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# Natural Resources Conservation Service's Role in the National Wetland Condition Assessment


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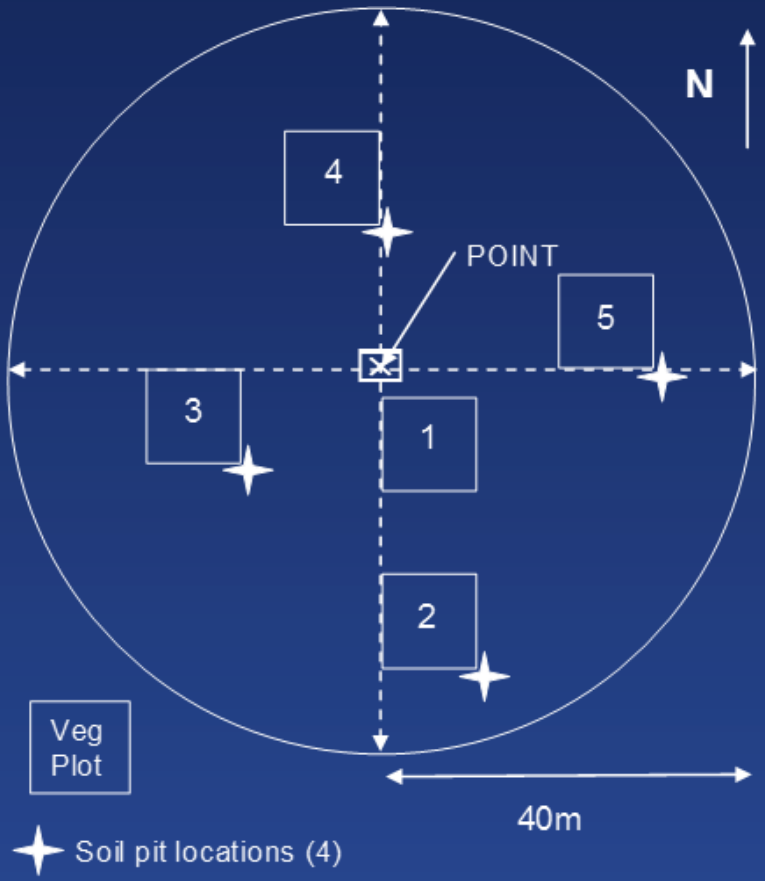
# WRITING THE SAMPLING PROTOCOL

# Soil Sampling Protocol

- 4 sampling locations per site adjacent to vegetation plots
- Field descriptions for all locations (60-120 cm)
- Samples for lab analysis taken at one location (120 cm)



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# Tools for Soil Pit Excavation

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# Special Tools for Difficult Soils

