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INTEGRATED LANDSCAPE RESEARCH: CASE STUDY OF THE LOSSKÝ STREAM DRAINAGE BASIN
(stream order 2, the Bohemia-Moravian Highlands, Czechoslovakia)

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SUMMARY

A group of physico-geographers investigated the 2nd order drainage basin of the Losský stream. Landforms, topoclimate, hydro-cycle, soils, phytocenoses and land use were studied by integrated landscape survey. Topochoric structure was analyzed after A. Hynek and P. Trnka (1981), A. Hynek (1981) as links among landscape components and land use, spatial pattern of horizontal structure as links among single tops (sites) and groups of tops. Integrated landscape research was intended for management and information systems linkage within socioeconomic management.

The Losský stream drainage basin with area 2.4 km², drainage density 2.7 km per 1 km², 58.5 per cent forested area has a special relevance in water management. It is situated at spring track of the Sázava river, the Bohemia—Moravian Highlands. The three topochores were identified: floodplain, valley sides and watershed. Their optic structure, contemporary land use and proposition of optimal land use were done, too.

Practical purpose consists in landscape management: hydro-cycle retention, stream channel bank consolidation, ponds cascade reclamation, arable land cultivation preventing accelerated erosion, improving soil properties, polyfunctional land use: agriculture, forestry, leisure, water management, nature conservation.

INTRODUCTION

Arable land management with growing stress of grouping its patches into larger blocks of fields and drained areas spreading is the relevant impact upon natural landscape processes causing serious changes of landforms, soils, hydro-cycle, topoclimate, phytocenoses and land use. Reclaimed drained segments are displayed mainly in the upper parts of catchments with water retention (slower runoff and lower evaporation) closed to watersheds of plains, gentle linear slopes, shallow depresions and adjacent concave slopes.

Purpose of these changes in hydro-cycle is for improvement of arable land under cultivation. Formerly woodland areas have lost isolated shrubs, trees, the most of meadows, and the landscape diversity strongly decreased.

Disappearing landscape segments diversity is good only for one category of land use being motivated by shortsighted economic benefit/cost ratio. We may hardly use landscape only for one purpose if there is a polyfunctional potential. In our case study forestry, agriculture, water management and leisure were respected.

Integrated landscape research advanced in the Geography Department, Faculty of Science, J. E. Purkyně University of Brno, Czechoslovakia, was applied in landscape survey of the Znojmo area, the Rosice-Oslavany area (A. Hynek, P. Trnka, 1981, A. Hynek et al., in press). A central axis of conception formulated by A. Hynek (1981) is the linkage of information and management systems on landscape in a broader context of socioeconomic management.

For identifying functional integration of landscape components a processes study is done in landscape survey. Land use survey is linked with surveying the process of man-land interactions. Main role in this interaction is played by social processes. That is why we follow three processes kinds: natural, social and interactive. Preventing degradation of nature and filling up social goals at managerial adjustment both the sides is the central idea of integrated landscape research or landscape ecology leading to purposive behavior of man in landscape, organizing the landscape.

A GENERAL OUTLINE OF THE LOSSKÝ STREAM DRAINAGE BASIN

The drainage basin of the Losský stream is the 2nd order one with unit cells — the lst order, including six channels. We use terminology of A. N. Strahler (in V. T. Chow, 1964). Dells and gullies without permanent surface linear runoff enter into them.

The drainage basin has 2.4 km^2, the maximum elevation within the basin is 532 metres above sea level, the minimum 446 m, the relief of the basin: 86 m, the total length of thalweg is 3.4 km, the drainage density 2.7 km per 1 km^2. The channel stream is straight at the upper track and meandering at lower one. Drainage pattern is dendritic: the two left tributaries of the lst order with length 0.71 km and the three right ones with 1.89 km. Forest is covering 58.5 per cent area, the rest is divided to arable land and meadows.

The bedrock is built of the Moldanubian crystalline metamorphic-crystalline schists, cordierite-biotite paragneisses, migmatites, sillimanite-biotite paragneisses with veinlets of quartz, small bodies of amphibolite. Regolith contains loamy sand and sandy loam material.

