after 39”** **Soil Moisture: 12%** **Note: core 3**
	**Sample ID:**S4 **O-horizon: ½”** **A-horizon:** 5” **Redox features:** **Soil Moisture: 16%** **Note: clay illuviation- core 4**

	**Sample ID:**S5 **O-horizon: 3”** **A-horizon: 5”** **Redox features: may be mottles at depth** **Soil Moisture: 10%** **Note: soil 3-4 transition?**
	**Sample ID:**S6 **O-horizon: 2”** **A-horizon: 5”** **Redox features:** **Soil Moisture: 7%** **Note:**
	**Sample ID:**S7 **O-horizon:** 2” **A-horizon:** 5” **Redox features:** **Soil Moisture: 8%** **Note: core 3**
	**Sample ID:**S8 **O-horizon:** 16” **A-horizon: -** **Redox features: yes** **Soil Moisture: 26%** **Note: core/soil “5”. When oven dried the soil turned gray showing high oxidation.**

	**Sample ID:**S9 **O-horizon:** 2” **A-horizon: 4”** **Redox features: yes?** **Soil Moisture: 13%** **Note: clay illuviation. Core 3/soil 5 transition.**
	**Sample ID:**S10 **O-horizon: 2”** **A-horizon: 4”** **Redox features: gleying** **Soil Moisture: 15%** **Note: clay illuviation, gleying (grey color). Core 3.**
	**Sample ID:**S11 **O-horizon:** 2” **A-horizon:** 4” **Redox features: If 3- Mottles after 39”** **Soil Moisture: 28%** **Note: Core 1. Taken just outside the peatland (core 1).**
	**Sample ID:**S12 **O-horizon:>10”** **A-horizon:-** **Redox features:** **Soil Moisture: 12%** **Note: This is core 2.**

From a brief analysis of the soil samples, it was found that water content was found to be highest at the bottom hillslope positions. Higher water content denotes the soil's ability to hold water due to higher clay or organic matter content. Looking at the reflectance data from the VNIR (Figure 6) for the visible to near infrared spectrum (350 to 2500 nm) we see similar trends for all samples, with abrupt changes around wavelengths 1400, 1900, and 2190 nm.

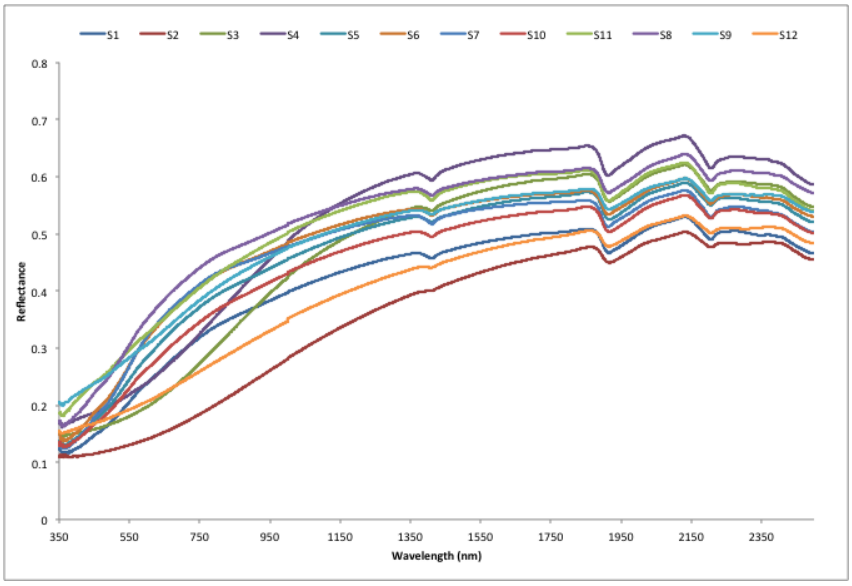


Figure 6: Soil sample VNIR reflectance vales for Ciha Fen.

Taking the first derivative of the reflectance made it possible to amplify the changes at these reflectance values (Figure 7). Highest organics and clay contents were found in soil sample 12, followed by 8-11. Soil samples 1 and 2, located along the hillslope profile had the least level of organics and clay content.

