Czech Society of Soil Science

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Point of Pilgrimage „U Lizu“

Pedologické dny conference

2019

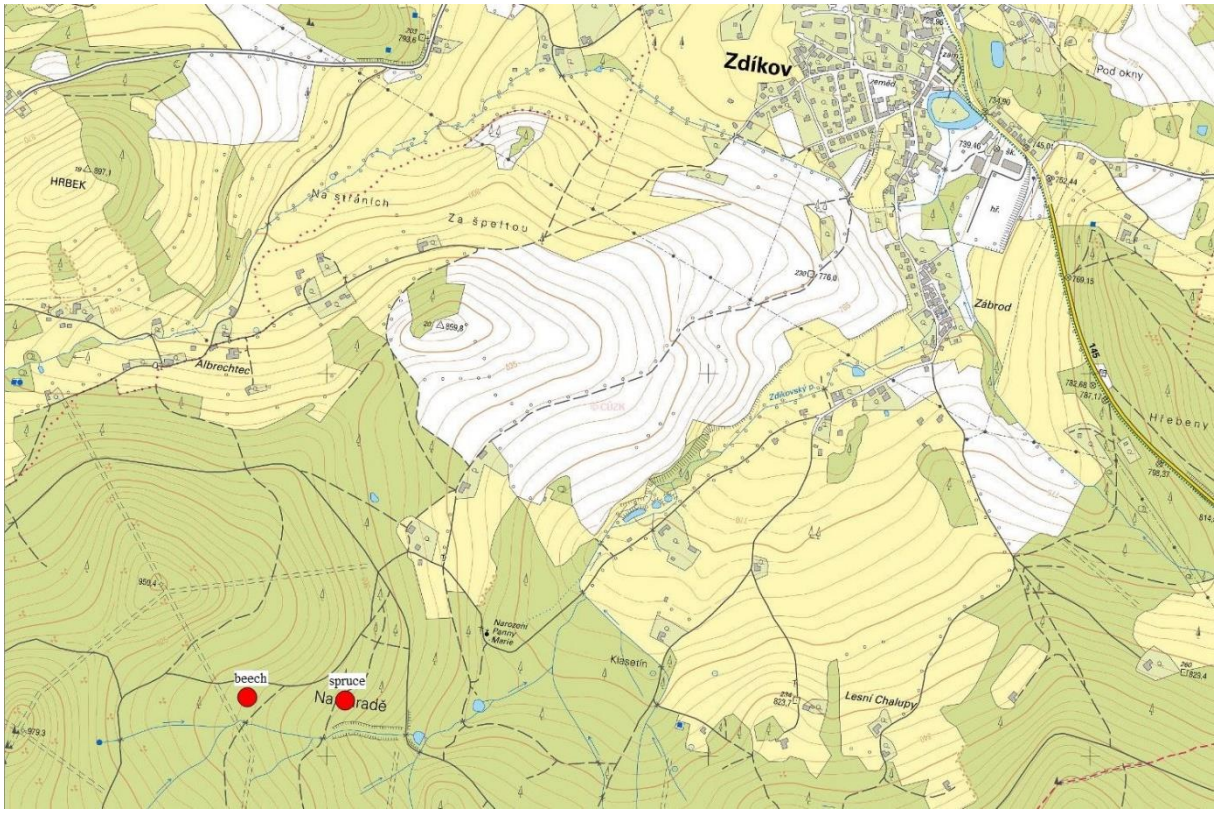
SOIL, AN INTEGRAL PART OF ECOSYSTEMS