The drainage basin of the Losský stream is a microchore of the Bohemia-Moravian Highlands (mesochore level) situated at upper Sázava river catchment (Bohemian side). Its landforms consists of:

- wide watershed plains of ridgetops, an etchplain with low ruwares and shallow depressions
- valley side slopes (2°—5°), steeper on right side (5°—35°), with dells and gullies pattern
- floodplain with longitudal double sequences of erosion, erosion-accumulation and accumulation tracks; a transitional segment is starting behind the Zádušní pond, a remnant of ponds cascade; the lower track is passing to aluvial fan covering floodplain of the Sázavka river, the upper one has been drained, the destruction of the Zádušní pond (peat bog vegetation) has been prepared.

Specific runoff was instrumented at four profiles:

- springs track covered with forest (1.27 km^2) has $Q_{355} = 0.58\ l \,.\, s^{-1} \,.\, km^{-2}$
- lower Zádušní pond profile draining area of woodland, meadows and arable land (0.31 km^2), $Q_{355} = 0.83\ l \,.\, s^{-1} \,.\, km^{-2}$

— the highest Q_{355} is down the stream draining the forestated area at steeper slopes reaching 2.62 l . s^{-1} . km^{-2}.

Soil survey recognized following soils:

— cambisols oligobasis
— cambisols mesobasic
— cambisols dystric spodic
— cambisols dystric pseudogleyed
— regosol cambic spodic
— fluvisols dystric (rambla)
— fluvisols humic gleyed
— semigleys
— organogleys
— organosols.

Climate, by E. Quitt (1971) is cold of highland, with short moist summer, mild cold springs and mild autumn (both are long), long mild cold and mild moist winter (long durated snow cover).

Higher humidity given by higher precipitation, annual above 650 mm, lower evapotranspiration and slower runoff causes a higher soil moisture with trend to pseudogleys, semigleys and gleys, organogleys. It occurs first of all at springs tracks, concave slopes, floodplains, depressions and lower tracks of dells. Watershed area of convex slopes, ruvares and convex sides of the valley, on the other hand, are relatively dry.

Plant communities consist species of hercynic flora (phytogeographic subregion Hercynicum submontanum). The drainage basin of the Losský stream belongs to the 5th fir-beech vegetation tier. On the basis of phytocenotic and habitat relations following vegetation types were distinguished:

— fir-beech forest, recently mostly changed into silvicultures, mainly spruce ones
— ash-alder communities, partly maintained in a narrow strip on the Losský stream banks
— peats and peaty alder communities, generating by natural succession
— reed, floating and submerged communities
— wet and peaty meadows — secondary communities after aforestation, partly drained
— agrocultures on cultivated soils.

Zoocomponents of the communities have not been studied in detail, we can mention some vertebrates conformably to functional landscape segments:

— spruce forest — mammals: *Capreolus capreolus, Sus scrofa, Sciurus vulgaris, Martes martes, Putorius putorius, Erinaceus europaeus, Sorex araneus, Apodemus flavicollis;* birds: *Garrulus glandarius, Pica pica, Cuculus canorus, Corone corone cornix, Dendrocopus major, Picus viridis, Streptopelia turtur, Columba palumbus, Turdus philomelos, Merula merula, Sitta europaea, Pyrrhula pyrrhula, Buteo buteo, Falco tinnunculus, Accipiter nisus, Accipiter gentilis, Strix aluco, Asio otus, Athena noctua*
— fields and meadows — mammals: *Lepus europaeus, Cricetus cricetus, Citellus citellus, Microtus arvalis, Mustela nivalis, Talpa europaea;* birds: *Phasianus colchicus, Perdix perdix, Alauda arvenis, Galerida cristata, Passer montanus, Emberiza citrinella, Carduelis carduelis, Lanius collurio*
— swamps and streams — mammals: *Arvicola terrestris, Ondatra zibethica;* birds: *Anas platyrhyncha, Anas crecca, Gallinula chloropus, Capella gallinago, Vanellus*

vanellus, Motacilla alba, Motacilla cinerea; reptiles: *Vipera berus, Natrix natrix;* amphibians: *Bufo bufo, Rana temporaria, Rana esculenta;* fishes: *Salmo trutta m. fario, Phoxinus phoxinus.*

THE LOSSKÝ STREAM DRAINAGE BASIN: LANDSCAPE UNITS

Applying integrated landscape research based on landscape analysis and synthesis we can identify natural processes at three sublevels: monomicrochores (whole the basin), topochores (elementary heterogeneous landscape units — tops patterns), and tops (elementary homogeneous landscape units).