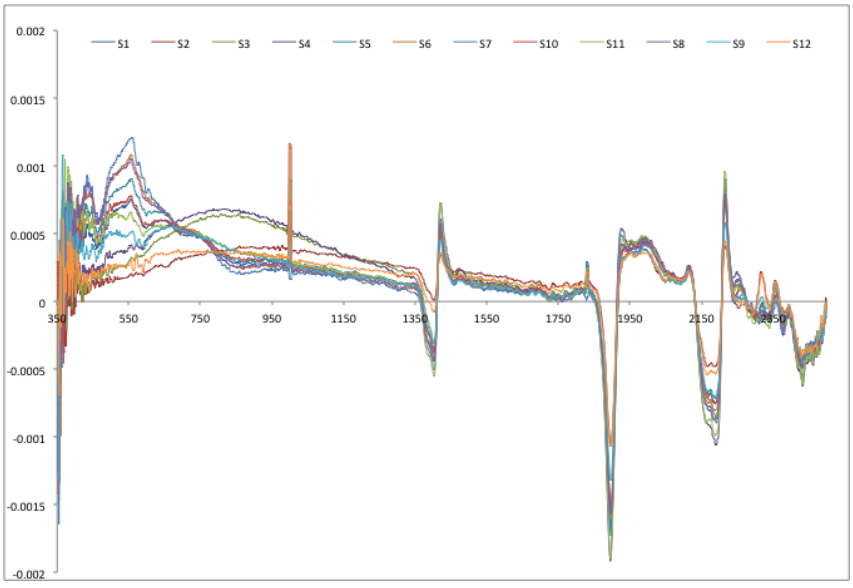


Figure 7: 1st derivative of soil sample VNIR reflectance vales for Ciha Fen.

