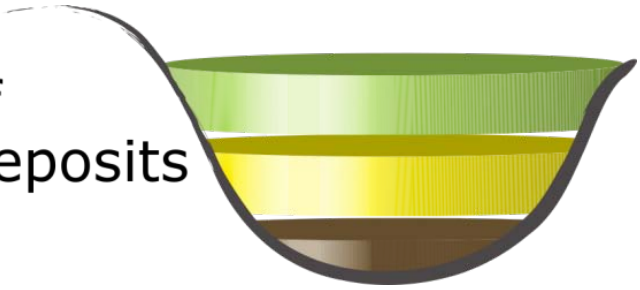
Portraits of peatland deposits
Germany



A: Portraits of peats, gyttjas and other peatland deposits

B: Annotations

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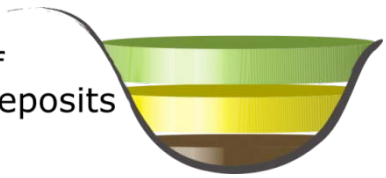
A:

Portraits of peats, gyttjas and other peatland deposits

Portraits of
peatland deposits
Germany



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1.1 Peat moss peat

(Sphagnum peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.1 Peat moss peat
(Sphagnum peat)

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Characteristics for field identification

Peat moss peat is mainly or completely formed by remains of mosses belonging to the genus *Sphagnum*. In slightly decomposed peat, whole plants are usually preserved. The characteristic colour is straw yellow to reddish-light brown, brightening in contact with air. When the peat is compressed, the structure persists and the colour brightens conspicuously. In the case of moderate decomposition, only stem fragments and isolated leaflets varying in colour from medium to dark red-brown are recognisable. When highly decomposed, the moss remains are hardly identifiable and pit-fresh peat is dark red-brown, becoming black in contact with air, and the fractured surface shows a distinctly scaly structure. Peat moss peat is generally loosely bedded and has a soft consistency, becoming pasty under conditions of very high water saturation during peat accumulation. Sometimes, it is also found as densely bedded peat with clearly laminated structure.
Peat mosses have a relatively thick, bright-translucent (but sometimes darker) main stem which appears to lack leaflets, with short and mostly densely foliated side branches. The leaflets are yellowish brown to reddish, ovate to acute-lanceolate, 0.3–1 mm wide, 1–2.5 mm long, not shiny, and always without a leaf vein. The KA5 classification distinguishes three peat types / *Sphagnum* sections, namely: *Cymbifolia* (coarse leaflets), *Cuspidata* (cuspidate leaflets) and *Acutifolia* (acute leaflets).
Peat moss peat can be distinguished from brown moss peat by the dull (not shiny) leaflets, the mostly bright main stems and the typical admixtures.

Typical admixtures: rhizomes and rootlets of sedges; leaf sheath bundles of tussock cotton grass; stem fragments and leaf remains of dwarf shrubs (e.g. heather, bog heather, bog rosemary, bog blueberry, small cranberry, marsh tea); sometimes rhizomes of pod grass; pine and birch wood.

Occurrence as pure peat / mixed peat: often as pure peat, frequently as sedge - peat moss peat and cotton grass - peat moss peat.

Typical degrees of humification: mostly slightly to moderately decomposed; good preservation due to the predominance of water saturation during peat accumulation; focus: H1-H3; in bogs, 'white peat' (H1–H5) and 'black peat' (H6–H10).

Site conditions and ecohydrological indications

Formation conditions
Peat moss peat is characteristic for oligotrophic acidic peatlands. It accumulates under a permanent supply of rainwater or oligotrophic to mesotrophic mineral soil water standing close to the surface of the peatland.

Occurrence and position in the landscape
This peat type accumulates preferentially in areas with high precipitation (Northwest Germany), at seashores, in low mountain ranges and in the northern foothills of the Alps. It can also occur where there is high ingress of groundwater in areas with nutrient-poor, acidic or surficially decalcified mineral deposits (glacial outwash plains, ground and end moraine landscapes).

Peat forming plant communities
Peat moss peat is formed by pure peat moss (*Sphagnum*) lawns or plant communities dominated by peat mosses. Frequent accompanying plants are cotton grass (*Eriophorum*), small sedges (*Carex* spp.), dwarf shrubs (mainly *Ericaceae*) and scattered woody plants such as pine (*Pinus* spp.) and birch (*Betula* spp.).

Occurrence in hydrogenetic mire types
Mainly: bog, kettle hole mire; frequently: sloping mire, terrestrialisation mire; rarely: water rise mire; very rarely: percolation mire, spring mire.

Occurrence in ecological mire types:
Oligotrophic and mesotrophic acidic mires.

• Trophic conditions of peat moss peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
50–27	oligotrophic (>33)
	mesotrophic (33–20)

• Base saturation conditions of peat moss peat:

Spectrum of measured pH values	Associated base saturation group and pH range
2.7–4.8	acidic (<4.8)

Mesotrophic acidic part of a kettle hole mire that is potentially forming peat moss peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
moss peats	Sphagnum peats	Cymbifolia peat (Hhsy)
		Cuspidata peat (Hhsu)
		Acutifolia peat (Hhsa)
		other Sphagnum peats (Hhs)

According to TGL 24 300/04	
peat type group	peat type
moss peat (h-m)	Sphagnum peat (h-mb)

1.1 Peat moss peat
(Sphagnum peat)

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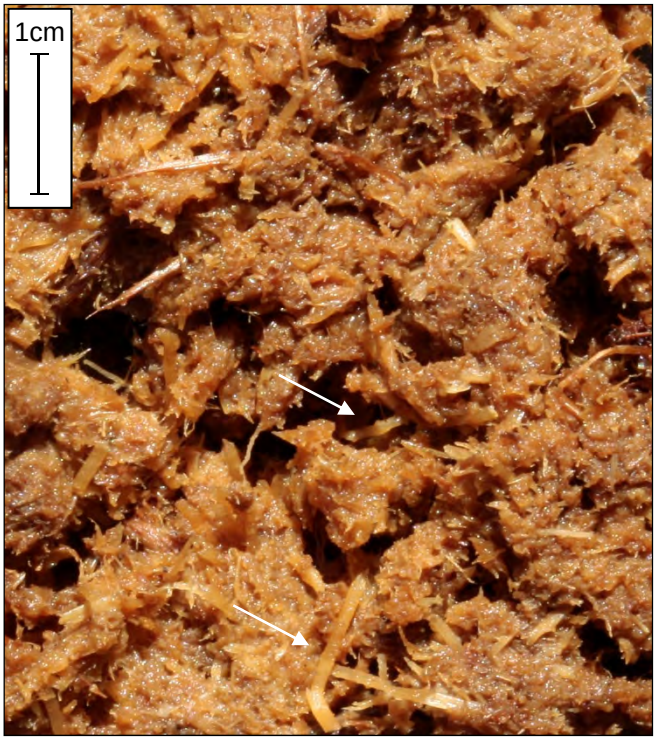
Typical appearance of peat in corer

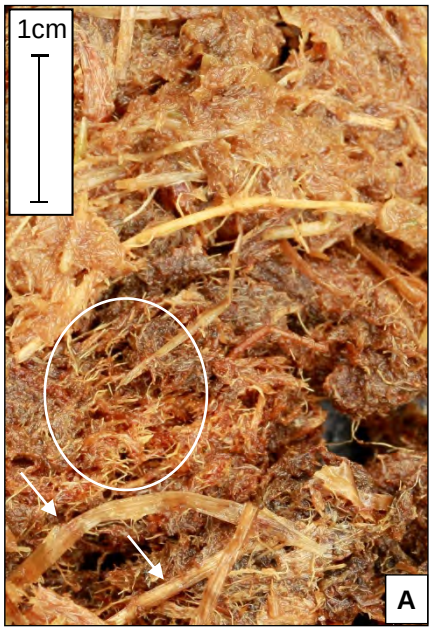
Slightly decomposed peat moss peat: loosely bedded with characteristic straw yellow to light brown colour.

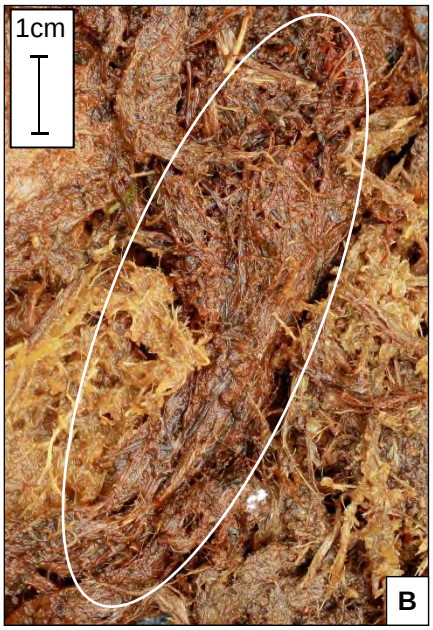
Close-up of exposed peat

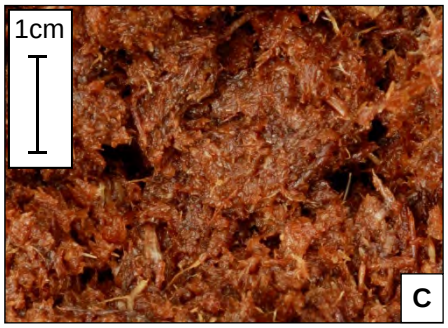


Clearly visible bright main stems of peat mosses (arrows) embedded in numerous adherent peat moss leaflets.