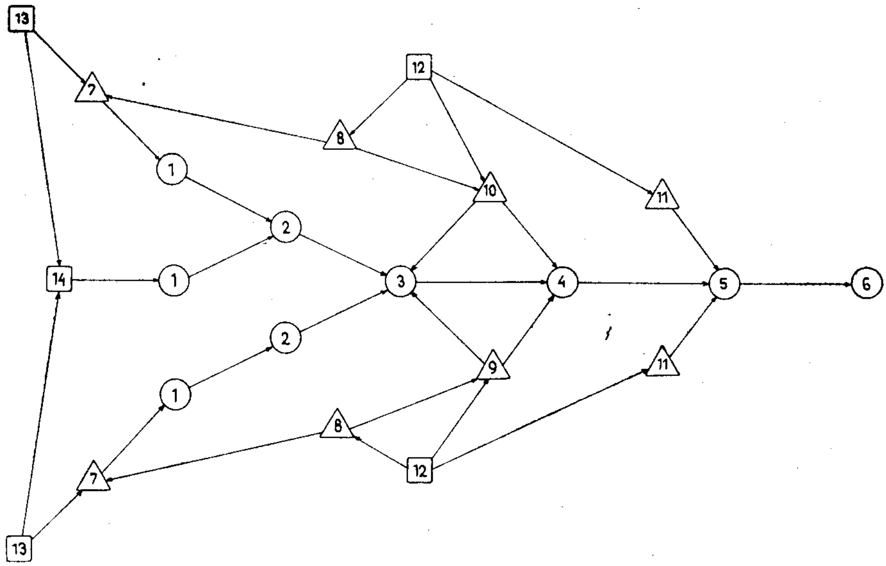

Fig. 1. Spatial structure of the Losský stream landscape monomicrochore
Explanation: Topochores spatial pattern — tops: ○ floodplain, △ valley sides, □ watershed

According to A. Hynek (1981) tops investigation prefers synergetic links among landscape components while topochores one though based on tops recognition prefers elementary level of synchoric linkage. Reflecting synchoric context realized by flows of matter and energy, mostly one — way direction caused by moving water, air, regolith, we can distinguish four kinds of topochores:

- — scalars, with minimal horizontal tops variability
- — gradients, with gradual surface changes on slopes as catenas
- — vectors, as linear oriented tops on slopes, frequently with branches, chains of linear tops
- — mosaics, with responses of former processes, varied sets of tops.

Spatial pattern of landscape units (tops and topochores) can be understood from following diagram (fig. 1).

Table 1a. Landscape units classification

Topochores	Tops
Floodplain	1. upper ash-alder and spruce forest 2. peaty alder forest 3. peaty bog and pond 4. peaty meadows 5. shifting tracts 6. the lowest alluvial fan
Valley sides	7. slope depressions 8. slope ridges 9. gentle semigleyed slopes 10. gentle pseudogleyed slopes 11. steep slopes
Watershed	12. drier watershed ridges 13. moister watershed ridges 14. gentle depressions

1. Ash-alder and spruce forest tops

are at the upper tracks of the stream, wet, swampy, with redox processes, chelatation, iron and organic matter transport. Soil cover includes gleyed humic fluvisols and semigleys. We can find here natural ash-alder forest and secondary wet spruce plantations. Water retention of these tops is relevant for water management.

2. Peaty alder forest tops

permanently wet with humic gleyed fluvisols and organosols. The species composition of the communities is characterized by following phytocenological relevé:

E_3 (three layer) canopy	70%		
Alnus incana	70%		
E_2 (shrub layer) canopy	20%		
Alnus incana	15%		
Sorbus aucuparia	+		
Picea excelsa	+		
Sambucus nigra	+		
E_1 (herb layer) coverage	100%		
Alnus incana juv.	1		
Frangula alnus juv.	1		
sedges and grasses:			
Carex remota	2		
Scirpus silvaticus	2		
Deschampsia caespitosa	2		
Festuca gigantea	1		
herbs:			
Lycopus europaeus	2	*Lysimachia vulgaris*	1
Rubus caesius	2	*Lysimachia nummularia*	1

Crepis paludosa	2	*Equisetum silvaticum*	1
Caltha palustris	2	*Equisetum palustre*	+
Ranunculus repens	2	*Ajuga reptans*	+
Chaerophyllum hirsutum	2	*Galium palustre*	+
Senecio fuchsii	1	*Oxalis acetosella*	+
Myosotis palustris	1	*Urtica dioica*	+
Filipendula ulmaria	1	*Athyrium filix-femina*	+
Cardamine amara	1	*Dryopteris spinulosa*	+

E_0 (moss layer) coverage 5%

A productive forest is under hazards of wind, swampisation, frost. A sample of soil profile — see Tab. 1.