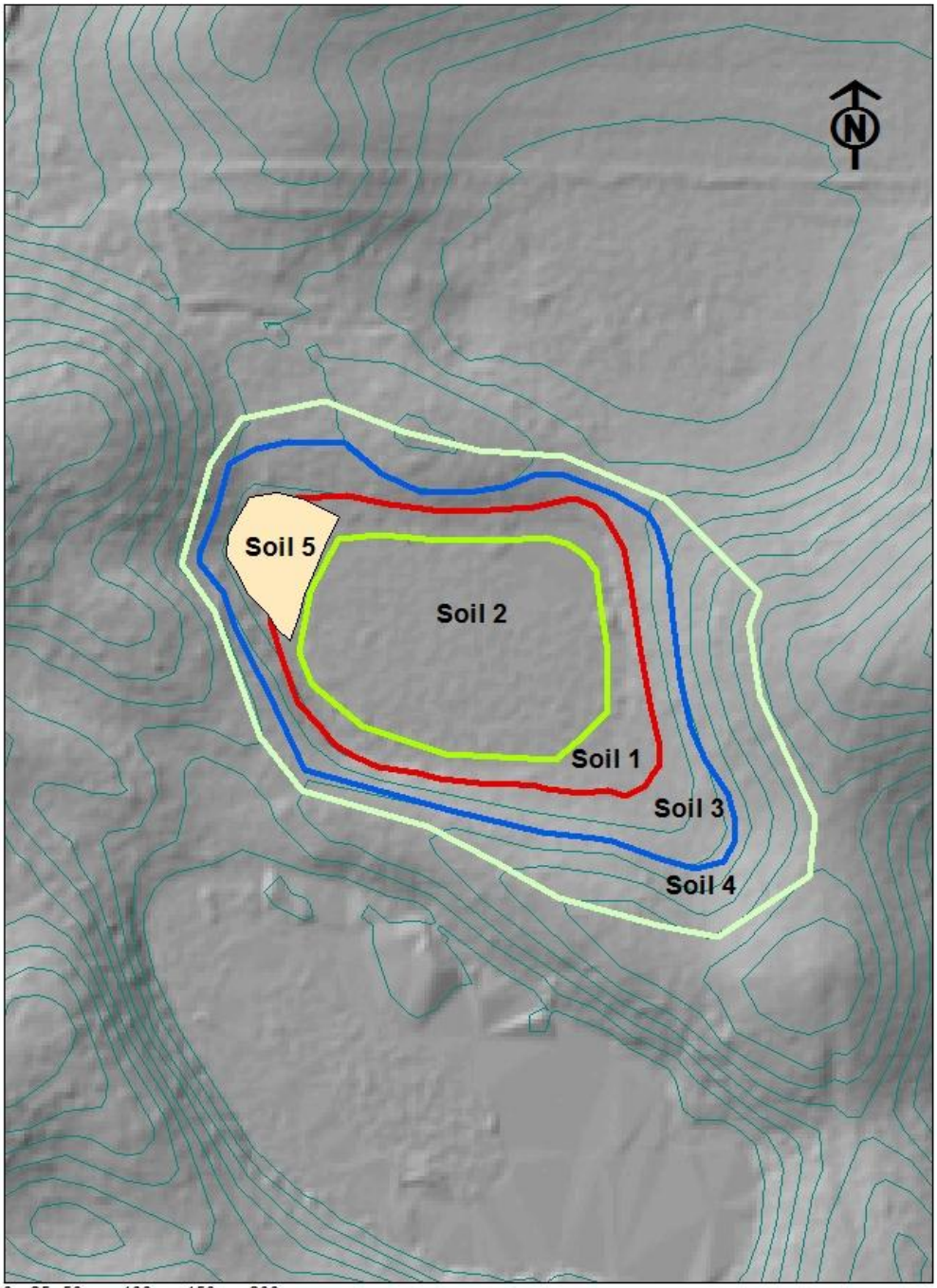
III. Soils of the project area

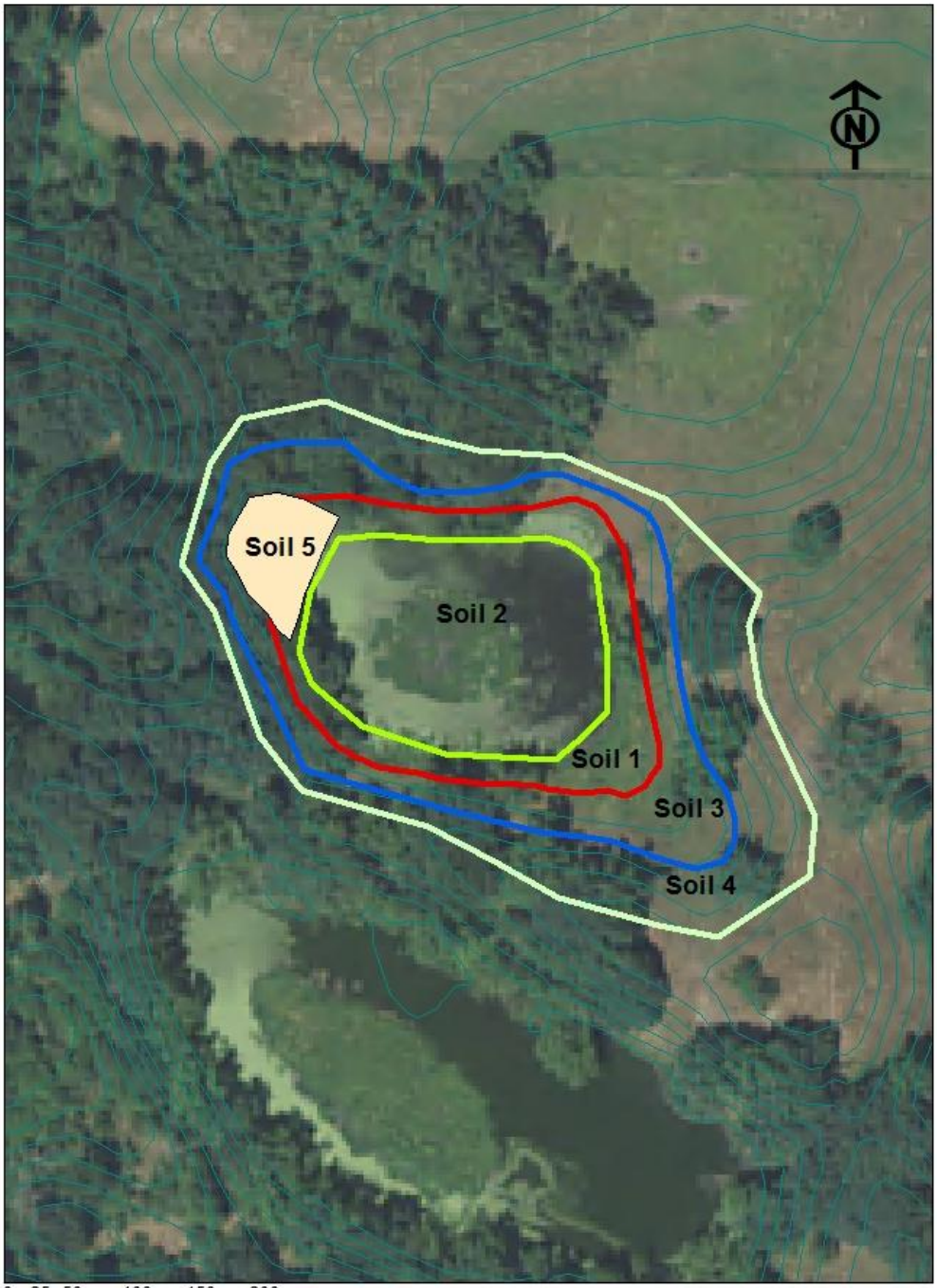
Over the area of the Ciha Fen site, a total of five soils were mapped. Each soil except Soil 5 was described from a different core taken during the first visit to Ciha Fen. Soil 5 was described from a hand-held probe sample collected during the second visit to the site. Each soil has been classified to the Great Group level.

