The Norwegian Forest and Landscape Institute

REPORT FROM WRB FIELD EXCURSION IN NORWAY 2010

Classification and pictures from the sites

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Participants of the WRB Field excursion in Norway 2010

(Photo: Severin Woxholtt, The Norwegian Forest and Landscape Institute)

FOREWORD

Some information on the report:

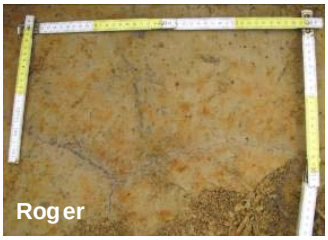
1. The Field guide is to be used in addition to this report (attached in the e-mail).
2. The pedon boundaries from the original field guide are used, even though the profile walls in the excursion differed slightly from the profile walls which were described whilst preparing the excursion
3. Classification is done according to WRB 2006, First update 2007 and taxonomic classification to the family level using the eleventh edition of the Keys to Soil Taxonomy, 2010. The classification according to Soil Taxonomy is done by Joe Chiaretti, presented in italic letters for each site. He has also entered some suggested additions or changes to horizon designations and to the diagnostic horizons, properties, and materials in the short tables for the soils.
4. The soil department in The Norwegian Forest and Landscape Institute has a new proposal for classification in most sites: named: Revised proposal (-s).
5. If there is a proposed classification from NFLI: added qualifier is in bold (example: **Anthric**), qualifier which is removed, is written like this: example: ~~Colluvic~~).
6. Photos are collected from a lot of the participants, first name of the photographer in white letters in each photo.
7. To be able to work with the document being so full of pictures, the pictures had to be reduced in size. Hopefully the quality on screen is ok, but on paper it might not be sufficient. If there is **one** (or two) particular picture (-s) that you would like to have in a better quality, please let me know.

Ås, January 2011

Siri Svendgård-Stokke

CONTENT

SITE 1



Classification site 1

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties			Diagnostic materials
		Field guide	Excursion						
1	0 - 29	Ap1	~						*mineral material*
2	29 - 35	Ap2	~						*mineral material*
3	35 - 48	Bg1	~		***cambic***			**gleyic s.c.p**	*mineral material*
4	48 - 60	Bg2	~						*mineral material*
5	60 - 83	2Btg1	~			abrupt text. change	litholog.discontinuity	**stagnic s.c.p.**	*mineral material*
6	83 +	2Btg2	~						*mineral material*

WRB

1. From the discussion: Gleyic Planosol (Ruptic, Eutric, Siltic)
2. Revised proposaI: Gleyic Planosol (Ruptic, Eutric, Siltic, **Gelistagnic**)
3. Arguments: The freeze-thaw dynamics are important for both the pedogenesis and the management of this soil, and should be in the classification: Gelistagnic as a qualifier.

Soil Taxonomy *Fine-silty, mixed, active Aquic Dystrocryept*

SITE 2

Classification site 2

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties		Diagnostic materials	
		Field guide	Excursion						
1	0 - 6	Ah							*mineral material*
2	6 - 10	AE							*mineral material*
3	10 - 21	Bs							*mineral material*
4	21 - 37	E		**albic**			**stagnic s.c.p.**		*mineral material*
5	37 - 60	E/Btg	*E/Btxg*		**argic + fragic**	**albeluvic tonguing**			*mineral material*
6	60 - 77	Btg/E	*Btxg/E*					**fluvic m.**	*mineral material*
7	77 - 90	Btg							*mineral material*
8	90 - 175	BCg							*mineral material*

WRB

1. From the discussions: Stagnic Cutanic Fragic Albeluvisol (Dystric, Siltic, Fluvic, Protospodic)
2. Revised proposal: None

Soil Taxonomy: *Fine, vermiculitic, frigid Aquic Fraglossudalf*

Diagnostic horizons:	*Diagnostic characteristics:*
ochric epipedon from 0 to 37 cm	*albic materials*
albic horizon from 21 to 37 cm	*interfingering of albic materials*
glossic horizon from 37 to 77 cm	*aquic conditions from 60 to 150 cm*
argillic horizon from 37 to 90 cm	*fragic soil properties*
fragipan from 37 to 77 cm	

Notes:

1.) The vermiculitic mineralogy class is based on the clay mineralogy data shown in pedon bar graphs provided by D. Sauer.