Guide of trip

Srní

11.– 13. september 2019

Area of interest with the indication of investigated stands

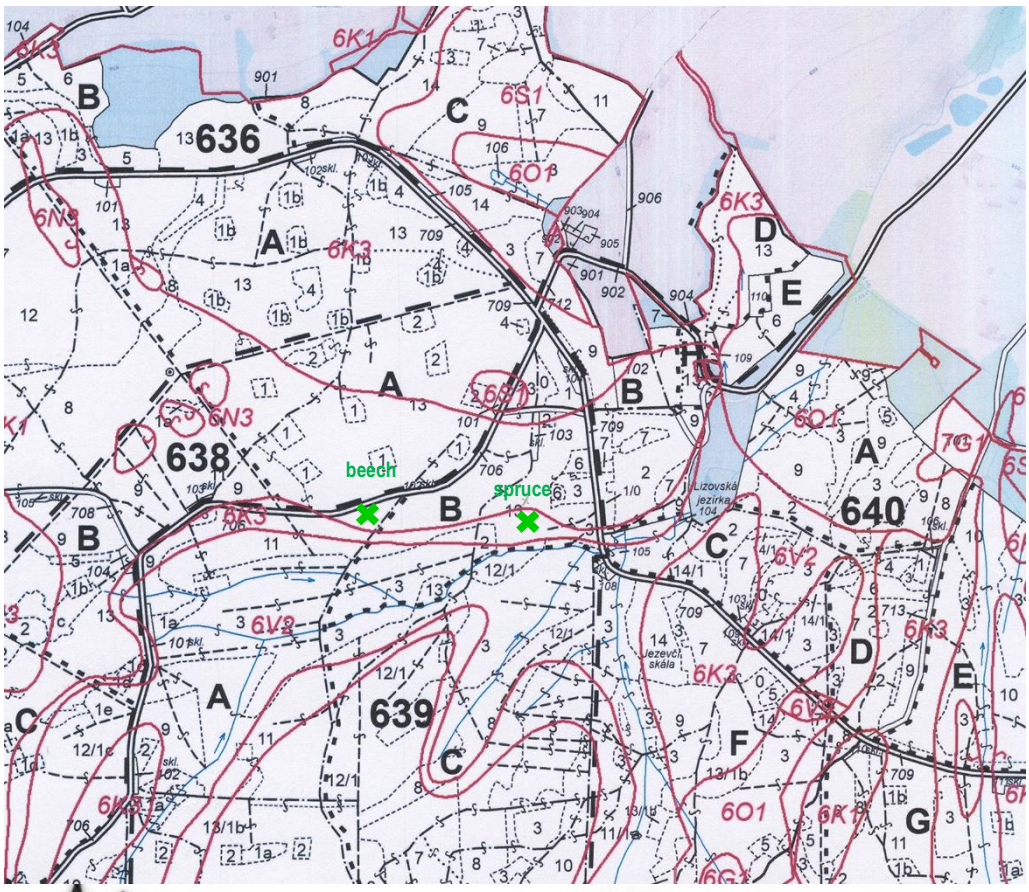


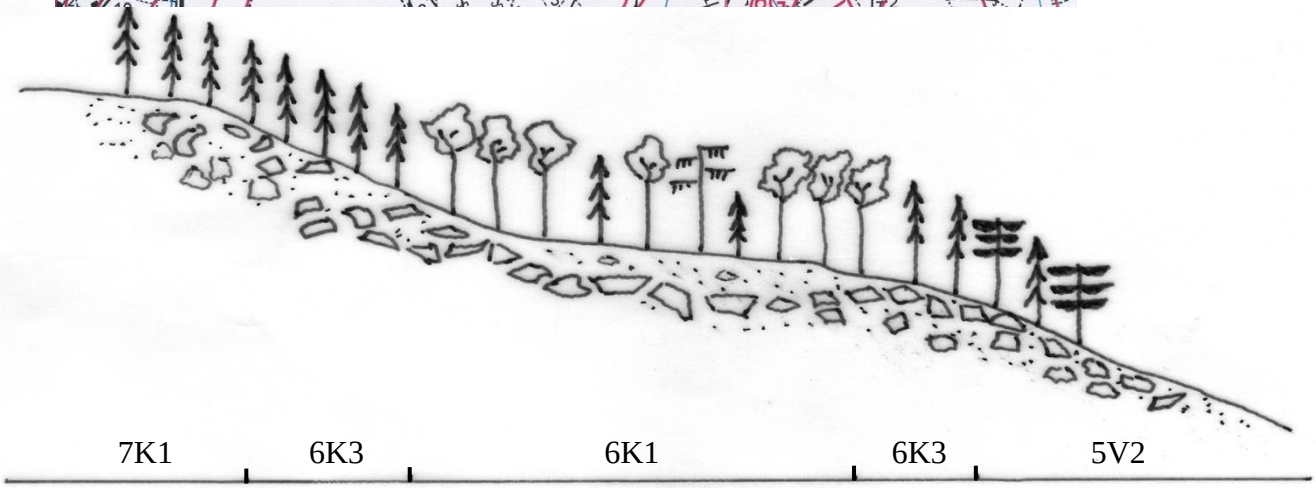
Moto:

