Evaluating updated redoximorphic feature descriptions: Evidence from Saskatchewan soils

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BACKGROUND

Gleysolic soils are typical of prairie pothole wetlands in Saskatchewan and are indicative of saturated soil conditions that occur for at least part of the growing season. The oxidation-reduction processes in Gleysolic soils result in the development of depleted or reduced soil matrices (dull or blue-gray), and brightly coloured (red, orange, or brown), oxidized concentrations.

These features are critical diagnostic indicators for identifying soil saturation and are fundamental to soil classification in Canada.

The CSSC Redoximorphic Soils Working Group has proposed updates intended to improve clarity, consistency, and applicability of redoximorphic feature descriptions. Currently, these proposed updates have not been examined on Saskatchewan soils, and therefore their implications are currently unknown.

METHODS

- Sample 9 cultivated seasonal wetlands in SK.
- One transect per wetland, targeted to intersect 3 hydroperiod zones: ephemeral, temporary, and seasonal (Fig. 4).
- 3 soil pits will be sampled per wetland, soil sampling will occur for each unique horizon to 50 cm (Fig. 4, Fig. 6).
- Field data collection will include classifying the soil profile and testing α,α'-dipyridyl (di-peeri-dill) dye paper strips.
- Laboratory analysis will include particle size determination, pH, EC, and extractable Fe.
- Reclassify ~313 archived soil profiles using R (Fig. 5).

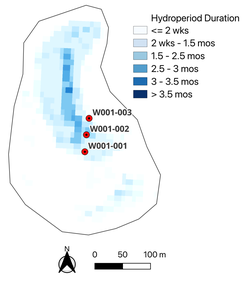


Fig. 4. Plot design layout.

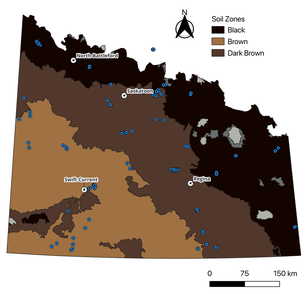


Fig. 5. Distribution of archived soil data locations in SK.



PRELIMINARY RESULTS

The below results summarize the proposed changes to the Canadian System of Soil Classification (3rd ed.).



Fig. 1. Soil profile observed at W001-001.

Orthic Humic Gleysol
↓
Orthic Humic Gleysol
Horizon Summary:
0-23 cm: Ap → **Ap**
23-47 cm: Bgk → **Bgk**
47-73+ cm: Bg → **Bg**



Fig. 2. Soil profile observed at W001-002.

Orthic Humic Gleysol
↓
Orthic Humic Gleysol
Horizon Summary:
0-27 cm: Ap → **Ap**
27-76+ cm: Bg → **Bgα**



Fig. 3. Soil profile observed at W001-003.

Orthic Humic Gleysol
↓
Gleyic Brown Chernozem
Horizon Summary:
0-27 cm: Ap → **Ap**
27-48 cm: Bg1 → **Bgβ1**
48-75+ cm: Bg2 → **Bgβ2**

SUMMARY OF PRIMARY CLASSIFICATION CHANGES

Current	→	Proposed
Gleysolic Subgroups (Vertisols, Cryosols)	→	Gleysolic Subgroup modifier applied to any Subgroup of any mineral soil keyed out prior to the Gleysolic soil order
"Gleyed" Subgroup	→	"Gleyic" Subgroup
3 Great Groups: Luvic Gleysol, Humic Gleysol, Gleysol	→	4 Great Groups: add Stagnosol Great Group
none	→	add "Stagnosolic" and "Stagnic" Subgroup modifiers
2 horizon suffixes: **g, gj**	→	4 horizon suffixes: **g, gj, gα, gβ**
use of mottle contrast (faint, distinct, and prominent), and presence of low chromas to assign g or gj suffixes	→	"degree of gleying" and "degree of mottling" used to assign g, gj, gα, gβ suffixes

*Adapted from Heck et al. (2023)

SIGNIFICANCE & NEXT STEPS

This research is a section of a broader study examining wetland classification and hydric soil characteristics in Saskatchewan's cultivated landscapes. This component supports the continued refinement of redoximorphic criteria in soil classification and provides Saskatchewan specific evidence to inform ongoing updates to the Canadian System of Soil Classification.

Next steps include soil sampling at 8 wetland sites, laboratory analysis, and reclassifying archived soil data.



Fig. 6. Soil pit excavation at W001-001 (a big thanks to Emma, Breanna, and Andrea for helping me dig at my first wetland site!).

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