Varieties and peculiarities of peat







A. *Sedge - peat moss peat: characteristic peat moss remains plus flattened, pale yellow-brown sedge rhizomes (arrows) and numerous fine, pale grey to yellow-brown rootlets (circle). A frequently occurring mixed peat.*

B. *Cotton grass - peat moss peat: characteristic peat moss remains and shiny brown fibrous bundles of tussock cotton grass leaf sheaths several centimetres long (circle). An occasionally occurring mixed peat.*

C. *Moderately decomposed (H5) peat moss peat: the stem fragments and remains of leaflets are less recognisable and have a darker shade of brown than in slightly decomposed condition.*

D. *Tip: numerous leaflets adhere to skin and clothes when in contact with peat moss peat.*

1.1 Peat moss peat
(Sphagnum peat)

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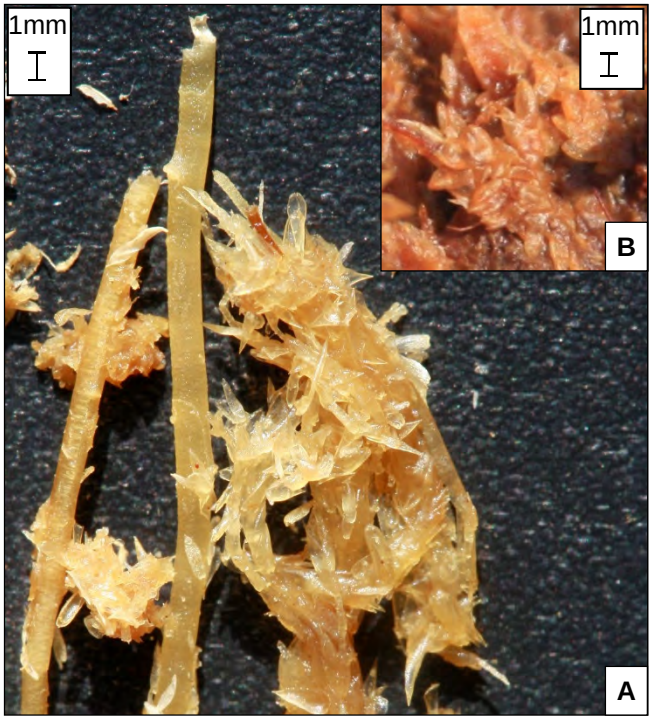
Main peat forming living plants

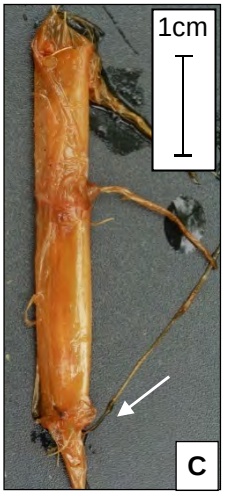
A. *Population of peat mosses (Sphagnum* spp.*).*
B. *Peat mosses; the whole plant is peat forming.*
C. *Close-up of peat moss: relatively thick main stems with numerous densely foliated side branches (arrows), comosely compact at the top.*

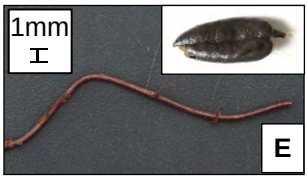
Main peat forming macrofossils

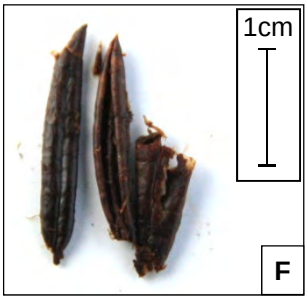


A: Sphagnum *section* Cuspidata *(cuspidate leaflets): relatively thick, bright to translucent main stems (left); side branches with numerous yellowish, acute, dull (not shiny) leaflets (right).*
B. Sphagnum *section* Cymbifolia *(coarse leaflets): densely foliated side branch with reddish-light brown ovate leaflets.*

Typical admixtures in peat







A. *Fine, hollow, pale grey to yellow-brown rootlets, mostly <1 mm wide, and characteristic flattened pale yellow rhizome fragments (arrows) of sedges.*
B. *Slightly shiny, tough, tight, mid-to-dark brown bundle of tussock cotton grass leaf sheaths.*
C. *Yellow to red-brown rhizome of pod grass with bristle-like remains of vascular bundles at the nodes (arrow).*
D. *2–5 mm thick fragment of heather stem with dull, brown to red-brown bark showing fine lengthwise structure and four vertical rows of former leaf attachments.*
E. *Bristle-like thin (<1 mm wide) red-brown stem and rather thick, leathery ovate leaflet of small cranberry.*
F. *Leaflets of bog rosemary: 1–2 cm long, cuspidate on both sides, with distinctly reflexed margins.*

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1.2 Brown moss peat

(Bryales peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.2 Brown moss peat
(Bryales peat)

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Characteristics for field identification

Brown moss peat consists mainly or completely of the remains of various brown mosses, which are usually only slightly decomposed. The characteristic colour of the moss plants and peat is shiny (metallic) vibrant gold-brown, bronze or red-brown (hence the term 'brown mosses'). The moss stems are 1 mm thick, unbranched or only slightly branched, occasionally with squarrose appearance and often bundled. Most of the stems are fully foliated (leaf arrangement single-, double-, triple-spaced or alternate, depending on species). The shiny, opaque leaflets are polymorphic (e.g. acute-lanceolate, ovate, falcate), again according to species. Identification to species level is possible only by using a microscope or with much experience. When more highly decomposed, the colour of brown moss peat changes to dark brown to black and the moss fragments are hardly identifiable.
Confident differentiation between brown moss peat and peat moss peat is possible only at low or moderately high degrees of humification; in this condition brown mosses differ from peat mosses in that they are mostly fully foliated, shiny, never as bright as peat mosses and without substantial brightening when compressed. Also, brown moss stems are opaque and more squarrose/robust than peat moss stems; and most brown moss leaflets have leaf veins, whereas peat moss leaflets never do. It may, otherwise, be possible to distinguish between these two peat types by considering their typical admixtures.

Typical admixtures: sedge rootlets and rhizomes, bogbean seeds; less frequently: rhizomes of common reed.

Occurrence as pure peat / mixed peat: often as pure peat; mostly as sedge - brown moss peat; less frequently as common reed - brown moss peat.

Typical degrees of humification: mostly slightly to moderately decomposed; good preservation due to permanent water saturation during peat accumulation; focus H1–H3.

Site conditions and ecohydrological indications

Formation conditions

Brown moss peat accumulates under the influence of mineral soil water, either percolating or standing permanently close to the peatland surface, under predominantly mesotrophic subneutral conditions. It also forms during the terrestrialisation of water bodies by floating mats of brown mosses.

Occurrence and position in the landscape

This frequently found peat type often occurs as the basal layer that initiated peat formation. It occurs predominantly in river valleys on ground moraine plates and in depressions and kettle holes on end and ground moraines, and more rarely on glacial outwash plains in morainic landscapes where the glacial deposits are base-rich or even calcareous.

Peat forming plant communities

Brown moss peat is formed by pure mats of brown mosses (*Bryales*) or by reed and sedge (*Carex*) communities with high representation of brown mosses. The term 'brown moss' is applied to all peat forming mosses that do not belong to the peat moss genus (*Sphagnum*). Among the brown mosses, the main peat forming genera are *Hypnum*, *Calliergon*, *Scorpidium*, *Drepanocladus*, *Polytrichum*, *Meesia* and *Paludella*. Brown moss peat seldom accumulates nowadays, due to the rarity of vegetation that is rich in brown mosses.

Occurence in hydrogenetic mire types

Mainly: percolation mire, terrestrialisation mire; frequently: spring mire; rarely: kettle hole mire, bog.

Occurrence in ecological mire types

Mainly: mesotrophic subneutral mires; frequently: mesotrophic calcareous mires; rarely: oligotrophic acidic, mesotrophic acidic and eutrophic mires.

• Trophic conditions of brown moss peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
38–15	oligotrophic (>33)
	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of brown moss peat:

Spectrum of measured pH values	Associated base saturation group and pH range
4.6–7.5	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

Mesotrophic subneutral terrestrialisation mire that is potentially forming brown moss peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
moss peats	Bryales peats	different peat types (Hnb)

According to TGL 24 300/04	
peat type group	peat type
moss peat (h-m)	Bryales peat (h-ml)

1.2 Brown moss peat
(Bryales peat)

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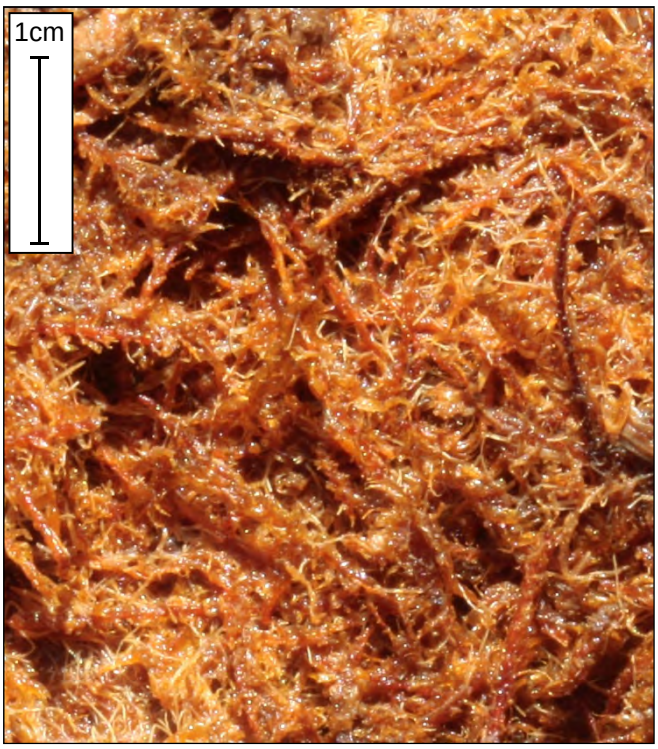
Typical appearance of peat in corer

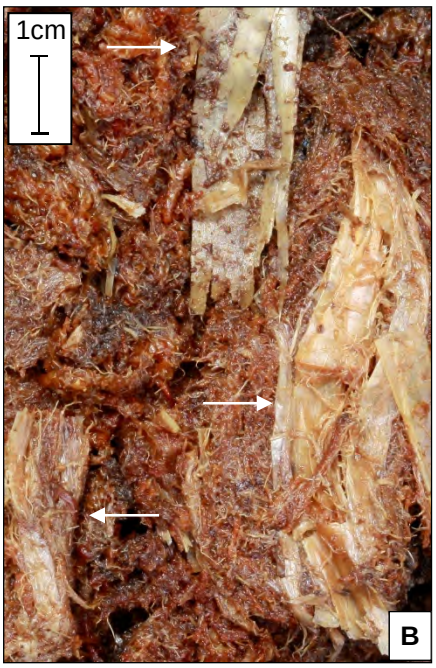
Slightly decomposed brown moss peat displaying the characteristic bronze-brown colour.