Vegetation cannot be accorded the rank of an independent variable, since it is itself closely governed by situation, soil, and climate. And, therefore, whilst the intimate relationship between natural vegetation and soil cannot be overlooked, it must be regarded as mainly a reciprocal contract.
HANS JENNY: Factors of soil formation,1941.

The soil profiles are placed on the forest stands managed by the company Forest of Czech Republic, forest district of Zdíkov. These forests were the parts of large farm Zdíkov in the property of Thun Hohenstein house. The rests of origin spruce fire virgin forests from the beginning of 19. centuries are documented by the historical records. According to the pollen analysis performed in the higher position, the composition of stands 2500 – 500 years ago was: spruce 61%, beech 21%, fir 18%. The species composition of forest complex under Plechý mountain in 1828 was: spruce 79,2%, beech 10,4 %, fir 10,4 %. The abundance of wildings was 38 125 pieces per hectare. The beech and maple predominated in the forest type Piceeto-Fagetum acidophilum and advance growth was about 71 250 wildings per hectare. After the wind and bark beetle calamity in the end of 19th century (especially in 1870) the artificial regeneration conversed the species composition in favour of spruce and the European larch of unknown origin was introduced.
Today forest management is based on the forest type mapping. The natural properties of site, including the soil chemistry, are suitable for the natural regeneration of forest.
We can see the advance regeneration of spruce, beech, larch, pine and rowan on the sunny stand margin on the spruce stand. This is the starting point of stand regeneration. The stand will be regenerated by the shelterwood felling step by step. The necessary percentage of beech and fir will be reached by the artificial regeneration in the gaps with game-proof fence.
The intervention in the beech stand are limited on the salvage felling only with the regard to promising tree which are considered to have high reproductive potential as the basis for the stand regeneration.

Stand map with site types and soil profiles displacement





Legend:
5V2- Abieto-Fagetum fraxinosum humidum, Athyrium f.fem.
6K1- Piceeto-Fagetum acidophilum, Carex pilulifera
6K3- Piceeto-Fagetum acidophilum, Vaccinium m.
7K1- Fageto-Piceetum acidophilum, Avenella

spruce larch fir beech

Profile of soil N. 1: Spruce stand

Part of a stand: $639B_{13}$
Natural forest region No. 13 Šumava;
Category of forest: commercial forest
Forest type: 6K3 (6K1; 6V4)
Species composition: spruce 80 %, beech 20 %, larch +
Age: 129 years
Herb and grass layer: Avenella flexuosa, Vaccinium myrtillus, Pleurosium schreberi
Soil type**: dystric cambisol**

horizon	thickness	description
L	10 - 14	litter
F_{noz} non-zoogenically transformed	6 - 10	bright brown, laminar, plant remains, fungi mycelia
F_{zo} zoogenically transformed	3 - 6	dark, crumbly, loose, cream when wet, excrements, plant remains smooth transition to H
H	0 – 3	dark, crumbly, powdery/creamed, sharp transition to A_h (< 3mm)
A_h	0 – 13	10YR 6/4, dull yellowish orange, loamy sand, prismatic, polyhedron, crumbly, loose
B_v	13 – 30	7,5YR 5/6 bright brown, loamy sand, crumbly to medium prismatic, polyhedron, crumbly, loose.
B_v/C	30 - 45	5YR 4/6, reddish brown, loamy sand, medium prismatic, coherent
IIC	45 - 75	10YR 5/3; 2,5Y 4/6 dull yellowish brown, sandy, fine prismatic, coherent