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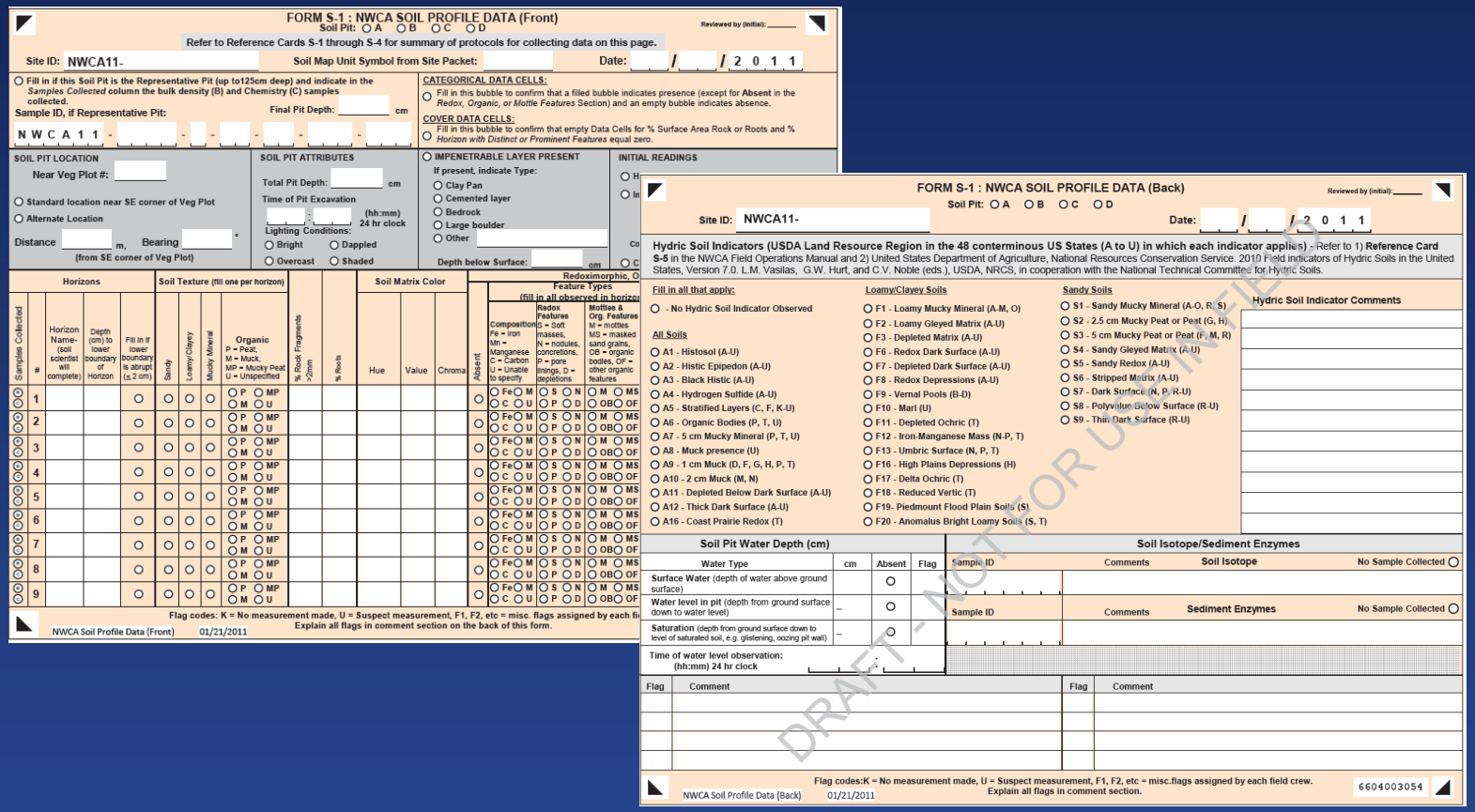
# Development of the Forms



FORM S-1 : NWCA SOIL PROFILE DATA (Front)

Soil Pit: A B C D

Reviewed by (Initial):

Refer to Reference Cards S-1 through S-4 for summary of protocols for collecting data on this page.

Site ID: NWCA11-

Soil Map Unit Symbol from Site Packet:

Date: / / 2011

Fill in if this Soil Pit is the Representative Pit (up to125cm deep) and indicate in the *Samples Collected* column the bulk density (B) and Chemistry (C) samples collected.

Sample ID, if Representative Pit: NWCA11-

Final Pit Depth: cm

CATEGORICAL DATA CELLS:

Fill in this bubble to confirm that a filled bubble indicates presence (except for Absent in the *Redox, Organic, or Mottle Features* Section) and an empty bubble indicates absence.

COVER DATA CELLS:

Fill in this bubble to confirm that empty Data Cells for % Surface Area Rock or Roots and % *Horizon with Distinct or Prominent Features* equal zero.

SOIL PIT LOCATION

Near Veg Plot #:

Standard location near SE corner of Veg Plot

Alternate Location

Distance m, Bearing °

(from SE corner of Veg Plot)

SOIL PIT ATTRIBUTES

Total Pit Depth: cm

Time of Pit Excavation (hh:mm) 24 hr clock

Lighting Conditions: Bright Dappled Overcast Shaded

IMPENETRABLE LAYER PRESENT

If present, indicate Type: Clay Pan, Cemented layer, Bedrock, Large boulder, Other