Close-up of exposed peat



Clearly visible brown moss plants: shiny, gold-brown, fully foliated with somewhat squarrose appearance.

Varieties and peculiarities of peat



A. *Sedge - brown moss peat: characteristic remains of brown mosses with numerous fine, pale yellow-grey rootlets, mostly <1 mm wide (circle) and flattened, ribbon-like, yellow-brown rhizomes (arrows) of sedges. A frequently occurring mixed peat.*

B. *Common reed - brown moss peat: characteristic remains of brown mosses with flattened, shiny, yellowish to olive-tinted rhizomes of common reed, 1–3 cm wide (arrows). An occasionally occurring mixed peat.*

C. *Moderately decomposed (H5) brown moss peat: a darker shade of brown with quite readily identifiable mosses.*

1.2 Brown moss peat
(Bryales peat)

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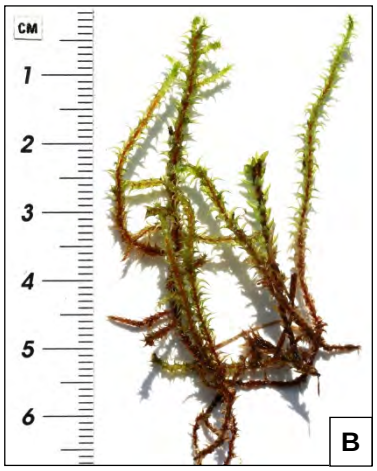
Main peat forming living plants



A. *Permanently water-saturated brown mosses in a hollow.*

B. *Brown mosses: the whole plant is peat forming; note the unbranched or only slightly branched stems.*

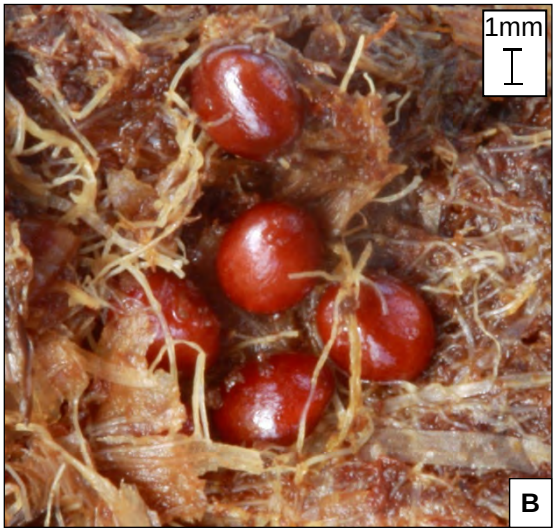
C. *Close-up of a dark, densely foliated brown moss stem.*

Main peat forming macrofossils

A. *Characteristically shiny, vibrant gold-brown to bronze, unbranched or only slightly branched, fully foliated brown moss plants with squarrose appearance.*

B. *An isolated moss plant with falcate leaflets, belonging to the genus* Drepanocladus.

Typical admixtures in peat



A. *Fine (mostly <1 mm thick), hollow, pale grey to yellow-brown rootlets and characteristically flattened pale yellow rhizome fragments (arrow) of sedges.*

B. *Conspicuous bogbean seeds: shiny, coralline to yellow-brown, lenticular, 2–3 mm in diameter, hollow inside, often falling apart into two halves.*

C. *Rhizome fragments of common reed: 1–3 cm wide, flattened, shiny, yellowish to olive-tinted.*

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1.3 Coarse sedge peat

(Radicel peat, Magnocarex peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.3 Coarse sedge peat
(Radicel peat, Magnocarex peat)

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Characteristics for field identification

The matrix of coarse sedge peat either consists of a dense root felt or the recognisable plant remains are embedded in a medium to dark brown, sometimes blackish, predominantly unstructured, frequently solid or dense substance. Characteristic plant remains are the rhizomes of tall sedge (*Carex*) species. The flattened, 1–4 mm wide, two-layered ribbons are grey-yellow to dark brown and at most faintly shiny. A high proportion of the peat is formed by fine (<1 mm to a few mm thick), hollow, pale grey to yellow-grey rootlets or rootlet fragments (radicels) which are not assignable to a specific plant species in the field. However, especially if they are found in combination with the characteristic rhizomes described above, the probability that sedge species were substantially involved in peat formation is high. Rarely, the characteristic fruit tubes of sedges (ovate, cuspidate, veined) are found in the peat.
Fine sedge peat can be distinguished from coarse sedge peat by the more slender rhizomes (<1 mm) of small ('fine') sedges, which make up at least 90 % of all rhizomes. Coarse sedge peat might be confused with common reed peat because the roots of sedges and common reed cannot be differentiated with certainty in the field, although common reed roots are mostly yellower. Furthermore, common reed peat is easily recognisable by the characteristic 1–3 cm wide, shiny, yellow to olive-coloured remains of common reed rhizomes.

Typical admixtures: alder wood, rhizomes of common reed, occasionally brown mosses.

Occurrence as pure peat / mixed peat: often as pure peat, frequently as alder - coarse sedge peat, common reed - coarse sedge peat, occasionally as brown moss - coarse sedge peat.

Typical degrees of humification: due to seasonal water-level fluctuations or oxygen-rich water supply during peat accumulation, mostly moderately and occasionally highly decomposed; focus: H3–H6.

Site conditions and ecohydrological indications

Formation conditions
Coarse sedge peat accumulates under the influence of mineral soil water permanently or periodically standing or flowing close to the surface, and under predominantly eutrophic but also mesotrophic conditions.

Occurrence and position in the landscape
This peat type occurs mainly in lowlands and depressions on glacial outwash plains, end and ground moraines; as well as in the valleys of rivers in lowlands and morainic landscapes.

Peat forming plant communities
Coarse sedge peat is formed by communities of reeds dominated by different tall sedges (*Carex* spp.) (taller than ~ 40 cm).
Occasionally accompanying plants are common reed (*Phragmites australis*), sparsely growing shrubs and woody plants such as black alder (*Alnus glutinosa*) and willow (*Salix* spp.), various herbaceous plants and, less frequently, brown mosses (*Bryales*).

Occurrence in hydrogenetic mire types
Mainly: water rise mire, flood mire, spring mire; frequently: terrestrialisation mire; rarely: percolation mire; very rarely: sloping mire, kettle hole mire.

Occurrence in ecological mire types
Mainly: eutrophic mires; frequently: mesotrophic subneutral mires; rarely: mesotrophic calcareous mires.

• Trophic conditions of coarse sedge peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
28–12	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of coarse sedge peat:

Spectrum of measured pH values	Associated base saturation group and pH range
4.6–6.5	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

Eutrophic area of a terrestrialisation mire that is potentially forming coarse sedge peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	reed peats	radicel peat (Hnr)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Magnocarex peat (h-rsg)

1.3 Coarse sedge peat
(Radicel peat, Magnocarex peat)

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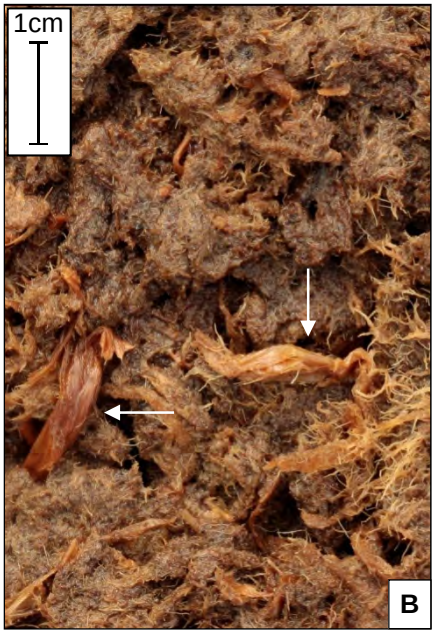
Typical appearance of peat in corer

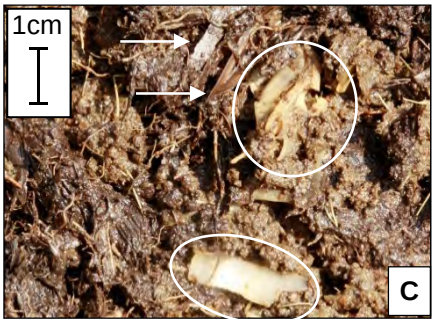
Moderately decomposed coarse sedge peat: brown, relatively solid matrix with a few emerging rhizomes (arrow).