Soil texture

Genetic horizon	Earth fraction (%)			Texture
	>2,00 mm	0,05-2,00mm	<0,002mm	USDA
A_h	74	55,4	7,89	Silt Loam
B_v	80	53,7	7,42	Silt Loam
B_v/C	95	55,1	4,74	Silt Loam

IIC	95	63,9	4,67	Silt Loam

nrcs.usda.gov/wsp/portal/urcs/detail/soil/surwey

Soil acidity, oxidizable carbon, total nitrogen, extractable contents of elements

	pH_{H2O}	$C_{ox.NIR/s}$	N-.NIR/s	dry matter	P	K	Ca	Mg	Al	Fe
		%	%	$t.ha^{-1}$	$mg.kg^{-1}$					
L	4,7	41,5	1,32	13,7	1200	2630	4370	831	836	775
F_{noz}	4,1	41,2	1,42	24,0	807	862	3140	697	2640	2880
F_{zo}	3,8	32,5	1,45	50,2	747	1020	1570	985	6850	8230
H	3,7	29,5	1,41	92,0	692	1130	803	899	9190	10700

Oxidizable carbon, total nitrogen, accesible contents of elements

Horizon	$C_{ox.NIR/s}$	N-.NIR/s	P	K	Ca	Mg	Al	Fe	S
	%	%	$t.ha^{-1}$	$mg.kg^{-1}$					
A_h	2,77	0,04	<3,50	32,4	<30,0	<10,0	3170	189	56,1
B_v	2,23	0,08	<3,50	28,4	<30,0	<10,0	2930	101	87,9
B_v/C	<0,35	<0,04	<3,50	23,0	<30,0	<10,0	2800	76,8	108
IIC	<0,35	<0,04	<3,50	24,2	<30,0	<10,0	2830	76,1	127

Soil acidity and extractable contents of elements

Horizon	pH_{H2O}	pH_{CaCl2}	P	K	Ca	Mg	Al	Fe	Mn
			$mg.kg^{-1}$						
A_h	4,6	4,2	58,0	189	167	1900	14400	8890	92,0
B_v	4,7	4,3	47,2	154	130	1550	12700	9470	119
B_v/C	4,8	4,4	41,9	294	158	1780	11100	7230	112
IIC	4,7	4,4	48,2	452	138	1700	10300	6640	113

Exchangeable forms od elements, CEC and base saturation

Horizon	$(A+H)^+$	Al^{3+}	Ca^{2+}	K^{2+}	Mg^{2+}	Na^+	CEC	BS
	$mekv.kg^{-1}$							%
A_h	31,8	31,2	<1,00	0,41	0,55	0,18	33,9	6,3
Bv	22,6	21,2	<1,00	0,33	0,35	0,20	24,4	7,7
Bv/C	11,8	10,5	<1,00	0,25	0,22	0,17	13,4	13,4
IIC	11,8	10,4	<1,00	0,29	0,22	0,21	13,5	13,5

Selected microbiological properties

Horizont	C_{ox}	C_{ext}	MBC	RES	RB	RS	AMO	RS/MBC	MBC/C_{ox}
F	40,99	777	3819	33,20	92,39	409,45	37,753	0,11	93,16
H	16,34	255	1620	6,03	15,55	72,02	23,699	0,04	99,14
A_h	5,05	160	491	1,33	2,88	13,80	4,604	0,03	97,22