Soil profile 1 Organogley

O/T	0—2 cm	undecomposed plant debris
T	2—30 cm	grey-brown decomposed, sphagno fibrist plant debris
T/G	30—80 cm	bluish, sticky massive wet
G/R	80 cm	clay-loam gleyed fluvial sediment

Table 1

Horizon		T	T/G
Depth (in cm)		0—30	30—50
Soil separate (%)	0,1—2 mm		28,19
	0,5—0,1 mm		8,49
	0,01—0,05 mm		20,40
	< 0,01 mm		42,92
	< 0,002 mm		32,12
pH	pH/H_2O	5,45	6,00
	pH/KCl		4,60
$CaCO_3$			—
Humus (%)	C titr.		1,52
	contents		2,62
	C/N		5,45
N total (%)			0,28
CEC (mval/100 g)	S		13,30
	T—S		8,40
	T		21,70
	V		61,29

3. Peaty bog and pond

The Zádušní pond with surface water and peaty bog (1,2 ha) was formerly one of the cascade ponds altered to autogenic succession. Organic matter accumulated and open water replaced by peat bog vegetation and land-forming communities. A sample of the marginal land-forming community:

E_1 coverage	100%		
sedges and grasses:		herbs:	
Carex lasiocarpa	3	*Stachys palustris*	2
Carex rostrata	2	*Lysimachia vulgaris*	2
Typha latifolia	1	*Menyanthes trifoliata*	2
Poa palustris	1	*Scutellaria galericulata*	1
Calamagrostis villosa	1	*Gallium palustre*	1
Eriophorum vaginatum	1	*Comarum palustre*	1
Juncus conglomeratus	1	*Epilobium palustre*	1
Isoëtes lacustris	+	*Lotus uliginosus*	+

E_0 coverage	10%
Sphagnum sp. (*S. recurvum*, *S. cuspidatum* etc.)	

Soil toposequence is developed — organosol, organogley and semigley humic showing the gradient from peat to pond bank. Peat volume is 2,000 m³. Microclimatic instrumentation is showing high surface evapotranspiration. Hydric one is showing water pH input to pond 6.2 and output 4.8 increasing iron transport. Surface humidity in summer is low at noon and temperature high.

4. Peaty meadows

are situated at the former ponds bottom. Organogleys and organosols developed from former subhydric deposits. A sample of grasses and herbs structure of the meadow community:

E_1 coverage	100%		
sedges and grasses:		herbs:	
Scirpus silvaticus	3	*Lysimachia nummularia*	3
Juncus conglomeratus	1	*Filipendula ulmaria*	3
Poa palustris	1	*Equisetum palustre*	2
Deschampsia caespitosa	1	*Epilobium palustre*	1
Carex brizoides	+	*Stachys palustris*	1
		Viola palustris	+
		Angelica silvestris	+
		Hypericum perforatum	+
		Lotus corniculatus	+

E_0 coverage	20%
Sphagnum sp.	
Polytrichum commune	
Bryum sp.	

5. Shifting tracts

are displayed on alluvial fans cause by shifting stream channel carrying fluvial sediments from transported slope and soil material. We can find them below the the upper track of the Losský stream and above the lower one. Former ash-alder community were destroyed and plantation of spruce is covering them at permeable rambla (lithic fluvisol) and spodic cambic regosol. Small patches of heath are not exception. Channel stabilization is a problem for adjustment system in man-land interaction.

6. The lowest alluvial fan
is covering the Sázavka-river floodplain. Surface humidity and temperature has a wide amplitude, the whole top is very moist. Mostly loam material is relatively spread in vast segment of floodplain with humic gleyed fluvisol and organogley. Species composition of community reflects phytocoenological reléve:

E_1 (herb layer) coverage 100%

sedges and grasses:		herbs:	
Scirpus silvaticus	4	*Filipendula ulmaria*	2
Juncus conglomeratus	2	*Lysimachia vulgaris*	2
Baldingera arundinacea	2	*Stachys palustris*	2
Glyceria aquatica	1	*Equisetum palustre*	2
Carex brizoides	1	*Galium palustre*	1
		Carduus crispus	+
		Myosotis palustris	+
		Malachium aquaticum	+
		Lycopus europaeus	+
		Vicia cracca	+

A sample of soil profile — see Tab. 2.