Soil 1, a humudept, contains a mollic epipedon and a cambic or argillic horizon. This soil has marsh sediment as the parent material and comes from the toeslope of a slope profile. In general, this soil consists of silt loam and silty clay and ranges from gray to black at different points in the profile. Of note are iron accumulations along root channels and ped faces, as well as the presence of gleying in lower horizons. Soil 2, a haplohemist, is located in the center of the wetland and has peat as its parent material. Organic matter dominates this soil, with fibric, hemic, and sapric matter all present. Also of note is the black color of the soil and the presence of water at a depth of 18 cm. Located on the backslope and surrounded by oak trees and savanna grasses is Soil 3, a dystrudept. Soil 3 ranges in color from dark gray near the surface to a light yellowish brown at depth. The parent material is eolian sand, and the soil texture is a sandy loam or loamy sand throughout. Fibric organic matter lies near the surface in an O horizon of 2 inches. Redoximorphic features are present in the form of mottles with halos in the C horizon at depth. Soil 4 is also a dystrudept, with parent material of eolian sand, but is located at the summit along a narrow ridge above the wetland. The texture changes from sandy loam to loamy sand to sand with depth, and colors range from dark grayish brown to yellowish brown. The only redoximorphic features appear to be several yellowish red streaks along the root linings in the Btw2 horizon. Soil 5, a -histosol, can be found at the toeslope to the northwest of the wetland. Marsh sediments are the most likely parent material of the soil, which is mostly black. As this sample comes from a hand-held probe, any characteristics past a depth of approximately 16 inches remain unknown. However, the soil does possess a thick O horizon of fibric material and was noticeably wet, and there appeared to be some gleying in the A horizon.

IV. Inferred water table relationships, infiltration capacity and erodability

The gleying in soil 5 indicates that this area is anoxic (saturated) year-round, or mottles would have been present from reduction. Soil 2 similarly has no mottles, and the gleying past 40cm indicates that the water table doesn't dip below this point. Because soils 2 and 5 are wet and high in organics, water probably does not infiltrate quickly (slow), and since it occupies a low point in the topography, this soil is unlikely to be very erodible. Soil 1, on the toeslopes near the outer edge of the low-topography area, has gleying past 13" suggesting saturated conditions, and additionally has iron accumulations and oxidized streaks along root channels up to 44". This indicates that the water table fluctuates between up to13" and not below 44". The low area is likely covered with water during some part of the year. This soil also occupies a low point, and due to the presence of clays is likely less susceptible to erosion and has a relatively slow infiltration capacity. Soil 3, which is mapped on the backslopes around the basin, has mottles and halos after 39", and soil 4 (summit) has oxidized streaks only in root linings. This suggests that the water table was higher in the past, or seasonally reaches about 39" depth in the footslope. Soils 3 and 4 have a sandy parent material and likely have moderate to high infiltration capacities. Soil 3 is most susceptible to erosion due to its landscape position, while soil 4 is less so.


N
Soil 5
Soil 2
Soil 1
Soil 3
Soil 4
0 25 50 100 150 200
Feet


N
Soil 5
Soil 2
Soil 1
Soil 3
Soil 4
0 25 50 100 150 200
Feet

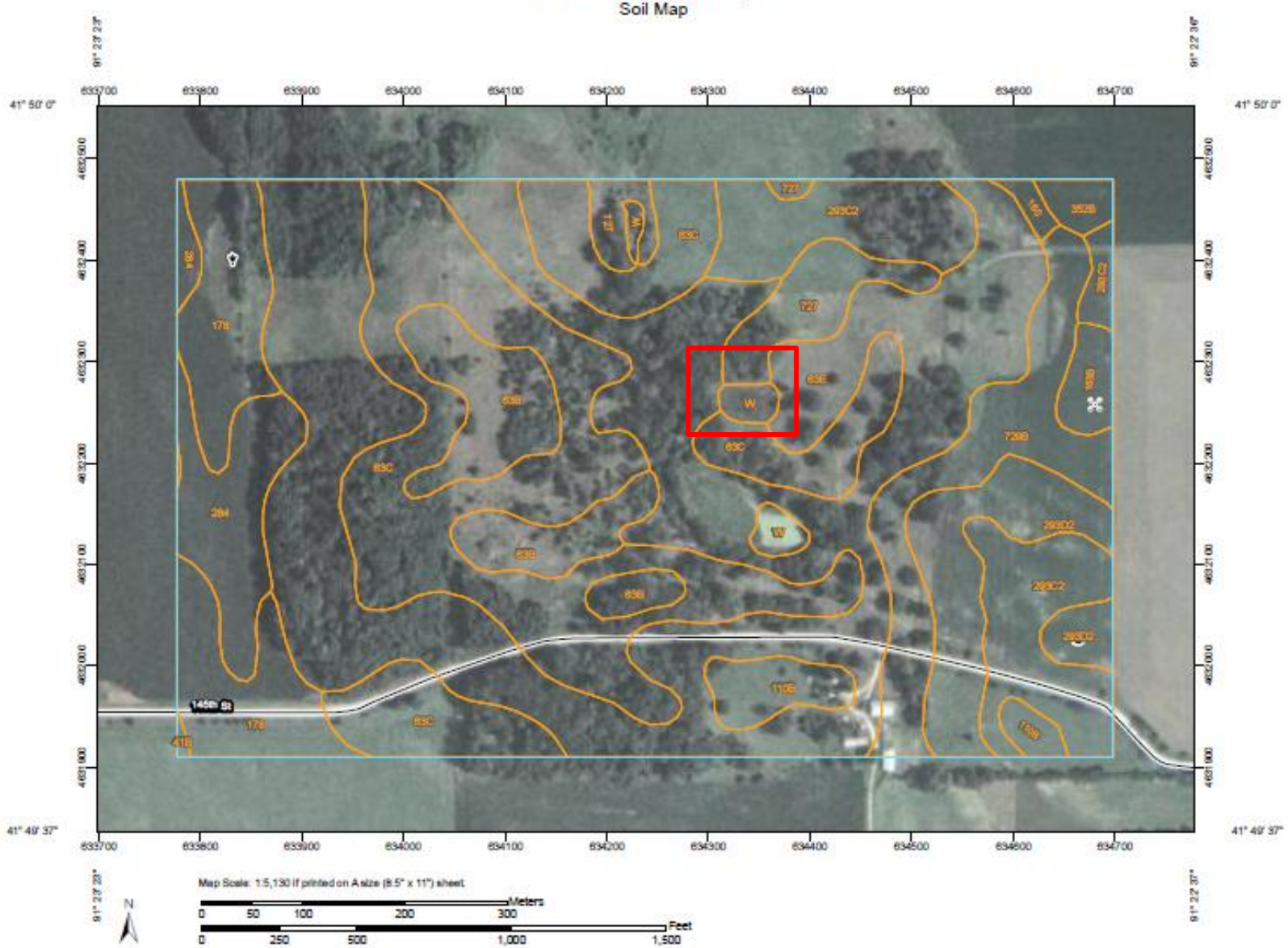
V. Comparison of mapped soils with Web Soil Survey data