2.) This pedon has a frigid instead of a cryic soil temperature regime. This estimation is based on the data for the Trogstad presented in Table 1, page 8 of the excursion field guide. The ØF 11 pedon has an O horizon and is assumed to not be saturated with water at the 50 cm depth during some part of the summer. Under this assumption of soil moisture status, the mean summer soil temperature (June, July, and August) is between 8 and 15 degrees C. and fits the frigid soil temperature regime of Soil Taxonomy.

3.) Suffix symbol "x" for fragic character was added to the Btg parts of the transitional horizons between 37 and 77 cm.

SITE 3


Ove


Antoine


Daniela


Roger


Deborah


Hilde


Hilde

Classification site 3

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties				Diagnostic materials
		Field guide	Excursion							
1	0 - 20	Ap	~	**anthric**	**umbric**					*mineral material*
2	20 - 32	Apd	~							*mineral material*
3	32 - 40	Bg	~					**stagnic s.c.p**		*mineral material*
4	40 - 50	Eg	~		**albic**					*mineral material*
5	50 - 65	2Eg/Btg	~	**argic**		abrupt text. change	litho.discont.		**albeluvic tonguing**	*mineral material*
6	65 +	2Btg/Eg	~							*mineral material*

WRB

1. From the discussions: $^{6/10}$ Umbric Stagnic Cutanic Albeluvisol (Anthric, Abruptic, Ruptic, Eutric, Epiarenic, Endosiltic)
   $^{4/10}$ Umbric Luvic Planosol (Albic, Ruptic, Eutric, Epiarenic, Endosiltic)
2. Revised proposal: $^{6/10}$ Umbric Stagnic Cutanic Albeluvisol (Anthric, Abruptic, Ruptic, Eutric, Epiarenic, Endosiltic, **Gelistagnic)**
   $^{4/10}$ Umbric Luvic Planosol (Albic, Ruptic, Eutric, Epiarenic, Endosiltic, **Anthric, Gelistagnic**)
3. Arguments for new proposal: To be able to tell something about temperature regime causing the active freeze-thaw dynamics, the qualifier Gelistagnic should be added in both the Albeluvisol alternative and Planosol alternative. In the Planosol alternative, the Anthric qualifier should also be included (it's because of the cultivation that this soil has an umbric horizon).

Soil Taxonomy *Fine, mixed, semiactive, frigid Arenic Oxyaquic Glossudalf*

Diagnostic horizons:	*Diagnostic characteristics:*
umbric epipedon from 0 to 32 cm	
albic horizon from 40 to 50 cm	*albic materials*
glossic horizon from 50 to 65 cm	*interfingering of albic materials*
argillic horizon from 50 to 65 cm	*endosaturation*

SITE 4

Classification site 4

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties		Diagnostic materials
		Field guide	Excursion					
1		Ah	~					*mineral material*
2		BE	~					*mineral material*
3		E	~	**albic**				*mineral material*
4		Btg1	~		**argic**	**stagnic s.c.p.**		*mineral material*
5		Btg2	~					*mineral material*
6		Bg	~				**gleyic s.c.p.**	*mineral material*
7		Cg	~					*mineral material*

WRB

From the discussions: Alic Endogleyic Stagnosol (Albic, Hyperdystric, Siltic)

Revised proposal: Alic Endogleyic Stagnosol (Albic, Hyperdystric, Siltic, **Gelistagnic**)

Arguments for the new proposal: In the springtime, thawing of the upper most layers occurs when the subsoil is still frozen, which causes the short period of stagnic conditions. Gelistagnic would be an appropriate qualifier for this soil.