Legend: C_{ox} – oxidizable carbon (dichroman) (%), C_{ext} – extractable carbon (0.5 M K_2SO_4) ($\mu g.g^{-1}$), MBC-microbial biomass carbon ($\mu g.g^{-1}$), RES –respiration (CO_2) ($\mu gCO_2\text{-}C.g^{-1}.h^{-1}$), RB – respiration (O_2) OxiTop (WTW) ($\mu gO_2.g^{-1}.h^{-1}$), SRS substrate-induced respiration OxiTop (WTW) ($\mu gO_2.g^{-1}.h^{-1}$), AMO- anaerobic amonification ($\mu gNH_4^+\text{-}N.g^{-1}.d^{-1}$).

Profile of soil N. 2: Beech stand

Part of a stand: $639A_{11}$
Natural forest region No. 13 Šumava;
Category of forest: commercial forest
Forest type: 6K1
Species composition: beech 97%, larch 2%, spruce 1%.
Age: 107 years
Herb and grass layer: Prenanthes purpurea, Soldanella montana, Lamium galeobdolon, Carex pilulifera, Hieracium sabaudum, Viola reienbachiana, Oxalis acetosella, Veronica montana, Vaccinium myrtillus, Avenella flexuosa.

Soil type**: dystric cambisol**

horizon	thickness	description
L	6,5 – 10	Mostly beech litter
F	4 – 6,5	Different stadium of liter decomposition, mycelia
H	0 – 4	Dark brown, laminar, clumps, black layer at the bottom
A_h	0 -10	10YR 3/3, dark brown, lighter at the bottom, sandy loam, crumbly, loose
B_{vs}	10 - 35	7,5YR 5/6, bright brown, loamy sand, crumbly, lumpy, loose
B_v	35 - 50	10YR 6/6, dull yellowish brown, loamy sand, lumpy, coherent
B_vC_1	50 - 60	10YR 5/2, greyish yellow brown, sandy loam, fine prismatic, coherent/viscous
B_vC_2	60 – 72	10YR 4/2, greyish yellow brown, sandy loam, fine to media prismatic, coherent, flatten
IIC	72 - 85	2,5Y 6/1; yellowish grey, sandy loam, coarse prismatic, coherent flatten

Soil texture

Horizont	Fraction (%)			Texture
	>2,00 mm	0,05-2,00mm	<0,002mm	USDA
A_h	68	61,5	10,1	Silt Loam
B_{vs}	80	61,2	7,89	Silt Loam
B_v	79	65,6	7,08	Silt Loam
B_vC_1	84	55,0	9,50	Silt Loam
B_vC_2	85	56,2	9,03	Silt Loam

IIC	96	51,6	11,22	Loam

nrcs.usda.gov/wsp/portal/urcs/detail/soil/surwey

Soil acidity, oxidizable carbon, total nitrogen, extractable contents of elements

	pH_{H2O}	$C_{ox.NIR/s}$	N-.NIR/s	dry matter	P	K	Ca	Mg	Al	Fe
		%	%	$t.ha^{-1}$	$mg.kg^{-1}$					
L	5,7	38,6	1,34	5,7	968	1300	10100	1260	466	496
F	5,2	38,8	1,34	9,9	988	1380	7820	1480	2400	2950
H	4,5	24,3	1,07	31,4	835	1850	1230	2920	12300	15500

Oxidizable carbon, total nitrogen, accessible contents of elements

horizon	$C_{ox.NIR/s}$	N-.NIR/s	P	K	Ca	Mg	Al	Fe	S
	%	%	$mg.kg^{-1}$						
A_h	4,08	0,28	<3,5	61,9	73,2	33,7	1990	547	25,6
B_{vs}	2,32	0,21	<3,5	39,7	45,8	21,2	2090	318	22,9
B_v	0,39	0,08	<3,5	24,0	34,7	11,5	1870	264	16,6
B_vC_1	<0,35	<0,04	3,68	49,4	238	72,6	1480	225	7,32
B_vC_2	<0,35	<0,04	10,3	69,8	508	128	1240	192	9,20
IIC	<0,35	<0,04	12,1	89,8	655	165	1310	204	5,55