Our mapped soils vary from those shown in the Web Soil Survey (WSS). We found and mapped five distinct soils in the fen, while the WSS shows two; it labeled the largest portion of the area as water, and divided the higher regions into Chelsea loamy fine sand and Udolpho loam. It doesn't show the change in soils along the drainage ways, or name the soil unit at the center of the fen. This is because the large scale soil designations produced by the WSS are meant for more general application and are produced for a large area, whereas we were mapping a much smaller area with more detail. The WSS site states that the information is not meant for use beyond the mapping scale (1:15,800), as the boundaries are general and not necessarily accurate at a small scale.

There were also some discrepancies between the textural classes and horizon thicknesses mapped by WSS and our group. The textural classes on the WSS were described as loam and loamy fine sand, while we varied slightly and called them silt loam, sandy loam, and loamy sand. Again, features in WSS are meant for more general use and represent an average for the unit, while ours were based on measurements and tests of specific cores. Additionally, determining the textural class in the field is a somewhat subjective test, and the testers could place the same soil in different classes.

Finally, we mapped the area solely based on soil descriptions, and stopped short of labeling it with a unit name. The extent also varies, because the WSS covers much more of the wetland area. We didn't map the entire basin due to time constraints.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,130 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Johnson County, Iowa
Survey Area Data: Version 13, Aug 30, 2012

Date(s) aerial images were photographed: 7/7/2006; 7/6/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Johnson County, Iowa (IA103)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
41B	Sparta loamy fine sand, 2 to 5 percent slopes	0.1	0.1%
63B	Chelsea loamy fine sand, 2 to 5 percent slopes	7.4	5.7%
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	30.4	23.5%
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	41.9	32.3%
110B	Lamont fine sandy loam, 2 to 5 percent slopes	2.5	1.9%
160	Walford silt loam, 0 to 1 percent slopes	0.4	0.3%
163B	Fayette silt loam, 2 to 5 percent slopes	1.2	0.9%
178	Waukee loam, 0 to 2 percent slopes	9.2	7.1%
284	Flagler sandy loam, 0 to 2 percent slopes	5.3	4.1%
293C2	Chelsea-Lamont-Fayette complex, 5 to 9 percent slopes, moderately eroded	11.0	8.5%
293D2	Chelsea-Lamont-Fayette complex, 9 to 14 percent slopes, moderately eroded	6.6	5.1%
352B	Whittier silt loam, 2 to 5 percent slopes	0.8	0.6%
727	Udolpho loam, 0 to 2 percent slopes	4.2	3.2%
729B	Nodaway-Arenzville silt loams, 1 to 4 percent slopes	7.5	5.8%
W	Water	1.2	0.9%
Totals for Area of Interest		**129.8**	**100.0%**

VI. Environmental factors responsible for mapped soil differences in the project watershed

In a geologic sense the fen is a relatively small system; however, many different types of soils are present due to the environmental variability throughout the fen. The lowest area of the fen is subject to accumulation of moisture and sediment which yields a higher organic production than surrounding areas. This organic production leads to a prominent organic horizon in the soils located at the topographic low of the fen. This organic matter will also decompose at a much faster rate due to this location having the most direct exposure to the sun. Another important environmental factor located at the topographic low of the fen is the increase of cation exchange capacity (CEC). This is directly tied into the translocation of clays into this area. Moving up hill, you experience the full effect of soil variability in the fen. On the back slope erosion is the most prevalent; due to this there will be the lowest amounts of organic matter accumulation here which is consistent with our results. Moving up the fen, to the summit and shoulder, you will see a much dryer soil with much thicker profiles. An anomaly in the fen would be in the drainage ways. These are convex features located on the shoulder, back slope, and toe slope. These areas are saturated for more time than the surrounding areas and have more potential for surface erosion. As an overall trend the largest A horizons will be present and the toe slope ; however, due to large organic matter accumulation in the aquic toe slope there is a thick O horizon yielding a uncertain depth of the A horizon.