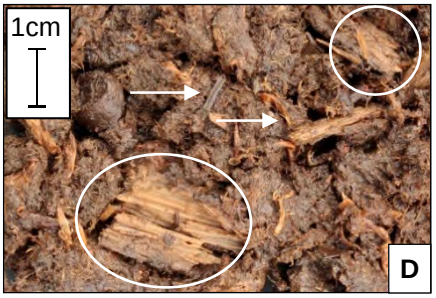
Close-up of exposed peat

Flattened, 1–4 mm wide, grey-yellow to brown rhizome fragments of tall sedges (arrows) and numerous fine rootlets (circles) embedded in a brown matrix.

Varieties and peculiarities of peat







A. *More highly decomposed (H7) coarse sedge peat: dark brown, predominantly unstructured matrix with a few brown remains of rhizomes (arrows).*

B. *Slightly decomposed (H2) coarse sedge peat: light brown remains of rhizomes (arrows) embedded in pale yellow root felt. Rarely found.*

C. *Common reed - coarse segde peat: a combination of the rhizomes of sedges (arrows) with yellow to olive-coloured, 1–3 cm wide remains of common reed rhizomes (circles). A frequently occurring mixed peat.*

D. *Alder - coarse sedge peat: a combination of the characteristic rhizomes of sedges (arrows) with pale brown, easily squeezable fragments of black alder root wood (circles). A frequently occurring mixed peat.*

Portraits of peatland deposits Germany

1.3 Coarse sedge peat
(Radicel peat, Magnocarex peat)

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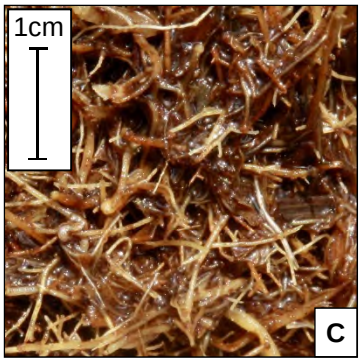
Main peat forming living plants

A. *A population of growing tall sedges (*Carex *spp.).*
B. *A tall sedge: the circle indicates the peat forming subsurface rhizomes and rootlets.*
C. *Close-up of the peat forming parts of a tall sedge.*

Main peat forming macrofossils



A & B. *Characteristic remains of tall sedges: 1–4 mm wide, flattened, grey-yellow to dark brown rhizome fragments.*
C. *Fine, <1 mm to a few mm wide, hollow, pale grey to yellow-grey rootlets.*
D. *Characteristic ovate, cuspidate, veined fruit tube.*

Typical admixtures in peat

A. *Pale brown, easily squeezable root wood of black alder.*
B. *1–3 cm wide, flattened, shiny yellowish to olive-coloured rhizome fragments of common reed.*
C. *Shiny, gold to bronze-brown, unbranched to little-branched brown moss plants with squarrose appearance.*

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1.4 Fine sedge peat

(Radicel peat, Parvocarex peat)

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Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

Portraits of peatland deposits Germany

1.4 Fine sedge peat
(Radicel peat, Parvocarex peat)

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Characteristics for field identification

The matrix of fine sedge peat either consists of a dense root felt or the recognisable plant remains are embedded in a light to dark brown predominantly unstructured substance. Characteristic plant remains are the rhizomes of small to moderately tall sedges (*Carex* spp.). The flattened, two-layered ribbons are greyish-yellow to brown and at most faintly shiny. The majority of these rhizomes are <1 mm wide; only 10% of the rhizomes are wider than this (up to 4 mm). A high fraction of the peat is formed by fine, predominantly <1 mm wide, hollow, pale grey to yellow-grey rootlets or rootlet fragments (radicels). These rootlets are not assignable to a specific plant species in the field but, especially where they occur in combination with the characteristic rhizomes described above, the probability that sedge species were considerably involved in peat formation is high. Rarely, the characteristic fruit tubes of sedges (ovate, cuspidate, veined) are found in the peat.
In order to differentiate fine sedge peat from coarse sedge peat, the proportion of rhizomes >1 mm wide is estimated: the proportion of wider rhizomes in coarse sedge peat is >10 % and this peat type frequently contains considerably stronger rootlets.

Typical admixtures: brown mosses, bogbean seeds, peat mosses; rarely: common reed rhizomes, wood of alder and birch.

Occurrence as pure peat / mixed peat: often as pure peat, frequently as brown moss - fine sedge peat, peat moss - fine sedge peat, rarely as common reed - fine sedge peat.

Typical degrees of humification: mostly slightly to moderately decomposed, due to usually permanent water saturation during peat accumulation; focus: H3–H5.

Site conditions and ecohydrological indications

Formation conditions
Fine sedge peat accumulates under the influence of mineral soil water permanantly standing or flowing close to the surface, and under predominantly mesotrophic subneutral, acidic or calcareous conditions.

Occurrence and position in the landscape
This frequent peat type occurs mainly in river valleys, in depressions and kettle holes of end and ground moraines, and rarely on glacial outwash plains of morainic landscapes, as well as in low mountain ranges and the foothills of the Alps.

Peat forming plant communities
Fine sedge peat is formed by reed communities dominated by different small to moderately tall sedges (*Carex* spp.) (shorter than ~ 40 cm).
Depending on site conditions, accompanying plants are brown mosses (*Bryales*) or peat mosses (*Sphagnum* spp.), different herbaceous plants, and occasionally common reed (*Phragmites australis*), as well as sparsely growing shrubs and woody plants such as black alder (*Alnus glutinosa*) and birch (*Betula* spp.).

Occurrence in hydrogenetic mire types
Mainly: percolation mire; frequently: terrestrialisation mire, sloping mire, kettle hole mire; rarely: water rise mire, spring mire.

Occurrence in ecological mire types
Mainly: mesotrophic subneutral mires; frequently: mesotrophic acidic and mesotrophic calcerous mires; rarely: oligotrophic and eutrophic mires.

•Trophic conditions of fine sedge peat

Spectrum of measured C/N values	Associated trophic group and C/N range
50–15	oligotrophic (> 33)
	mesotrophic (33–20)
	eutrophic (< 20–10)

• Base saturation conditions of fine sedge peat

Spectrum of measured pH values	Associated base saturation group and pH range
3.0–7.6	acidic (< 4.8)
	subneutral (4.8–6.4)
	calcareous (> 6.4)

Mesotrophic subneutral spring mire that is potentially forming fine sedge peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	reed peats	radicel peat (Hnr)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Parvocarex peat (h-rsf)

1.4 Fine sedge peat
(Radicel peat, Parvocarex peat)

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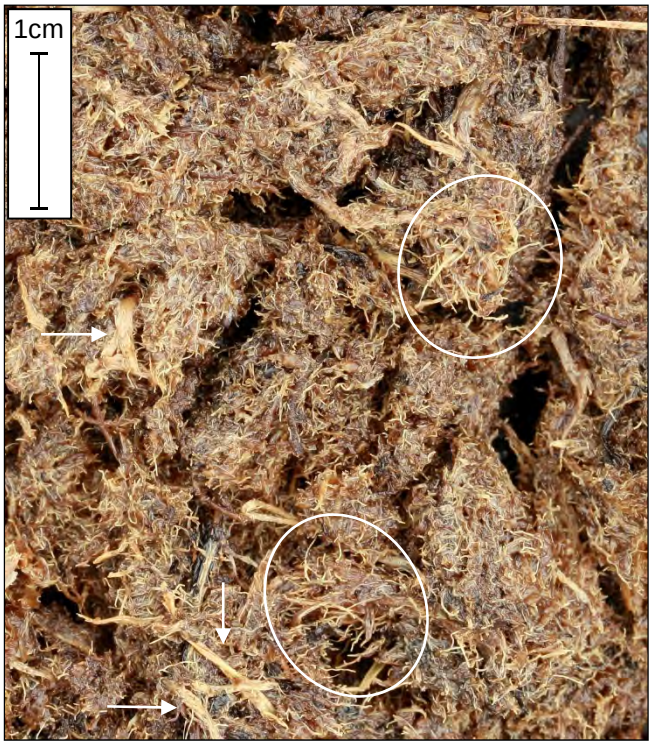
Typical appearance of peat in corer

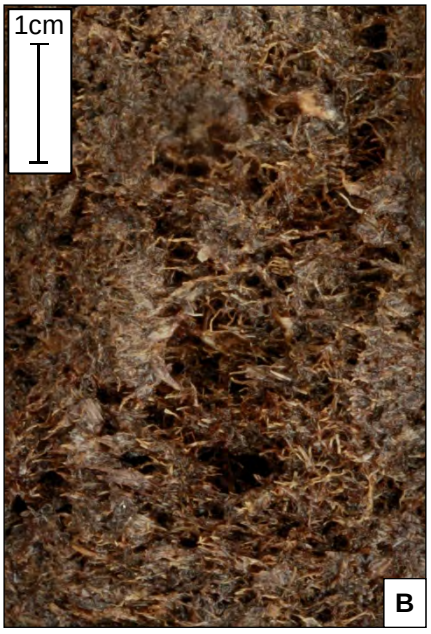
Slightly decomposed (H4) fine sedge peat: bright, yellow-brown rootlets in a brown matrix already apparent in the corer.

Close-up of exposed peat



Flattened, >1 mm wide, greyish yellow-brown rhizomes of small and moderately tall sedges (arrows) and numerous fine rootlets (e.g. circles).