Soil Taxonomy *Fine-silty, mixed, active Aquic Haplocryalf*

SITE 5

Classification site 5

	Pedon boundary (cm)	Horizon		Diagnostic horizon			Diagnostic properties			Diagnostic materials
		Field guide	Excursion							
1	0 - 30	Ap	Ap	**umbric**	**anthric**					*mineral material*
2	30 - 35	Apdg	Apdg	*1)*	***1)***	**densic**				*mineral material*
3	35 - 60	Cgd	Cgd		*2)*				**stagnic s.c.p**	*mineral material*
4	60 - 72	Cg1	Cg**		**Albic***		abrupt text. change			*mineral material*
5	72 - 90	Cg2	2Cg1**					litho.discont.	**gleyic s.c.p.**	*mineral material*
6	90 - 115	Cg3	2Cg2**							*mineral material*
7	115 +	Cg4	2Cg3**					*reducing conditions*		*mineral material*

* In the excursion, an E-horizon was observed in the upper most part of the H4, causing the albic horizon.

** *Horizon designations from Chiaretti: Ap, Apdg, Cgd, Cg1, 2Cg2, 2Cg3, 2Cg4*

WRB

From the discussions: $^{9/10}$ Umbric Bathigleyic Planosol (Albic, Ruptic, Eutric, Arenic)

$^{1/10}$ Gleyic Umbrisol (Anthric, Albic, Ruptic, Eutric, Arenic)

Revised proposal: $^{9/10}$ Umbric Bathigleyic Planosol (Albic, Ruptic, Eutric, Arenic, **Anthric**, **Densic**)

$^{1/10}$ Gleyic Umbrisol (Anthric, Albic, Ruptic, Eutric, **Densic**, Arenic)

Arguments for the new proposal: Due to the diagnostic properties, we would prefer to classify this soil as a Planosol. The Densic qualifier should also be used due to both the penetration resistance in H2 and H3, the absence of active roots (neither found in the cereal stubble) and the experience of the farmer and the man digging the profile. This is important for both pedogenesis and for the management of the soil, and should be in the classification.

Chiaretti's notes on WRB classification:

1.) *This horizon should also be considered as part of both the umbric and anthric horizons. Criterion 4 for the umbric horizon states that the base saturation is less than 50 percent on a weighted average throughout the depth of the horizon. The upper 35 cm of this soils averages 48 percent base saturation.*

2.) *I believe that the Cgd horizon should also be considered as part of the albic horizon. Based on the pedon description on page 57 of the field guide, the moist value is 5 and the chroma is 1.5.*

3.) *If the gleyic colour pattern begins at 72 cm, then the prefix qualifier should be Endogleyic instead of Bathygleyic. The specifier "Bathy" is defined as having the horizon, property, or material starting between 100 and 200 cm from the soil surface.*

4.) *How can an Umbrisol be possible for this soil? The Key to reference soil groups (Chapter 3, Report 103) has Planosols keying out well before Umbrisols. It must classify in the first RSG that it meets the criteria for.*

5.) *I added reducing conditions to the 2Cg4 horizon due to positive reaction shown to a,a, dipyridyl. See the photo below. The two purplish red spots resulted when the dipyridyl solution was applied to chunks of this horizon that were on the spoil pile.*

6.) *I added mineral material as the only diagnostic material present in this pedon*

.

Soil Taxonomy *Sandy over loamy, mixed, semiactive, nonacid, frigid Aeric Humaquept*

Diagnostic horizons:	*Diagnostic characteristics:*
umbric epipedon from 0 to 35 cm	
albic horizon from 35 to 72 cm	*albic materials*
	lithologic discontinuity at 72 cm
	aquic conditions below 35 cm

SITE 6

SITE 7A

Classification site 7A

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties			Diagnostic materials
		Field guide	Excursion						
1	0 - 30	Ap	~						*mineral material*
2	30 - 60	Bw	~	**cambic**					*mineral material*
3	60 - 78 (90)	Bg	~			abr.text.ch.		**stagnic s.c.p**	*mineral material*
4	78 (90) - 110	Bx	*Bdg*		**fragic**				*mineral material*
5	110 +	Bkd	~				litho. discont.		*mineral material*