VII. Appendix (soil descriptions and diagnostic horizons, classification sequence)

Soil 1:

Description:

Site: Core 1
Landscape position: toeslope
Parent material: marsh sediment
Vegetation:
Location: UTM zone 15 0634370
4632230
Slope: 2-5%
Classification:

Depth (inches)	Soil Horizon (weathering zone)	Description
0-9	A	Black (5Y 2.5/1) Silt Loam, moderate fine subangular blocky, friable, abundant roots, gradual boundary
9-13	AB	Very Dark Gray (5Y 3/1) Silt Loam, moderate fine subangular blocky parting to weak medium platy structure, gradual boundary
13-28	Btg	Gray (2.5Y 5/1) Silt Loam, strong medium angular blocky, common fine light reddish brown (2.5YR 6/4) mottles with gradual boundaries, firm, gradual boundary
28-33	Btg2	Dark Gray (10YR 4/1) Silty Clay Loam, strong medium angular blocky, firm, gradual boundary
33-44	Btg3	Gray (10YR 5/1) Silty Clay, strong medium angular blocky, firm, Dark Red (2.5YR 3/6) Iron accumulations on ped faces and in root channels with abrupt boundaries, gradual boundary
44-47	2BCg	Dark Gray (10YR 5/1) Sandy Loam, weak fine subangular blocky, moderately sticky

Diagnostic Surface Horizon

- Mollic Epipedon
  - Zone from the surface to a depth of 30cm
- Cambic or Argillic horizon
  - Zone from a depth of 30 cm to 120 cm (BCg horizon)

Key to Soil Orders

- A. No permafrost
- B-J: Not meet classifications
- K:Has cambic horizon within 100cm of mineral soil surface and has a lower boundary at a depth of 25 cm or more below mineral soil surface.
- K: Has no sulfidic material within 50 cm of mineral soil and has a mollic epipedon
- **INCEPTISOL**S

Key to suborders

- KA:: Not histic epipedon
- KB: No plaggen or anthropic epidpedon
- KC: No gelic soil temperature regime
- KD: No cryic soil temperature regime
- KE: Not ustic soil moisture regime
- KF: Not xeric soil moisture regime
- KG: Other Inceptisols: **Udepts**

Key to Great Groups

- KGA:No sulfidic materials within 50 cm of the mineral soil
- KGB: No duripan with 100cm of surface
- KGC: No fragipan within 100 cm of mineral surface
- KGD: Has mollic epipedon: **Humudepts**

Soil 2:

Description:

Site: Core 2
Landscape position: Center of wetland
Parent material: peat
Vegetation: Wetland plants (sedges and composites)
Location: UTM zone 15 0634339
4632252
Slope: 0-2%
Classification:

Depth (inches)	Soil Horizon (weathering zone)	Description
0-1.6	Oi	Very dark brown (10YR2/2) fibric organic matter, dominantly sedges, clear boundary
1.6-11.8	Oe	black (10YR 2/1), hemic organic matter, water at 18cm, gradual boundary
11.8-15.7	Oa	black (10YR 2/1,) sapric organic matter with few sand grains, saturated, gradual boundary
15.7-20.5	2Bg	black (5YR 2.5/1), organic clay loam, weak medium subangular blocky, friable, gradual boundary
20.5-?	3Bg	dark gray (10YR 4/1), sandy loam with few fine organic blobs, weak medium angular blocky, friable

Diagnostic horizon: Histic epipedon

-Saturated >30 cumulative days.
-Reduction for some time during normal years
-Is 20-60 cm thick (40 cm).

Classification sequence:

Keys to Soil Orders

A.

1. No- no permafrost
2. No- no permafrost.

B.

1. Yes- (no andic soil properties)
2. Yes- do have organic soil materials
    a. No- don't overlie cindery, etc. material. (or…)
    b. No- no cindery material. (or…)
    c. MAY be 2/3 of the total thickness of the soil (from surface to densic, lithic, or paralithic contact).
    d. YES- Is saturated 30+ days/year; upper boundary is within 40 cm of soil surface (barely- 40cm).
        1. NO only 40 cm. (or…)
        2. YES 40 cm +, consist largely of sapric and hemic (38 cm).

Histosol

Keys to Suborders

BA. NO. Are saturated with water for MORE than 30 cumulative days.
BB. UNLIKELY that it has a positive water potential at surface for >21 hr/day.
(solutes usually have negative water potential.)
BC.