Varieties and peculiarities of peat



A. *Exceptionally well preserved (H2) fine sedge peat: consisting of numerous bright yellow rootlets with a few bright, fine rhizomes (arrows).*

B. *Moderately decomposed (H5) fine sedge peat: pale brown rootlets embedded in an unstructured brown matrix.*

C. *Brown moss - fine sedge peat: a combination of characteristic sedge rootlets with shiny, gold to bronze-brown, unbranched to little branched brown moss plants (circle). A frequently occurring mixed peat.*

D. *Peat moss - fine sedge peat: a combination of characteristic sedge rhizomes and rootlets with bright to translucent peat moss stems (arrow) and mushy, cohesive, yellow peat moss leaflets (circle). A frequently occurring mixed peat.*

Portraits of peatland deposits Germany

1.4 Fine sedge peat
(Radicel peat, Parvocarex peat)

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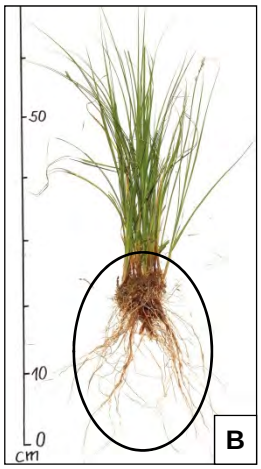
Main peat forming living plants

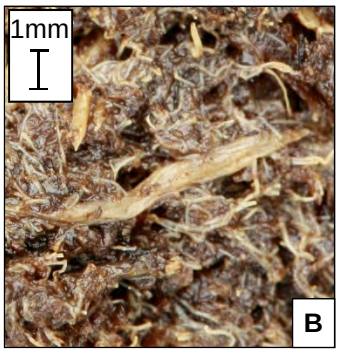


A. *A typically sparse population of growing small sedges (*Carex *spp.).*

B. *A moderately tall sedge: the circle indicates the peat forming subsurface rhizomes and rootlets.*

C. *Close-up of the peat forming parts of a moderately tall sedge.*

Main peat forming macrofossils



A. *Fine, mostly >1 mm wide, hollow, pale grey to yellow-brown rootlets (radicels) and characteristic, flattened, pale yellow, >1 mm wide rhizome fragments (arrows).*

B. *Rhizome fragment.*

C. *Characteristic ovate, cuspidate, veined fruit tube.*

Typical admixtures in peat

A. *Shiny, gold to bronze-brown, unbranched to little branched brown moss plants with squarrose appearance.*

B. *Conspicious seeds of bogbean: shiny coralline to yellow-brown, lenticular, 2–3 mm in diameter, hollow inside, often falling apart into two halves.*

C. *Peat moss remains (in this case,* Sphagnum *section* Cuspidata*): proportionally thick, bright to translucent main stems (on the left) and side branches with numerous yellowish, acute, non-shiny leaflets (on the right).*

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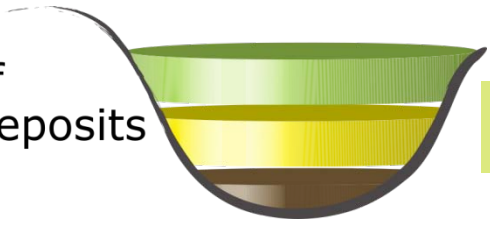
1.5 Common reed peat

(Phragmites peat)

Portraits of peatland deposits
Germany



Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.5 Common reed peat
(Phragmites peat)

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Characteristics for field identification

The easily recognisable remains of common reed, which often smell of hydrogen sulphide, are embedded in a variable, often soft and loose matrix, depending on the conditions during peat formation. The matrix can consist of a dense, fine, yellowish-brown felt of common reed roots with a high proportion of gyttja as well as mineral components. At higher degrees of humification, the matrix is characterised by an untextured, dark brown to greyish substance. The most striking common reed remains are the often numerous strong rhizomes of the plant, which are well preserved even at higher degrees of humification. These flattened, 1–3 cm wide, two-layered ribbons are remarkably shiny, yellowish or bright grey to olive green, flat or wavy and can often be split into two parchment-like layers. Furthermore, they are characterised by "glabrous" nodes (without bristle wreath) at intervals of 4–12 cm. Axillary buds and roots up to 5 mm thick sometimes occur near the nodes. Ascending rhizomes are more slender, irregularly compressed, and their ends sometimes merge with the casually conserved, thin, crumpled basal parts of the stems that are vertically embedded in the peat .
The roots of common reed are mostly yellower than sedge rootlets, but the two cannot be distinguished with certainty in the field. If rhizomes of common reed and characteristic rhizomes of sedges are both present in the peat, sedge - common reed mixed peat can be suggested. Extremely slender common reed rhizomes may be mistaken for pod grass rhizomes, but the latter are clearly thinner (4–6 mm) and feature bristle wreaths ("pilose" nodes).

Typical admixtures: rootlets and rhizomes of sedges, brown mosses, occasionally alder wood, peat mosses, gyttja and mineral components.

Occurrence as pure peat / mixed peat: often as pure peat, frequently as sedge - common reed peat, sometimes as brown moss - common reed peat and alder - common reed peat.

Typical degrees of humification: due to seasonal water-level fluctuations during peat accumulation, mostly moderately decomposed; in the case of permanent saturation, slight decomposition also possible; focus: H3–H7.

Site conditions and ecohydrological indications

Formation conditions

Common reed peat accumulates in the terrestrialisation zones of standing water bodies, in flood-prone areas at seashores and alongside running water bodies. It is also formed under the influence of mineral soil water periodically standing or flowing close to the surface. Common reed peat exhibits a wide ecological range, but accumulates predominantly under eutrophic or mesotrophic subneutral to mesotrophic acidic conditions.

Occurrence and position in the landscape

This common peat type is not closely associated with a specific landscape. It occurs at coastal lowlands and along lowland rivers and river valleys, as well as in depressions on glacial outwash plains and in end and ground moraine areas.

Peat forming plant communities

Common reed peat is formed by naturally species-poor reed communities dominated by common reed (*Phragmites australis*). Accompanying plants are frequently sedges (*Carex* spp.) and duckweed (*Lemna* spp.), occasionally brown mosses (*Bryales*) or peat mosses (*Sphagnum* spp.) as well as sparsely growing shrubs and woody plants such as black alder (*Alnus glutinosa*), willow (*Salix* spp.) and birch (*Betula* spp.).

Occurrence in hydrogenetic mire types

Mainly: flood mire, terrestrialisation mire; frequently: spring mire, percolation mire, water rise mire.

Occurrence in ecological mire types

Mainly: eutrophic, mesotrophic subneutral and mesotrophic acidic mires; rarely: mesotrophic calcareous mires; very rarely: oligotrophic acidic mires.

•Trophic conditions of common reed peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
34–12	oligotrophic (>33)
	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of common reed peat:

Spectrum of measured pH values	Associated base saturation group and pH range
2.6–6.5	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

A terrestrialisation mire that is potentially forming common reed peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	reed peats	Phragmites peat (Hnp)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Phragmites peat (h-rp)

1.5 Common reed peat
(Phragmites peat)

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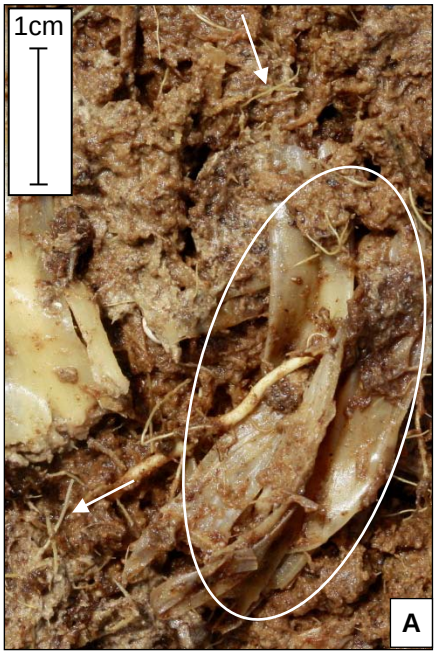
Typical appearance of peat in corer

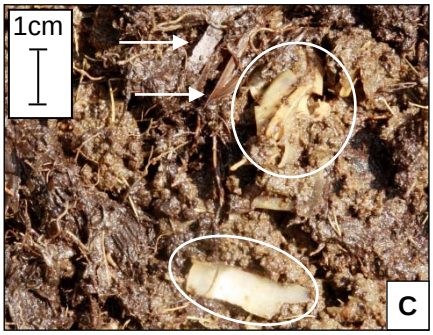
Moderately decomposed common reed peat: the yellowish remains of rhizomes embedded in a greyish-brown matrix are already apparent in the corer.

Close-up of exposed peat

Numerous wide, yellowish-olive-green, shiny remains of rhizomes embedded in a brown unstructured matrix of fine common reed roots.

Varieties and peculiarities of peat





A. *Slightly decomposed (H2) common reed peat: wide, pale yellow common reed rhizomes (circle) embedded in a gyttja-like matrix with numerous well preserved, yellowish fine roots (arrows).*

B. *Highly decomposed (H7) common reed peat: common reed rhizomes are darker but still recognisable (circles).*

C. *Sedge - common reed peat: brown, slender, flattened rhizomes of sedges (arrows) along with a few characteristic common reed rhizomes (circles). A frequently occurring mixed peat.*

D. *Brown moss - common reed peat: bronze-brown, shiny brown moss plants (circle) along with common reed rhizomes.*

Portraits of peatland deposits Germany

1.5 Common reed peat
(Phragmites peat)

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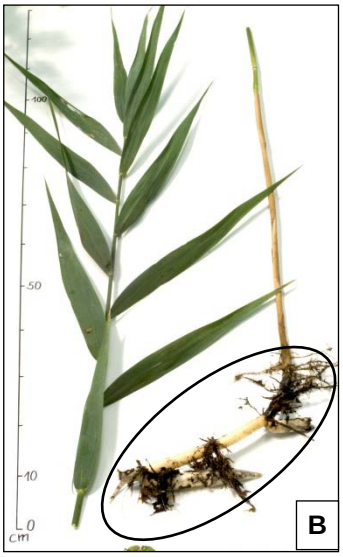
Main peat forming living plants