Soil profile 2		Fluvisol humic gleyed
O	0—3 cm	partly decomposed gresses detrit
Ah	3—25 cm	dark brown, silt loam, massive, wet, settled humic material with smudges
C1g	25—40 cm	light brown with grey and rust smudges, silt loam slightly humic
C2g	40 cm	light grey, silt loam, gravel

Table 2

Horizon		Ao	Ah	Cg
Depth (in cm)		0—3	3—15	15—60
Soil separate (%)	0,1—2 mm		16,19	16,41
	0,5—0,1 mm		5,19	11,79
	0,01—0,05 mm		38,46	37,72
	< 0,01 mm		40,16	34,08
	< 0,002 mm		17,34	17,54
ph	pH/H_2O		5,90	6,60
	pH/KCl		4,60	4,20
$CaCO_3$			—	—
Humus (%)	C titr.		2,40	0,91
	contents		4,14	1,68
	C/N		6,12	5,43
N total (%)			0,39	0,17
CEC (mval/100 g)	S		16,30	12,00
	T—S		11,20	6,90
	T		27,50	19,90
	V		59,27	60,30

7. Slope depressions

are upper parts of dells and gullies joining the streams and floodplain. Concave gentle, shallow, elongated depressions are below convex headings. Slope processes — sheet flow — transport debris and destroyed soils accumulated there. Mixed slope and soil deposits are semigleyed by surface water. Wet tops with springs indicate hygrophilous species — *Juncus conglomeratus*, *J. effusus*, *Caltha palustris* etc. A sample of forest community:

E_3 canopy	70%
Picea excelsa	60%
Larix europaea	10%
E_2 canopy	20%
Abies alba	10%
Fagus silvatica	5%
Picea excelsa	+
Acer pseudoplatanus	+
Sorbus aucuparia	+

Soil profile 3		Cambisol dystric pseudogleyed
Ao1	0—1 cm	needles litter, varieted cover
Ao2	2—9 cm	grey-black, massive, mild moist, fibric plant debris
Ah	9—11 cm	grey silt-loam, granular, moist, without coarse gravel
B1v	11—35 cm	light grey, rust patches, loam, crushed, moist without coarse gravel
B2v	35 cm	grey, rust patches, loam, moist, crushed

Table 3

Horizon		Ao	Ah	B1v	B2v
Depth (in cm)		0—9	9—11	20—30	45—55
Soil separate (%)	0,1—2 mm		21,00	22,79	17,48
	0,5—0,1 mm		1,04	3,79	3,56
	0,01—0,05 mm		32,28	28,52	31,24
	< 0,01 mm		45,68	44,72	47,72
	< 0,002 mm		26,40	26,58	30,83
pH	pH/H_2O	4,20	4,40	4,90	4,65
	pH/KCl		3,40	3,90	3,60
$CaCO_3$			—	—	—
Humus (%)	C titr.		4,26	0,58	0,30
	contents		7,35	0,99	0,53
	C/N		15,21	4,12	2,71
N total (%)			0,28	0,14	0,11
CEC (mval/100 g)	S		0,00	0,50	1,50
	T—S		44,10	19,80	22,70
	T			20,30	24,20
	V		—	2,46	6,20

E_1 coverage	80%			
Picea excelsa juv.	1	herbs:		
Sorbus aucuparia juv.	1	*Oxalis acetosella*	3	
Acer pseudoplatanus juv.	+	*Vaccinium myrtillus*	2	
Betula pubescens juv.	+	*Rubus hirtus*	2	
sedges and grasses:		*Mycelis muralis*	1	
Deschampsia flexuosa	2	*Rubus idaeus*	1	
Carex pilulifera	1	*Chamaenerion angustifolium*	1	
Calamagrostis epigeios	1	*Hieracium silvaticum*	1	
Glyceria aquatica	+	*Maianthemum bifolium*	+	
Deschampsia caespitosa	+	*Dryopteris spinulosa*	+	
E_0 coverage	10%			

8. Slope ridges
as convex segments of landforms are opposite to slope dells. Regolith and soil cover is thin, bedrock is exposed. Debris is stony, gravelly and dystric cambisols are developed. A sample of soil profile — see Tab. 3.