1. NO. Have more Oe and Oa than Oi thickness.
2. n/a
3. n/a

BD. NO. Have more Oe thickness (26 cm) than Oa (10 cm).
BE. YES. Other histosols.
Hemists

Keys to Great Groups

BEA. NO. No sulfuric horizon within 50 cm.
BEB. NO. No sulfidic materials within 100 cm (likely; description doesn't go to 100 cm).
BEC. MAYBE. "Humilluvic materials"=organic matter illuvially transported downwards? Some in 2Bg and 3Bg hzn.
Luvihemist

Soil 3:

Description:

Site: Core 3
Landscape position: Backslope
Parent material: eolian sand
Vegetation: oak trees and grass (savanna)
Location: UTM zone 15 06334369
4632216
Slope: 5-9%
Classification:

Depth (inches)	Soil Horizon (weathering zone)	Description
0-2	O	Dark gray(10YR 4/1) fibric organic matter, very friable, gradual boundary
2-6	A	Very dark brown(10YR 2/2) sandy loam, moderate medium platy breaking to moderate fine granular, friable, noneffervescent, clear boundary
6-9	Bw	Yellowish brown(10YR 3/4) sandy loam, moderate fine to medium subangular blocky, few clay bridges between sand grains, friable, noneffervescent, gradual boundary
9-39	BC	Brown (7.5YR 5/4) loamy sand, weak medium subangular blocky, very friable, noneffervescent, gradual boundary
39-base	C	Light yellowish brown(10YR 6/4) loamy sand, single grain, loose, common fine strong brown (7.5YR5/6) mottles with light brownish gray (10YR6/2) halos

Diagnostic horizon: Ochric epipedon

-Fails to meet definitions for the other seven epipedons

-Too high in color, too thin for Anthropic; too thin for folistic; lacks Ap horizon, so not histic; no andic/volcanic properties- not melanic; too thin and coarse for mollic; too thin, not extensively human modified- not plaggen; too thin and high-color for umbric.

Classification sequence:

Keys to Soil Orders

A.

1. No- no permafrost
2. No- no permafrost.

B.

1. Yes- no andic soil properties (and…)
2. Yes- do have organic soil materials
    a. No- don't overlie cindery, etc. material. (or…)
    b. No- no cindery material. (or…)
    c. No- does not constitute 2/3 of the total thickness of the soil (from surface to densic, lithic, or paralithic contact), has mineral horizon. (or…)
    d. No- Is saturated 30+ days/year; upper boundary is within 40 cm of soil surface
        1. No- not >60 cm (or…)
        2. No- >40 cm

C.

1. No – No spodic or albic horizon, no cryic or gelic soil temperature regime
2. No – No spodic materials in Ap horizon
3. No – No spodic horizon

D. No – No andic soil properties

E.

1. No – No oxic horizon
2. No – No kandic horizon

F.

1. No - No slickenslides or wedge-shaped peds

G.

1. No – No aridic soil moisture regime

H.

1. No – No argillic or kandic horizon present
2. No – No fragipan present

I.

1.
    a. No – No mollic epipedon
    b. No – diagnostic horzions do not meet mollic epipedon requirements

J.

1. No – No argillic, kandic, or natric horizon
2. No – No fragipan

K.

1. Yes – Cambic horizon within 100 cm of the mineral soil surface with a lower boundary more than 25 cm below the mineral soil surface

Inceptisol

Key to Suborders

KA.

1. No – No aquic conditions above a densic, lithic, or paralithic contact
2. No – No ESP of 15 or more

KB. No – No plaggen or anthropic epipedon
KC. No – No gelic soil temperature regime
KD. No – No cryic soil temperature regime
KE. No – Soil moisture regime is udic
KF. No – Soil moisture regime is udic
KG. Yes – Soil fits into category of "Other Inceptisols"
Udept

Key to Great Groups

KGA. No – No sulfuric horizon
KGB. No – Duripan does not appear to be present
KGC. No – Does not have a fragipan
KGD. No – Does not have mollic or umbric epipedon
KGE.

1. No – Does not have the needed carbonate presence
2. No – Doesn't seem to have the needed base saturation

KGF. Yes – Soil fits category of "Other Udepts"
Dystrudepts

Soil 4:

Description:

Site: Core 4
Landscape position: narrow ridge above wetland- summit
Parent material: eolian sand
Vegetation: grasses and oak trees
Location: UTM zone 15 0634363
4632146
Slope: 2-5%
Classification:

Depth (inches)	Soil Horizon (weathering zone)	Description
0-4	A	dark grayish brown (10YR 4/2) dry, very dark grayish brown (10YR 3/2) moist, sandy loam, moderate fine granular, friable, gradual boundary
4-23	Bw1	yellowish brown (10YR5/4), loamy sand, moderate fine subangular, friable, gradual boundary
23-36	Bw2	yellowish brown (10YR 5/8) moist, loamy sand, moderate medium subangular blocky, friable, few yellowish red (5YR 4/6) streaks along root linings, gradual boundary
36-46	C	yellowish brown (10YR 5/6) moist, sand, single grain, loose