Soil acidity and extractable contents of elements

horizon	pH_{H2O}	pH_{CaCl2}	P	K	Ca	Mg	Al	Fe	Mn
			$mg.kg^{-1}$						
A_h	4,7	3,8	67,3	298	228	33,7	1990	547	251
B_{vs}	5,0	4,1	56,8	258	241	21,2	2090	318	310
B_v	5,1	4,3	41,7	351	215	11,5	1870	264	285
B_vC_1	5,6	4,3	30,6	672	456	72,6	1480	225	234
B_vC_2	5,9	4,7	57,3	743	767	128	1240	192	294
IIC	6,0	4,7	62,7	756	872	165	1310	204	292

Exchangeable forms of elements, CEC and base saturation

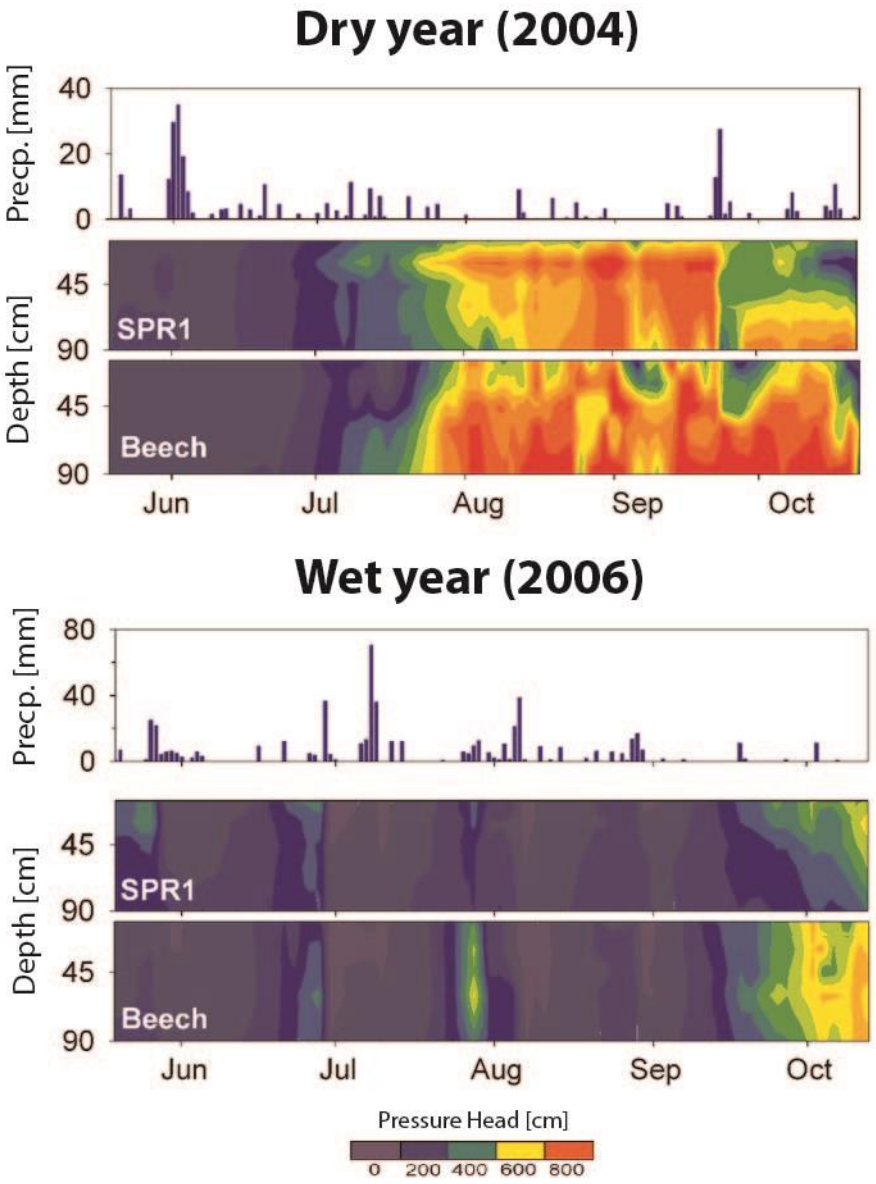
Horizon	$(A+H)^+$	Al^{3+}	Ca^{2+}	K^{2+}	Mg^{2+}	Na^+	CEC	BS
	$mekv.kg^{-1}$							%
A_h	44,5	42,3	4,07	1,14	2,36	0,36	52,4	15,1
B_{vs}	27,8	26,0	3,03	0,62	1,58	0,29	33,4	16,6
B_v	15,5	14,5	1,77	0,31	0,73	0,22	18,5	16,4
B_vC_1	10,4	8,82	11,7	0,79	5,16	0,34	28,4	63,3
B_vC_2	3,38	<3,00	26,3	1,21	9,64	0,46	41,0	91,8
IIC	4,04	<3,00	34,2	1,60	12,8	0,51	53,1	92,4