Depth below Surface: cm

INITIAL READINGS

| Horizons | | | | Soil Texture (fill one per horizon) | | | | | | Soil Matrix Color | | | Redoximorphic Feature Types (fill in all observed in horizon) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Samples Collected | # | Horizon Name- (soil scientist will complete) | Depth (cm) to lower boundary of Horizon | Fill in if lower boundary is abrupt (≤ 2 cm) | Sandy | Loamy/Clayey | Mucky Mineral | Organic P = Peat, M = Muck, MP = Mucky Peat U = Unspecified | % Rock Fragments >2mm | % Roots | Hue | Value | Chroma | Absent | Compositions Fe = Iron Mn = Manganese C = Carbon U = Unable to specify | Redox Features S = Soft masses, N = nodules, concretions, P = pore linings, D = depletions | Mottles & Org. Features M = mottles MS = masked sand grains, OB = organic bodies, OF = other organic features |
| | 1 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 2 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 3 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 4 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 5 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 6 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 7 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 8 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |
| | 9 | | | | | | | P MP M U | | | | | | | Fe M C U | S N P D | M MS OB OF |

Flag codes: K = No measurement made, U = Suspect measurement, F1, F2, etc = misc. flags assigned by each fi

Explain all flags in comment section on the back of this form.

NWCA Soil Profile Data (Front) 01/21/2011

FORM S-1 : NWCA SOIL PROFILE DATA (Back)

Soil Pit: A B C D

Reviewed by (Initial):

Site ID: NWCA11-

Date: / / 2011

Hydric Soil Indicators (USDA Land Resource Region in the 48 conterminous US States (A to U) in which each indicator applies) - Refer to 1) **Reference Card S-5** in the NWCA Field Operations Manual and 2) United States Department of Agriculture, National Resources Conservation Service. 2010 Field indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.), USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

Fill in all that apply:

- No Hydric Soil Indicator Observed

All Soils

- A1 - Histosol (A-U)
- A2 - Histic Epipedon (A-U)
- A3 - Black Histic (A-U)
- A4 - Hydrogen Sulfide (A-U)
- A5 - Stratified Layers (C, F, K-U)
- A6 - Organic Bodies (P, T, U)
- A7 - 5 cm Mucky Mineral (P, T, U)
- A8 - Muck presence (U)
- A9 - 1 cm Muck (D, F, G, H, P, T)
- A10 - 2 cm Muck (M, N)
- A11 - Depleted Below Dark Surface (A-U)
- A12 - Thick Dark Surface (A-U)
- A16 - Coast Prairie Redox (T)

Loamy/Clayey Soils

- F1 - Loamy Mucky Mineral (A-M, O)
- F2 - Loamy Gleyed Matrix (A-U)
- F3 - Depleted Matrix (A-U)
- F6 - Redox Dark Surface (A-U)
- F7 - Depleted Dark Surface (A-U)
- F8 - Redox Depressions (A-U)
- F9 - Vernal Pools (B-D)
- F10 - Marl (U)
- F11 - Depleted Ochric (T)
- F12 - Iron-Manganese Mass (N-P, T)
- F13 - Umbric Surface (N, P, T)
- F16 - High Plains Depressions (H)
- F17 - Delta Ochric (T)
- F18 - Reduced Vertic (T)
- F19- Piedmont Flood Plain Soils (S)
- F20 - Anomalus Bright Loamy Soils (S, T)

Sandy Soils

- S1 - Sandy Mucky Mineral (A-O, R, S)
- S2 - 2.5 cm Mucky Peat or Peat (G, H)
- S3 - 5 cm Mucky Peat or Peat (F, M, R)
- S4 - Sandy Gleyed Matrix (A-U)
- S5 - Sandy Redox (A-U)
- S6 - Stripped Matrix (A-U)
- S7 - Dark Surface (N, P, R-U)
- S8 - Polyvalue Below Surface (R-U)
- S9 - Thin Dark Surface (R-U)

Hydric Soil Indicator Comments

Soil Pit Water Depth (cm)

| Water Type | cm | Absent | Flag |
|---|---|---|---|
| Surface Water (depth of water above ground surface) | | | |
| Water level in pit (depth from ground surface down to water level) | – | | |
| Saturation (depth from ground surface down to level of saturated soil, e.g. glistening, oozing pit wall) | – | | |

Time of water level observation: (hh:mm) 24 hr clock

Soil Isotope/Sediment Enzymes

Sample ID Comments Soil Isotope No Sample Collected

Sample ID Comments Sediment Enzymes No Sample Collected

| Flag | Comment | Flag | Comment |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

Flag codes:K = No measurement made, U = Suspect measurement, F1, F2, etc = misc.flags assigned by each field crew.