Diagnostic horizons: Ochric epipedon and cambic horizon
For ochric epipedon: Too thin for Mollisol, low color values and low chroma, does not fit other categories of diagnostic horizons
For cambic horizon: Bw horizon present, no Ap horizon

Classification sequence:
Keys to Soil Order

A.
1. No – No permafrost
2. No – No gelic materials in soil

B.
1. Yes – No andic soil properties
2. No
   a. No – No cindery, fragmental, or pumiceous material
   b. No – No cindery, fragmental, or pumiceous material
   c. No – Organic materials do not constitute 2/3 of total thickness of soil
   d. (1) No – Moss fibers not most of density
      (2) No – Not enough organic material

C.
1. No – No spodic or albic horizon, no cryic or gelic soil temperature regime
2. No – No spodic materials in Ap horizon
3. No – No spodic horizon

D. No – No andic soil properties

E.
1. No – No oxic horizon
2. No – No kandic horizon

F.
1. No - No slickenslides or wedge-shaped peds

G.
1. No – No aridic soil moisture regime

H.
1. No – No argillic or kandic horizon present
2. No – No fragipan present

I.
1.
   a. No – No mollic epipedon
   b. No – diagnostic horzions do not meet mollic epipedon requirements

J.
1. No – No argillic, kandic, or natric horizon
2. No – No fragipan

K.
1. Yes – Cambic horizon within 100 cm of the mineral soil surface with a lower boundary more than 25 cm below the mineral soil surface

Inceptisol

Key to Suborders

KA.

1. No – No aquic conditions above a densic, lithic, or paralithic contact
2. No – No ESP of 15 or more

KB. No – No plaggen or anthropic epipedon
KC. No – No gelic soil temperature regime
KD. No – No cryic soil temperature regime
KE. No – Soil moisture regime is udic
KF. No – Soil moisture regime is udic
KG. Yes – Soil fits into category of "Other Inceptisols"
Udept

Key to Great Groups

KGA. No – No sulfuric horizon
KGB. No – No duripan present
KGC. No – No fragipan present
KGD. No – No umbric or mollic epipedon
KGE.

1. No – No free carbonates in soil
2. No – Base saturation by NH4OAc not necessarily 60% or more

KGF. Yes – Soil fits category of "Other Udepts"
Dystrudepts

Soil 5*:

Description:

Site: Core 5
Landscape position: toeslope
Parent material: likely marsh sediment
Vegetation: grasses
Location: UTM zone 15 634311
4632266

Slope: 0 - 1%
Classification:

Depth (inches)	Soil Horizon (weathering zone)	Description
0-~16	Oi	Black, thick O horizon, wet, fibric.
16-?	A	Lighter colored, subangular blocky, medium to firm, organic accumulation, gleying.

***Note: Soil 5 description is based on a soil sample taken with a hand probe. We have no information about composition or any horizons at depth.**

Diagnostic horizon: Histic

-Saturated >30 cumulative days.
-Reduction for some time during normal years
-Is 20-60 cm thick (40 cm).

Classification sequence:
It is a Histosol; however, there is not enough specific information to accurately classify this soil further.
Based on the thick organic layer and the amount of fibrous organic material, this is likely a **Fibrist** suborder and a **Haplofibrist** at the great group level.

VIII. References

Anderson, J.R., Hardy, E.E., Roach, J.T., and Witmer, R.E. 1976. A Land Use and Land Cover Classification System for Use With Remote Sensor Data. Geological Survey Professional Paper 964. Retrieved 30 Nov 2012 from http://landcover.usgs.gov/pdf/anderson.pdf. Online.

Iowa Association of Naturalists, Cohen, D. (Ed.). 2002. *Iowa Prairie*. Iowa's Biological Communities Series. Online publication. Retrieved from http://www.extension.iastate.edu/Publications/IAN203.pdf on 30 Nov 2012.

Iowa Natural Heritage Foundation. 2012. *Ancient Treasure*. Onine publication. Retrieved from http://www.inhf.org/pdfs/about_us/annual_report/INHF_18NewCiha.pdf on 28 November 2012.

Iowa Natural Heritage Foundation. 2012. Online Publication. Retrieved from http://www.inhf.org/ciha-fen-preserve.cfm on 28 November 2012.

Johnson County Conservation Board. 2012. *Ciha Fen Multiple Species Inventory and Monitoring Project*.Johnson County Conservation Board Quarterly **12**(2). Retrieved from www.johnson-county.com/conservation on 30 November 2012.

National Climatic Data Center. 2006. *Climate of Iowa*. Retrieved from http://www.crh.noaa.gov/images/dvn/downloads/Clim_IA_01.pdf on 30 November 2012.

Web Soil Survey Staff,(2012) Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Retrieved from http://websoilsurvey.nrcs.usda.gov/ 29 November 2012.