Soil profile 4		Semigley
Ao1	0—1 cm	needle debris
Ao2	1—2 cm	partly decomposed förn
Ah	2—9 cm	moist, massive, densely rooted
Ah/Bv	9—10 cm	grey, fine crumb clear boundary
Bv	10—15 cm	ashy grey, loam, granular, moist, crushed
G1	15—40 cm	grey, rusty smudges sandy clay loam, granular, moist gravel
G2	40—70 cm	blue-grey, rusty smudges, sandy clay loam

Table 4

Horizon		Ah	Ah/Bv	Bv	G
Depth (in cm)		0—9	9—10	10—15	15—40
Soil separate (%)	0,1—2 mm		28,39	31,93	30,87
	0,5—0,1 mm		1,61	7,39	19,33
	0,01—0,05 mm		36,56	29,48	13,84
	< 0,01 mm		33,44	31,20	35,96
	< 0,002 mm		16,49	18,54	23,74
pH	pH/H_2O	4,60	4,70	5,20	5,10
	pH/KCl		3,50	3,60	3,50
$CaCO_3$			—	—	—
Humus (%)	C titr.		3,62	0,98	0,43
	contents		6,06	1,69	0,74
	C/N		12,55	6,99	3,80
N total (%)			0,28	0,14	0,11
CEC (mval/100 g)	S		—	—	2,00
	T—S		23,30	15,30	14,90
	T				16,90
	V		—	—	11,83

9. Gentle semigleyed slopes

Transaccumulated gentle moist slopes are the most frequent tops in the Losský stream drainage basin. Regolith varies in texture, sandy loam and silt loam with gravel prevail. Runoff is poorer, water retention higher, but in the case of accelerated erosion soil cover is destroyed and water retention decreases. Impermeable bedrock and slower runoff cause moist soil water regime, semigleys are developed. Most of the primary natural communities (semiwet fir-beech forests) were substituted by the spruce plantantions. A sample of soil profile — see Tab. 4.

10. Gentle pseudogleyed slopes

Slope sides which are more permeable are seasonly moist with drier period. Pseudogleys are developed there. They are at the upper slopes sides, not far from watershed and at the right side of the drainage basin. Natural communities create dystric fir-beech forest and contemporaly species composition of stands is following:

E_3 canopy	80%		
Picea excelsa	80%		
Betula pubescens	+		
E_2 canopy	20%		
Sambucus nigra	15%		
Sorbus aucuparia	5%		
Quercus petraea	+		
E_1 coverage	25%		
grasses:		herbs:	
Deschampsia flexuosa	2	*Senecio nemorensis*	2
Calamagrostis epigeios	2	*Mycelis muralis*	1
Agrostis stolonifera	+	*Chamaenerion angustifolium*	1
		Senecio jacobaea	+
		Scrophularia nodosa	+
		Moehringia trinervia	+

A sample of soil profile — see Tab. 5. These tops are suitable for forestry and arable land use.

11. Steep slopes

at the lower side of the Losský stream drainage basin the channel is deeply cut forming steeper valley slopes with the inclination 5°—35°. Slope processes are intensive, for the strong gully and sheet erosion they are forested. Cambisols dystic, spodic and colluvisols are developed. Former acid fir-beech forest communities were changed to spruce monoculture with sparse birch trees.

12. Drier watershed ridges

Their etchplain relief of prevailing convex forms in broad watershed ridges has permeable weathered mantle, silt loam texture. Soil water regime is not too moist, fresh fir-beech forests and cambisols developed. A sample of phytocenosis:

E_3 canopy	
Picea excelsa	80%
Larix europaea	+

Soil profile 5 — Cambisol dystric

Ao	0—2 cm	dry crushed needle debris
Ah	2—5 cm	grey dry mull
B1v	5—10 cm	grey-brown sand loam, fine crumb moist
B2v	10—20 cm	light grey-brown sandy loam, fine crumb with crushed gravel material
C1	20—60 cm	grey, sandy loam, friable, partly crushed with gravel material
C2	60 cm	light-brown sandy loam, stony