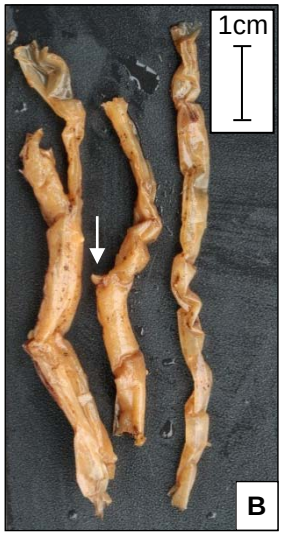


A. *Common reed (*Phragmites australis*) growing in a typical species-poor population.*

B. *Common reed plant (divided); the peat forming parts (circled) are: subsurface rhizomes, roots and occasionally basal parts of stems.*

C. *Close-up of the peat forming parts of common reed.*

Main peat forming macrofossils

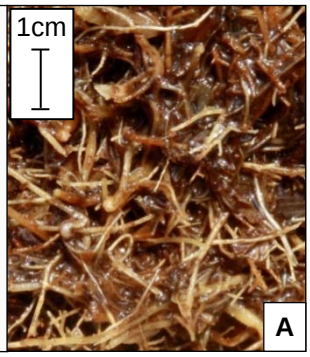


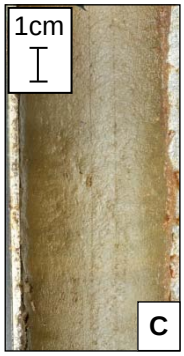
A. *Characteristic common reed remains: wide, flattened, shiny, yellowish to olive tinted rhizome fragments.*

B. *Left and middle: ascending, slender rhizome fragments with "glabrous" nodes (without bristle wreath) and axillary bud (arrow); right: slender, crumpled basal part of the stem (occasionally preserved).*

C. *Typical peat fracture surface: common reed rhizomes are mostly split into two parchment-like layers.*

Typical admixtures in peat





A. *Characteristic remains of sedges: <1–4 mm wide, flattened, grey-yellow to dark brown rhizome fragments (left); fine, <1 mm to a few mm thick, hollow, pale grey to yellow-grey rootlets (right).*

B. *Shiny, gold to bronze-brown, unbranched to little branched brown moss plants with squarrose appearance.*

C. *Gyttja: homogenous, elastic mass with colour variations from whitish to brown to blackish.*

D. *Pale brown, very easy squeezable root wood of black alder.*

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1.6 Saw-sedge peat

(Cladium peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

Portraits of peatland deposits Germany

1.6 Saw-sedge peat
(Cladium peat)

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Characteristics for field identification

The characteristic remains of saw-sedge are usually embedded in a thick, brown, slightly structured matrix, which quickly darkens in contact with air. The matrix often contains a considerable fraction of gyttja or, rarely, is formed by a thick brown felt of saw-sedge rootlets.
The upright stem bases of saw-sedge are the most obvious macrofossils. Even in more highly decomposed peat, they are usually well preserved. The stem bases are 1–2 cm thick and 3–5 cm long, ovate and elongated, often somewhat asymmetrically curved, truncated at the top and narrowed at the bottom. The dark brown bark of the stem base is mostly 2–3 mm thick and often quite woody (becoming softer at higher degrees of decomposition). The bark usually shows former leaf attachments, and rootlet holes up to 2 mm wide. Inside the bark there are very loose, carmine to brownish-orange, coarse-fibred remains of vascular bundles.
Occasionally, shiny dark brownish to bronze-brownish, not very compressed, 0.5–1 cm wide rhizomes of saw-sedge are found, also with reddish, coarse-fibred remains of vascular bundles inside them. The nodes of the rhizomes are close together (spacing 1–2 cm), inconspicuous, not distinctly confined, and occasionally with parallel-nerved, 1.5–2 cm long cataphylls.
Rarely, seeds of saw-sedge (black, oval, slightly three-part, 2 mm across) are found in the peat.
Saw-sedge peat might be confused with alder peat, due to the woody bark of the stem base and the reddish remains of the vascular bundles. The vascular bundles are always softer and more fibrous in saw-sedge than in alder wood.

Typical admixtures: gyttja, seeds of water plants (especially pond-lily), shells of molluscs, occasionally rootlets and rhizomes of common reed and sedges, brown mosses.

Occurrence as pure peat / mixed peat: mostly as pure peat with some gyttja, occasionally as common reed - saw-sedge peat, sedge - saw-sedge peat and brown moss - saw-sedge peat.

Typical degrees of humification: due to seasonal lake-level fluctuations during peat accumulation and subneutral to calcareous conditions, mostly moderately decomposed; sometimes also highly decomposed.

Site conditions and ecohydrological indications

Formation conditions
Saw-sedge peat accumulates in the shallow water of terrestrialisation zones of lakes (water depth up to ~0.5 m), under mesotrophic subneutral to mesotrophic calcareous conditions.

Occurrence and position in the landscape
This rare peat type is mainly confined to river valleys and depressions in end moraines and hilly ground moraines with glacial deposits that are base-rich or even calcareous.
Saw-sedge peat is usually found at greater depths because it was mostly deposited during the main phase of terrestrialisation during the Boreal and Subboreal periods. Recent accumulation of saw-sedge peat is rare in Germany, due to superficial decalcification of mineral deposits in catchment areas.

Peat forming plant communities
Saw-sedge peat is formed by reed communities dominated by saw-sedge (*Cladium mariscus*). Frequently accompanying plants are pond-lily (*Nuphar* spp.), brown mosses (*Bryales*), and rather sparsely growing common reed (*Phragmites australis*) and sedges (*Carex* spp.).

Occurrence in hydrogenetic mire types
Terrestrialisation mire.

Occurrence in ecological mire types:
Mesotrophic calcareous and mesotrophic subneutral mires.

• Trophic conditions of saw-sedge peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
25–21	mesotrophic (33–20)

• Base saturation conditions of saw-sedge peat:

Spectrum of measured pH values	Associated base saturation group and pH range
6.2–8.4	subneutral (4.8–6.4)
	calcareous (>6.4)

A mesotrophic calcareous terrestrialisation mire that is potentially forming saw-sedge peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	reed peats	Cladium peat (Hnd)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Cladium peat (h-rc)

1.6 Saw-sedge peat
(Cladium peat)

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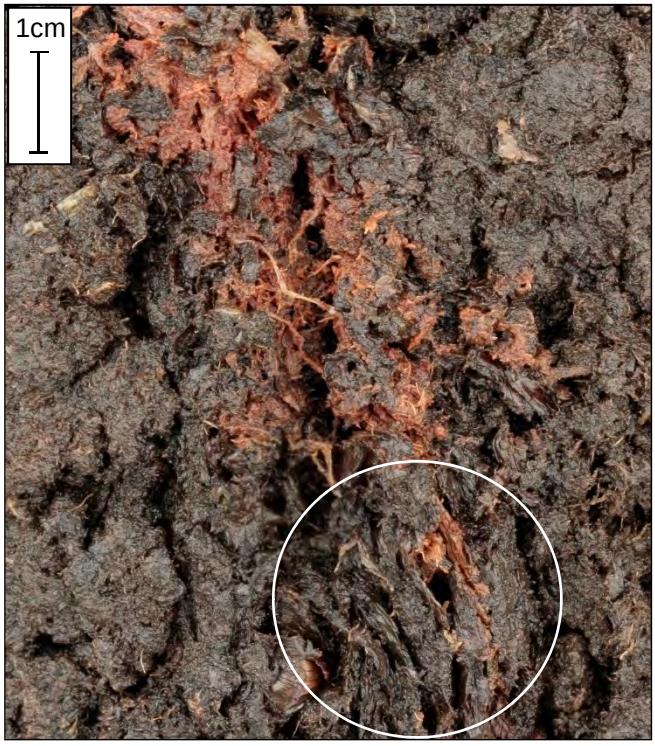
Typical appearance of peat in corer

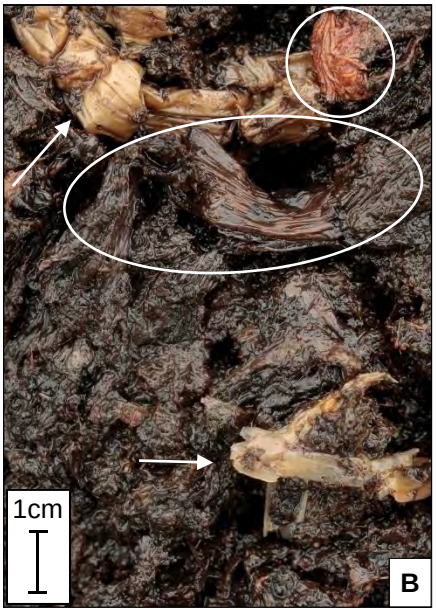
Moderately decomposed (H6) saw-sedge peat: reddish remains of saw-sedge vascular bundles in a brown matrix.

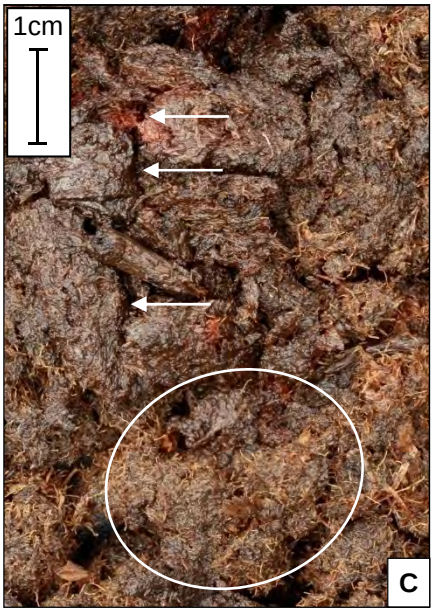
Close-up of exposed peat



Fibrous, carmine remains of vascular bundles and bark of stem base (circle) in a thick, brown, slightly structured matrix.