WRB

From the discussions: $^{1/10}$ Haplic Planosol (Ruptic, Eutric, Endofragic, Bathypisocalcic)

$^{9/10}$ Stagnic Endofragic Cambisol (Humic, Eutric, Ruptic, Bathypisocalcic)

Revised proposal: $^{1/10}$ Haplic Planosol (Ruptic, Eutric, Endofragic, Bathypisocalcic, **Gelistagnic**)

$^{9/10}$ Stagnic **Gelistagnic** Endofragic Cambisol (Humic, Eutric, Ruptic, Bathypisocalcic)

Arguments for the new proposal: Due to the properties of the parent material, we would prefer to classify this soil as a Cambisol. Looking to texture for the qualifier in this kind of material (till/moraine), is of little value. The abrupt textural change is by chance, it varies from site to site (abrupt text. ch. is not found in site 7b). In this soil, the freeze-thaw dynamics are important for both the pedogenesis and the management, and this should also be in the classification: Gelistagnic qualifier.

Soil Taxonomy *Coarse- loamy, mixed, active Oxyaquic Haplocryept*

Diagnostic horizons:

ochric epipedon from 0 to 30 cm

cambic horizon from 30 to 60 cm

Diagnostic characteristics:

aquic conditions from 60 to 150 cm

densic contact at either 78 or 90 cm

densic materials from either 78 or 90 cm to 150 cm

identifiable secondary carbonates from 110 to 150 cm

Notes

1.) Suffix symbol "d" for physical root restriction and "g" for gleying was added to the B horizon between 78 (90) and 110 cm. Symbol "x" is proposed to be removed.

SITE 7B

Classification site 7B

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties			Diagnostic materials
		Field guide	Excursion						
1	0 - 12	A	~						*mineral material*
2	12 - 50	Bw	~	**cambic**					*mineral material*
3	50 - 68	Eg	~	**albic**				**stagnic s.c.p**	*mineral material*
4	68 - 110	Bx	*Btx*	***argic***	**fragic**	*albeluvic tonguing*			*mineral material*
5	110 +	Bkd	~				litho. discont.		*mineral material* + calcaric *mat.*

WRB

From the discussions: $^{2/10}$ Stagnic Endofragic Cambisol (Humic, Dystric)

$^{8/10}$ Cambic Stagnic Cutanic Endofragic Albeluvisol (Dystric, Humic)

Revised proposal: $^{2/10}$ Stagnic **Gelistagnic** Endofragic Cambisol (Humic, Dystric, **Albic**)

$^{8/10}$ Cambic Stagnic Cutanic Endofragic Albeluvisol (Dystric, Humic, **Gelistagnic**)

Arguments for the new proposal: In this soil, the freeze-thaw dynamics which is important for both the pedogenesis and the management, and this should also be in the classification: Gelistagnic qualifier. In the Cambisol-classification, the Albic qualifier should also be included.