Table 5

Horizon		Ao + h	B1v	B2v
Depth (in cm)		0—5	5—10	10—20
Soil separate (%)	0,1—2 mm		50,48	55,68
	0,5—0,1 mm		9,16	8,80
	0,01—0,05 mm		20,28	15,80
	< 0,01 mm		20,08	19,72
	< 0,002 mm		6,87	10,23
pH	pH/H_2O	4,40	4,50	5,00
	pH/KCl		3,40	3,80
$CaCO_3$			—	—
Humus (%)	C titr.		8,52	1,34
	contents		14,70	2,32
	C/N		30,42	7,98
N total (%)			0,28	0,17
CEC (mval/100 g)	S		1,00	0,60
	T—S		25,40	14,80
	T		26,40	15,40
	V		3,79	3,90

E_2 canopy 50%
Picea excelsa 20%
Fagus silvatica 20%
Quercus petraea 5%
Betula pubescens 5%

E_1 coverage 90%
Sambucus nigra juv. 2
Picea excelsa juv. 1
Sorbus aucuparia juv. +
Acer pseudoplatanus juv. +
grasses and sedges:
Calamagrostis epigeios 2
Carex pilulifera +
Luzula pilosa +
Agrostis stolonifera +

herbs:
Oxalis acetosella 3
Vaccinium myrtillus 2
Hieracium silvaticum 1
Mycelis muralis 1
Senecio fuchsii 1
Rubus idaeus +
Maianthemum bifolium +
Acetosella vulgaris +

A sample of soil profile — see Tab. 6.

Soil profile 6 Cambisol mesobasic

Ao1	0—1 cm	needle litter
Ao2	1—2 cm	förn
Ao3	2—4 cm	grey blackish moist mull
Ah	4—8 cm	brown sandy loam crumby, moist, sligutty gravel
B1v	8—50 cm	light brown, sandy loam, crumby tough gravelly
B2v	50—60 cm	dark brown, sandy loam, friable, gravel
C	60 cm	brown, sandy loam, crushed, stony

Table 6

Horizon		Ao	Ah	B1v	B2v
Depth (in cm)		0—4	4—8	20—30	50—60
Soil separate (%)	0,1—2 mm		30,29	31,15	30,04
	0,5—0,1 mm		10,35	16,09	13,76
	0,01—0,05 mm		29,48	26,56	26,40
	< 0,01 mm		29,88	26,20	29,80
	< 0,002 mm		11,08	9,97	14,37
pH	pH/H_2O	4,25	4,30	4,90	5,40
	pH/KCl		3,40	3,70	3,90
$CaCO_3$			—	—	—
Humus (%)	C titr.		3,04	0,55	0,20
	contents		5,25	0,89	0,35
	C/N		10,85	4,89	1,81
N total (%)			0,28	0,11	0,11
CEC (mval/100 g)	S		—	—	1,00
	T—S		26,00	16,90	11,00
	T				11,50
	V		—	—	8,70

13. Moister watershed ridges

Having poor runoff caused by less permeable subsoil and bedrock and higher clay amount the soils physical properties are better but worse in pH and cation--exchange capacity (CEC). Phytocenoses belong to acid fir-beech ones.

Some tracks are semi-wet with semigleys, wet fir-beech phytocenoses. They are exploited for arable land, though under rills erosion hazard.

14. Gentle watershed wet depressions

Etchplain broad concave depressions, structurelly conditioned, are filled up transaccumulated weathered material less permeable. Bedrock is covered with clay and weathered coarse debris-gravel and stony phase. It causes semigleys development seasonly subsurface watered and poor runoff. Former plant communities were wet fir-beech forests. Gentle watershed depressions are initial spring tracts of the Losský stream drainage basin.

They are drained under surface for meadows and forests reclamation. Concentrated digg rills enter to open channel of the Losský stream. Swampy meadows are very acid and in the case of spruce forest reclaiming them there is a hazard of trees rooting.

CONCLUSION

The Losský stream drainage basin, the 2nd order, has a great importance in water management for its runoff and retention.

Stream channels banks consolidation by vegetation and ponds cascade reclamation could improve hydro-cycle. Forest and woodland reduction do not only decrease landscape diversity relevant for productive life systems but make worse runoff and cause natural hazards — accelerated erosion, lower retention.

Wide-spread peaty meadows can be hardly recognized as an effective land use if there are hazards of accelerated erosion, poorer soil, low yield. Improving soil chemical properties, changing grasses and plants composition, or reclaiming woodland are alternatives of contemporary land use. Turning fields to large ones is introducting accelerated erosion hazards, worsening water retention and landscape diversity reduction.

Polyfunctional use of the Losský stream drainage basin with respect not only to agriculture, but forestry, leisure, natural conservation and water management is the only way of optimal landscape management.

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