Varieties and peculiarities of peat





A. *Saw-sedge peat with a high fraction of gyttja: reddish remains of saw-sedge vascular bundles in a largely homogeneous, elastic, faintly shiny, bright brown matrix.*

B. *Common reed - saw-sedge peat: wide, flattened, shiny, yellowish to olive coloured rhizomes of common reed (arrows), in addition to remains of bark and stem base vascular bundles of saw-sedge (circles). An occasionally occurring mixed peat.*

C. *Sedge - saw-sedge peat: remains of bark and stem base vascular bundles of saw-sedge (arrows) with numerous fine, hollow, pale grey to yellow-brown rootlets and flattened, pale yellow rhizome fragments of sedges (e.g. circle). An occasionally occurring mixed peat.*

1.6 Saw-sedge peat
(Cladium peat)

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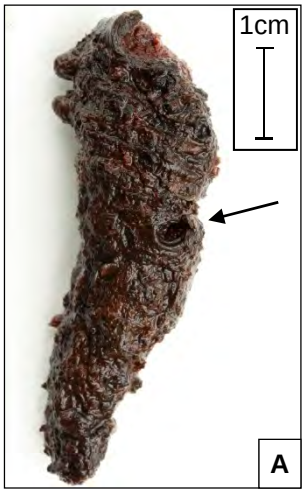
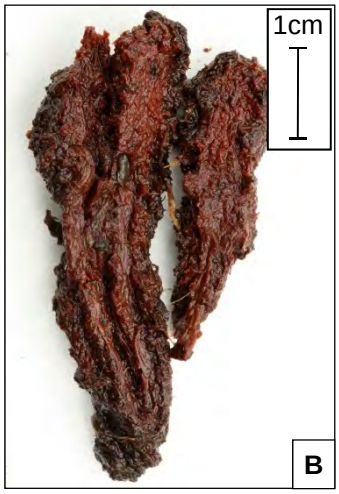
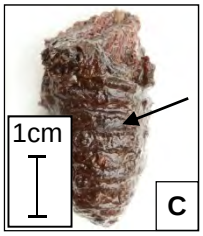
Main peat forming living plants

A. *Population of saw-sedge (*Cladium mariscus*).*
B. *Saw-sedge plant (divided); the peat forming parts (circled) are: subsurface stem base, rhizomes and rootlets.*
C. *Close-up of the peat forming parts of saw-sedge.*

Main peat forming macrofossils

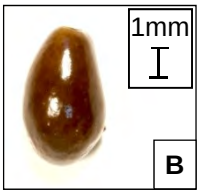


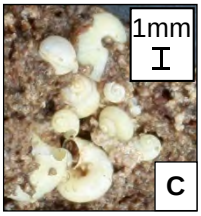




A & C. *Characteristic remains of saw-sedge stem bases: ovate and elongated, 1–2 cm thick, 3–5 cm long, with thick dark brown bark showing former leaf attachments (arrow in C) and rootlet holes (arrow in A).*
B. *Sliced stem base: carmine, fibrous remains of vascular bundles inside.*
D & E. *Shiny, dark brown rhizomes with fibrous, reddish remains of vascular bundles inside.*

Typical admixtures in peat





A. *Gyttja: homogenous, elastic to mushy mass with colour variations from whitish to greenish or brownish; shown here in corer with an included saw-sedge stem base (arrow).*
B. *Seed of pond-lily: conspicuously large (4–5 mm), oval-shaped with smooth brown surface.*
C. *Remains of mollusc shells.*
D. *Remains of common reed rhizomes: 1–3 cm wide, flattened, shiny yellowish to olive-coloured.*
E. *Fine (mostly <1 mm wide), hollow, pale grey to yellow-brown rootlets and flattened, pale yellow rhizomes (arrow) of sedges.*
F. *Brown moss plants with squarrose appearance: metallic shiny, vibrant gold-brown to bronze-brown.*

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1.7 Cotton grass peat

(Eriophorum peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.7 Cotton grass peat
(Eriophorum peat)

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Characteristics for field identification

Cotton grass peat is predominantly but rarely completely formed by easily identifiable remains of tussock cotton grass (*Eriophorum vaginatum)*. The remains are usually embedded in a matrix of slightly to moderately decomposed peat mosses, consisting of straw-yellow to reddish-bright brown stems and leaflets of mosses.
The most frequent and conspicuous remains of tussock cotton grass are tough, thick, slightly shiny, brown to dark brown tufts of fibres, consisting of the plant's subsurface leaf sheaths. Often more than 10 cm long, their appearance is reminiscent of a thick tuft of hair or a flattened brush, they are hard to tear apart lengthwise and they darken quickly in contact with air. These bundles of leaf sheaths are very resistant to decomposition and are even found in highly decomposed peat, where their colour is dark brown to black. The root stock (cylindrical, 3–5 mm thick, hardly 1 cm long) is sometimes preserved inside the bundles. Inside the root stock are dark, spindle-like formations (sclerenchyma spindles), 0.5 mm thick and 2–4 mm long. The ribbon-like roots of tussock cotton grass (1–2 mm wide; slightly shiny; dark brown, dark grey or black; slightly creased) are also conspicuous, running unbranched and quite vertically through the peat. Remains of common cotton grass (*Eriophorum angustifolium*) are less frequent, and mostly consist of stem bases reminiscent of small cigars, 0.7–1.3 cm wide and 2–3.5 cm long, with dark red-brown bark. Occasionally, fragile and easily tearable remains of leaf sheaths are preserved, ensheathing the stem bases. These are red-brown, dull and mostly heavily creased, but cohere in the upper part like a stem.
Cotton grass peat can hardly be confused with any other peat type.

Typical admixtures: slightly to moderately decomposed peat mosses, stem and leaf fragments of dwarf shrubs, occasionally pine and birch wood.

Occurrence as pure peat / mixed peat: rarely as pure peat, mostly mixed with peat moss peat, rarely with dwarf-shrub peat.

Typical degrees of humification: mostly good preservation, i.e. slightly to moderately decomposed, due to predominance of water saturation during peat accumulation; sometimes highly decomposed; focus: H3–H5.

Site conditions and ecohydrological indications

Formation conditions
Cotton grass peat is characteristic of oligotrophic acidic peatlands. The condition for its formation is a supply of rainwater or nutrient-poor mineral soil water standing close to the peatland surface.

Occurrence and position in the landscape
This peat type accumulates preferentially in areas with high precipitation (Northwest Germany), at seashores, in low mountain ranges and in the northern foothills of the Alps. It can also occur at locations with high groundwater ingress in areas of nutrient-poor, acidic or surficially decalcified mineral deposits (glacial outwash plains, ground and end moraine landscapes).

Peat forming plant communities
Cotton grass peat is predominantly formed by plant communities that are dominated by tussock cotton grass (*Eriophorum vaginatum*) and phytosociologically close to peat moss communities. Frequently accompanying plants are peat mosses (*Sphagnum* spp.) in hollows, dwarf shrubs (mainly *Ericaceae*) and scattered woody plants such as pine (*Pinus* spp.) and birch (*Betula* spp.).

Occurrence in hydrogenetic mire types
Mainly: bog, kettle hole mire; rarely: terrestrialisation mire, sloping mire, water rise mire.

Occurrence in ecological mire types
Mainly: oligotrophic acidic mires; rarely: mesotrophic acidic mires.

• Trophic conditions of cotton grass peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
34–32	oligotrophic (>33)
	mesotrophic (33–20)

• Base saturation conditions of cotton grass peat:

Spectrum of measured pH values	Associated base saturation group and pH range
2.7–3.7	acidic (<4.8)

The oligotrophic acidic centre of a kettle hole mire that is potentially forming cotton grass peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	bog herbaceous peats	Eriophorum peat (Hhe)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Eriophorum peat (h-rw)

1.7 Cotton grass peat
(Eriophorum peat)

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Typical appearance of peat in corer

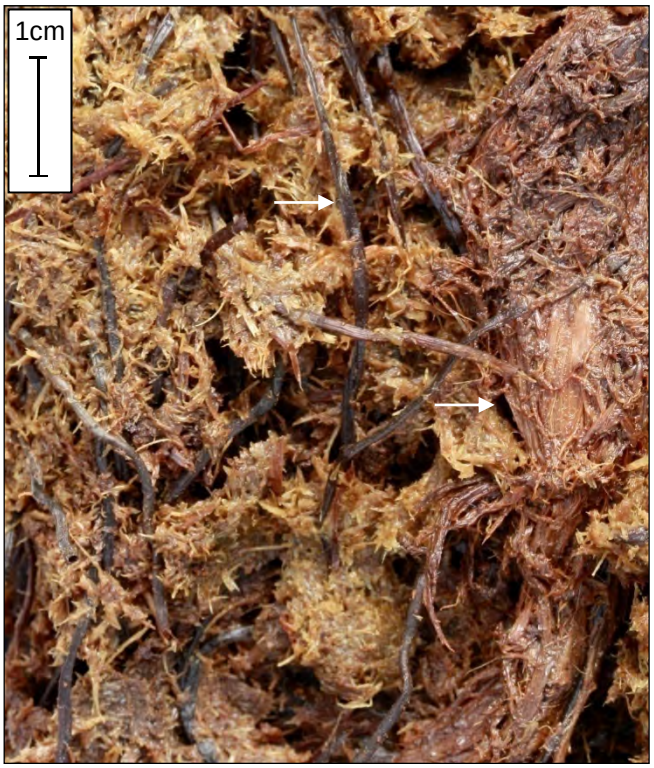
Slightly decomposed cotton grass peat with straw-like tufts of tussock cotton grass fibres, which are frequently identifiable before removal from the corer.