Soil Taxonomy *Coarse-loamy, mixed, active Oxyaquic Haplocryalf*

<u>Diagnostic horizons:</u>

ochric epipedon from 0 to 18 cm

cambic horizon from 12 to 50 cm

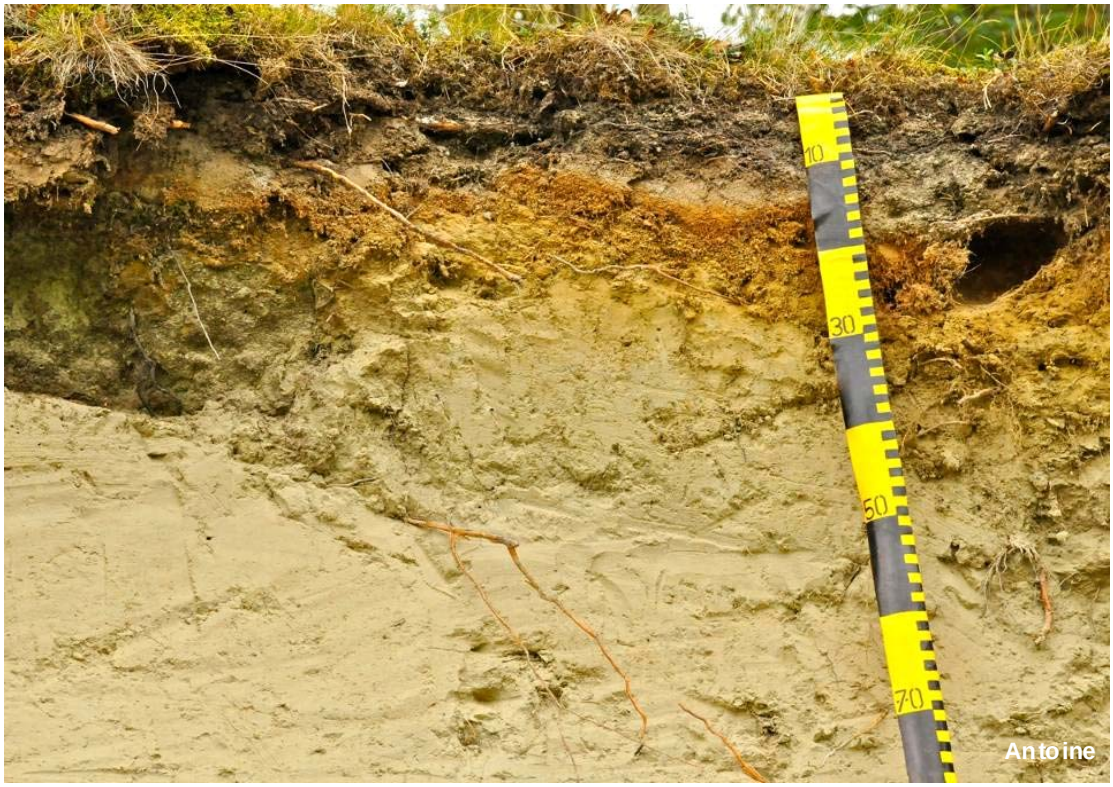
albic horizon from 50 to 68 cm

argic horizon from 68 to 110 cm

<u>Diagnostic characteristics:</u>

identifiable secondary carbonates from 110 to 125 cm?

SITE 8



Classification site 8

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties	Diagnostic materials	
		Field guide	Excursion					
1	0 - 6	Oi	~				*organic material*	
2	6 - 11	AE	~	**albic**			*mineral material*	
3	11 - 16	Bs	~		**spodic**		*mineral material*	
4	16 - 28	2Bw1	~			litho. discont.	*mineral material*	
5	28 - 80	2Bw2	~				*mineral material*	
6	80 - 83	2C1	~				*mineral material*	**fluvic material**
7	83 - 130	2C2	~				*mineral material*	
8	130 - 160	2C3	~				*mineral material*	
9	160 - 180	2C4	~				*mineral material*	
10	180 - 210+	2C5	~				*mineral material*	

WRB

From the discussions: Albic Podzol (Ruptic, Siltic, Bathyfluvic, Bathyeutric)

Soil Taxonomy *Coarse-silty, micaceous Typic Haplocryod*

Note:

The micaceous mineralogy class of Soil Taxonomy is estimated based on the visual evidence of abundant muscovite in the coarse sand fraction.

SITE 10

Classification site 10

WRB

From the discussions: Cryic Ombric Glacic Fibric Histosol

Soil Taxonomy *Dysic, subgelic Hemic Glacistel*

Assumptions: *The ground ice within about 30 cm of the soil surface constitutes both a glacic layer and permafrost.*
All horizons are composed of organic soil materials.
The organic soil materials have more hemic soil materials (intermediate decomposition) than other kinds of organics in the upper 50 cm.
The mean annual soil temperature is about 1 degree C. and allows the soil to qualify for the subgelic temperature class (+1 °C to -4 °C)