Selected microbiological properties

Horizon	C_{ox}	C_{ext}	MBC	RES	RB	RS	AMO	RS/MBC	MBC/C_{ox}
F	42,88	530	1979	15,77	54,70	189,96	19,936	0,10	46,15
H	25,76	298	846	6,23	16,42	59,02	11,722	0,07	32,84
A_h	8,52	226	502	1,59	4,10	17,04	1,322	0,03	58,92

Legend: C_{ox} – oxidizable carbon (dichroman) (%), C_{ext} – extractable carbon (0.5 M K_2SO_4) ($\mu g.g^{-1}$), MBC-microbial biomass carbon ($\mu g.g^{-1}$), RES –respiration (CO_2) ($\mu gCO_2\text{-}C.g^{-1}.h^{-1}$), RB – respiration (O_2) OxiTop (WTW) ($\mu gO_2.g^{-1}.h^{-1}$), SRS substrate-induced respiration OxiTop (WTW) ($\mu gO_2.g^{-1}.h^{-1}$), AMO- anaerobic amonification ($\mu gNH_4^+\text{-}N.g^{-1}.d^{-1}$).

The development of pressure heads at spuce (SPR1) and beech stand during a dry and a wet period
(autor: Václav Šípek).



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Field trip organisation

Both field trip versions share the same destination – soil profiles described above and catchment Liz. Nevertheless, there are two options – a shorter with stop at Jezerní slať moor with commentary and a longer with a hike from Antýgl through Tříjezrení slať moor (with commentary as well) to Modrava. Both excursion tours depart from Srní and when finished, busses are going to come back to Srní and then continue to Sušice. The attendees thus can count on transport to bus and train station in Sušice. Those of you, who plan to take use of the transport to Sušice, please load your luggage on the bus right in the morning before departure. The afternoon stop at Srní will be short and the busses will immediately depart to Sušice. Please note that the below given arrival times are estimated and may by subject to change. Registered attendees will be provided with a packed lunch.

Shorter version
Departure from Srní at **9:00** – commented stop at Jezerní slat moor – research catchment Liz – soil probes – comeback so Srní ca. 14:00 – Sušice ca. 15:00.

Longer version
Departure from Srní at **8:30** – soil probes – research catchment Liz – Antýgl, hike through Tříjezerní slať moor (commented stop) to Modrava – comeback so Srní ca. 16:00 – Sušice ca. 17:00.

Both versions are limited with seats available in busses. Your attendance and interest in transport to Sušice reserve in tables found on the informational board from Wednesday 8:00 to **Thursday 17:00**. In case of any questions feel free to contact the crew at the informational stand.