Explain all flags in comment section.

NWCA Soil Profile Data (Back) 01/21/2011 6604003054

DRAFT - NOT FOR USE IN FIELD

# Soils Field Data Collected by Horizon

- Abrupt boundary
- Field texture
- % rock fragments
- Matrix color
- Rodoxymorphic features
- % masked sand grains in sandy soils

# Other field data collected

- Field Indicators of Hydric Soils in the United States met
- Water table depth

# Lab analysis by horizon

- Particle size
- Calcium carbonate equivalent
- Total C, N and S
- pH
- CEC
- Amonium oxalate extraction (Al, Fe, Mn, P, Si)
- EC
- Dithionite-citrate extraction (Al, Fe, Mn)
- Trace elements
  - Ag, As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, P, Pb, Sb, Se, Sn. Sr V, W, Zn
- Bulk density

# Lab Data

- Complete data should be available by October 1, 2012
- Data will be available as flat files with all other data through EPA
- Soils data will be available on NRCS Soil Characterization Data website at http://ncsslabdatamart.sc.egov.usda.gov/

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# DEVELOPMENT OF DATA ANALYSIS PLAN

# Soil Data Analysis Issues

- What is the definition of "condition"?
- How do we determine reference?
- How do we group sites so that we are making valid comparisons?
- How do we integrate other data (veg., hydrology, buffer, etc.) with results from soils analysis to come up with comprehensive results?

# Initial Analysis

- Development of threshold criteria for specific characteristics to assist in the analysis of overall wetland condition.

# Further Analysis

- Develop models to be used to better evaluate ecosystem services and impacts to those services that can either utilize the collected data for analysis or callibration

# Examples of Ecosystem Services Directly Impacted by Soil Condition

- Water retention
- Sedimentation
- Biogeochemical cycling of Nutrients

# Soil Characteristics that May Affect Ecosystem Services

- Permeability
- Drainage class/hydroperiod
- Cation exchange capacity
- Organic carbon content
- Slope
- Microtopography
- Soil ecology (microbial community)

# Potential soils based indicators

- Permeability
  - Texture
  - Structure
  - Evidence of soil compaction

# Potential soil based indicators of drainage class/hydroperiod

- Field Indicator(s) of Hydric Soils
- Surface color
- Presence of organic soil material at the surface
- Subsurface color
- Redox feature characteristics





# Potential Soil Based Indicators of Cation Exchange Capacity

- Estimated percent organic carbon
- Percent clay

# Potential Soil Based Indicators of Soil Ecology

- Surface color
- Organic matter content
- Redox features

# Soil Characteristics Used to Evaluate Water Retention

- Long term storage
  - Slope
  - Drainage class/hydroperiod
  - Permeability
- Short term
  - Slope
  - Microtopography
  - Permeability
  - Surface organic carbon content

# Soil Characteristics Used to Evaluate Biogeochemical Cycling

- Cycling of Redox Sensitive Compounds
  - Permeability
  - Drainage class/hydroperiod
  - Organic C content
  - Soil ecology (microbial community)
- Sediment retention (phosphorous/heavy metals)
  - Permeability
  - Slope
  - Microtopography
  - Cation exchange capacity

# Soil Characteristics Used to Evaluate Biogeochemical Cycling

- Carbon sequestration
  - Organic carbon content
  - Drainage class/hydroperiod
  - Landscape position
  - Microtopography

# Summary

- NRCS has played an integral role in providing technical expertise in soil sampling and analysis in order to ensure that useful data was collected to evaluate the condition of our nations wetlands.
- NRCS was contracted to do the lab analysis of all NWCA samples to ensure consistency that allows for better analysis of the data.

# Summary

- NRCS will continue to assist EPA in development of the analysis plan and conclusions.
- NRCS will also utilize data collected to improve Soil Survey mapping and interpretation related to hydric soils.

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