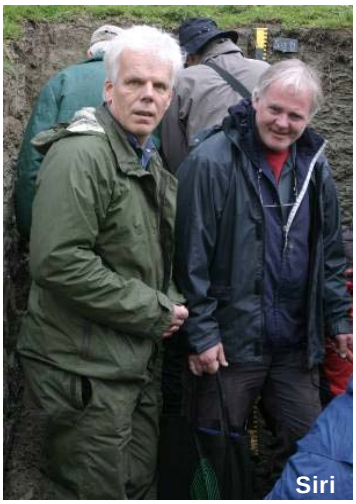
SITE 11


Roger


Roger


Siri


Siri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Elling


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Age


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Stefaan

Classification site 11

	Pedon boundary (cm)	Horizon		Diagnostic horizon		Diagnostic properties	Diagnostic materials	
		Field guide	Excursion					
1	0 - 10	Ap	~					*mineral material*
2	10 - 20	A	~					*mineral material*
3	20 - 48	Bw	~		**cambic**			*mineral material*
4	48 - 70	E	~	**albic**				*mineral material*
5	70 - 94	Btg	~		**argic**	**stagnic s.c.p.**		*mineral material*
6	94 - 120	BCg	~				**fluvic**	*mineral material*
7	120+	Cg	~					*mineral material*

WRB

From the discussions: Stagnic Endovertic Albic Cutanic Luvisol (Humic, Hypereutric, Siltic, Colluvic, Bathyfluvic)

Revised proposal: Stagnic ~~Endovertic~~ Albic Cutanic Luvisol (Humic, Hypereutric, Siltic, ~~Colluvic~~, Bathyfluvic, **Gelistagnic**)

Arguments for the new proposal: The freeze-thaw dynamic is very obvious in this profile: blady, lenticular and platy structure. Probably all the soil above 70 cm is frozen during some time in most years. Below, the concoidal prismatic structure starts: lateral flow after thawing will appear in the cracks. The use of the qualifier Gelistagnic is important to be able to tell something about this very pronounced dynamics, presently active.

As for the Endovertic and Colluvic qualifiers, we do not find evidence for them, and these must therefore be removed from the classification of this profile.

Soil Taxonomy *Fine-silty, mixed, semiactive Inceptic Haplocryalf*

SITE 12

Classification site 12

	Pedon and boundary (Field guide)		Pedon and boundary (Excursion)		Diagnostic horizon	Diagnostic materials		
1	0 - 20	Ap	0 - 15	Ap				*mineral material*
2	20 - 30	BCg	15 - 30	Bw1 or Bt1	**cambic or argic**			*mineral material*
3	30+	Cg	30 - 60	Bw2 or Bt2				*mineral material*
4			60 - 80	BCg		**stagnic s.c.p.**		*mineral material*
5			80+	Cg			**fluvic**	*mineral material*

WRB

From the discussions: $^{8/10}$Haplic Cambisol (Calcaric, Siltic, Cutanic, Bathyfluvic)

$^{2/10}$Cutanic Luvisol (Hypereutric, Nudiargic, Siltic)

Revised proposal: $^{8/10}$**Gelistagnic** Cambisol (~~Calcaric~~, **Hypereutric**, Siltic, Cutanic, Bathyfluvic)

$^{2/10}$Cutanic Luvisol (Hypereutric, Nudiargic, Siltic, **Gelistagnic**)

Arguments for the new proposal: 30-years of pedogenesis by frost action and the help of biological activity! Lenticular and platy structure down to a lesser depth than in site 11: young soil. H2 and H3 are separated due to the difference in soil structure. From 80 cm, most of the soil is massive, but some cracks are present. The cracks are further up in this profile than in site 11. The freeze-thaw dynamics are obvious in this profile, and the use of the Gelistagnic qualifier is important to be able to tell something about this very pronounced dynamics, presently active. As for the Calcaric qualifier, we do not find evidence for it, and this must therefore be removed from the classification of this profile.

Soil Taxonomy *Fine, mixed, active Typic Haplocryept*

<u>Diagnostic horizons:</u>

ochric epipedon from 0 to 18 cm

cambic horizon from 15 to 60 cm

<u>Diagnostic characteristics:</u>

aquic conditions below 60 cm

Excursion
dinner
at
Lian
restaurant,
Trondheim

Thank
you
for
your
participation!