Close-up of exposed peat

Mainly dense, slightly shiny, brown tufts of tussock cotton grass fibres (bundles of sheaths) and remains of peat mosses (top right).

Varieties and peculiarities of peat

Cotton grass peat with numerous 1–2 mm wide, slightly shiny, dark brown, unbranched roots of tussock cotton grass (arrows).



Peat moss - cotton grass peat: a mixed peat with typical remains of cotton grass (bundles of leaf sheaths and roots (arrows)) embedded in a straw-yellow to brown matrix consisting of peat moss remains.

1.7 Cotton grass peat
(Eriophorum peat)

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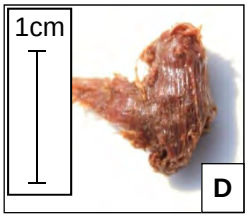
Main peat forming living plants

A: *A population of growing tussock cotton grass (Eriophorum vaginatum).*

B: *A fruit bearing individual of tussock cotton grass.*

C: *The peat forming subsurface bundles of leaf sheaths and roots (circle).*

Main peat forming macrofossils



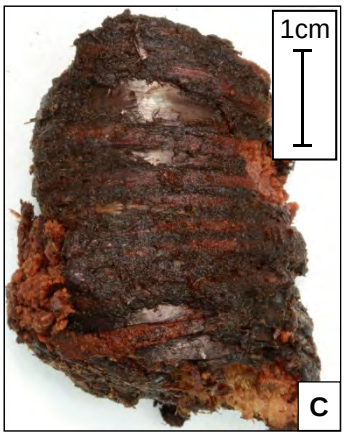
A *&* ***B.*** *Slightly shiny, brown to dark brown bundles of tussock cotton grass leaf sheaths.*

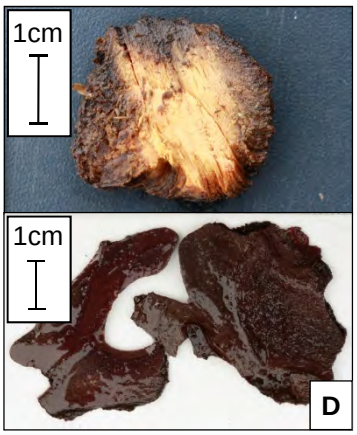
C. *A stem-like cohesion of creased, red-brown remains of common cotton grass leaf sheaths.*

D. *Cylindrical root stock of tussock cotton grass with rhizome attachment (left side).*

E. *1–2 mm wide, slightly shiny, dark brown, unbranched roots of tussock cotton grass.*

Typical admixtures in peat





A. *Remains of peat mosses (in this case* Sphagnum *section* Cuspidata*): proportionally thick, bright to translucent main stems (left); side branches with numerous dull (not shiny), yellowish, acute leaflets (right).*

B. *2–5 mm thick fragment of heather stem with dull, brown to red-brown bark showing fine lengthwise structure and four vertical rows of former leaf attachments.*

C. *Fragment of birch root with orange-reddish wood and characteristically shiny, silvery grey-brown bark.*

D. *Top: very firm, fibrous, dark brown to red-brown pine root wood, showing beige-bright brown colour when sliced; bottom: dark brown pine bark.*

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1.8 Pod grass peat

(Scheuchzeria peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 4: living plant (A): Sebastian von Wiegen; **References:** see part B: Annotations

1.8 Pod grass peat
(Scheuchzeria peat)

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Characteristics for field identification

Peat formed mainly from pod grass consists of a multitude of conspicuous rhizomes, often accumulated in layers, in a reddish-brown felty matrix of roots and stem bases. More frequently, the matrix consists of slightly to moderately decomposed peat mosses, which are yellowish-brown in colour with soft structure.
The most readily identifiable remains of pod grass are fragments of rhizomes that are highly resistant to decomposition. These are 4–6 mm wide, flattened, yellow-brown to red-brown, mostly horizontally layered, two-layered ribbons with sharply circumscribed straight margins. The rhizomes carry sleek nodes every 1–5 cm. Each node is surrounded by the variously long remains of thin vascular bundles from catapyhll or foliage leaf sheaths, which form a bristle wreath. The resulting “pilose” appearance of the nodes is a distinctive characteristic of pod grass macrofossils. Rather seldom, preserved roots originating from more or less triangular axillary buds, 2–3 mm across, are found up to 0.5 cm away from the nodes. Instead of roots and axillary buds, there are only 1–2 rootlet holes near each node in most cases. Dark brown, shiny, rounded, cylindrical pod grass seeds, ~2.5 mm thick and 3–4 mm long, that readily split lengthwise, are sometimes found in the peat.
Fragments of pod grass rhizomes may, at worst, be confused with very narrow rhizomes of common reed. However, rhizomes of common reed are greyish or olive-coloured (rhizomes of pod grass are never these colours) and their nodes are not “pilose”.

Typical admixtures: slightly decomposed peat mosses.

Occurrence as pure peat / mixed peat: very rare as pure peat, almost always as peat moss - pod grass peat.

Typical degrees of humification: mostly slightly to moderately decomposed; good preservation due to permanent water saturation during peat accumulation; focus: H1–H4.

Site conditions and ecohydrological indications

Formation conditions

Pod grass peat is mainly accumulated under the influence of rainwater or oligotrophic to mesotrophic acidic mineral soil water, permanently standing close to the ground surface. Its accumulation is typical for phases of large-scale climate-induced waterlogging in peatlands, and its occurrence frequently marks the transition from fen to bog. This peat type is also characteristic for floating mats and hollows.

Occurrence and position in the landscape

Pod grass peat is found mainly in areas with high precipitation (Northwest Germany), at seashores and in the northern foothills of the Alps. It also accumulates where depressions with high groundwater ingress occur in areas with nutrient-poor, acidic or surficially decalcified mineral deposits (glacial outwash plains and end moraine landscapes).

Peat forming plant communities

Recently accumulated pod grass peat is rather rare in Germany. It is formed by pure stands of pod grass (*Scheuchzeria palustris*) or by peat moss (*Sphagnum*) communities dominated by pod grass.

Occurrence in hydrogenetic mire types

Mainly: bog, terrestrialisation mire; frequently: kettle hole mire.

Occurrence in ecological mire types

Mainly: oligotrophic acidic and mesotrophic acidic mires; rarely: mesotrophic subneutral mires.

• Trophic conditions of pod grass peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
38–29	oligotrophic (>33)
	mesotrophic (33–20)

• Base saturation conditions of pod grass peat:

Spectrum of measured pH values	Associated base saturation group and pH range
2.4–5.8	acidic (<4.8)
	subneutral (4.8–6.4)

Floating mat in a mesotrophic acidic terrestrialisation mire that is potentially forming pod grass peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	bog herbaceous peats	Scheuchzeria peat (Hha)

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Scheuchzeria peat (h-rb)

Portraits of peatland deposits Germany

1.8 Pod grass peat
(Scheuchzeria peat)

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Typical appearance of peat in corer

Slightly decomposed pod grass peat with numerous horizontally layered, ribbon-like pod grass rhizomes already identifiable in the corer.

Close-up of exposed peat

Multitude of conspicuous yellow-brown pod grass rhizomes embedded in a pale brown matrix of slightly decomposed peat mosses and pod grass roots.

Varieties and peculiarities of peat

Peat moss - pod grass peat: fragments of pod grass rhizomes in a matrix of mushy remains of peat mosses (leaves and stems). A frequently encountered mixed peat.

Muddy pod grass peat with clearly identifiable fragments of pod grass rhizomes.

1.8 Pod grass peat
(Scheuchzeria peat)

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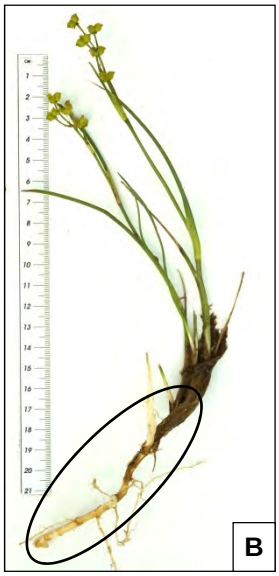
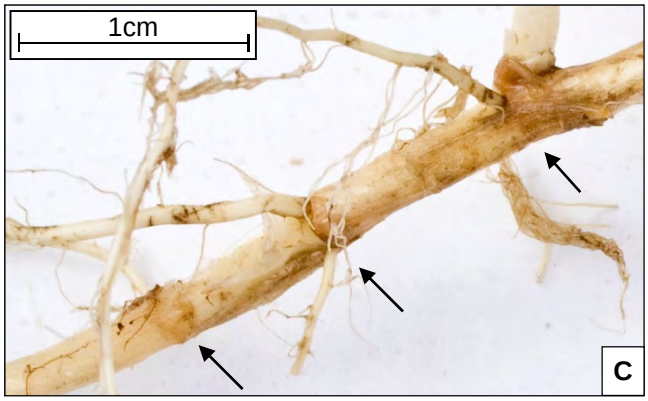
Main peat forming living plants



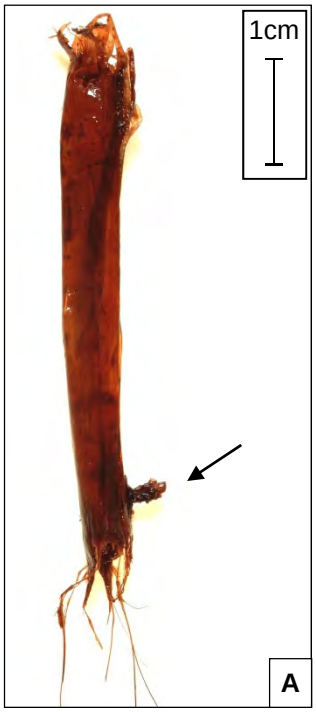


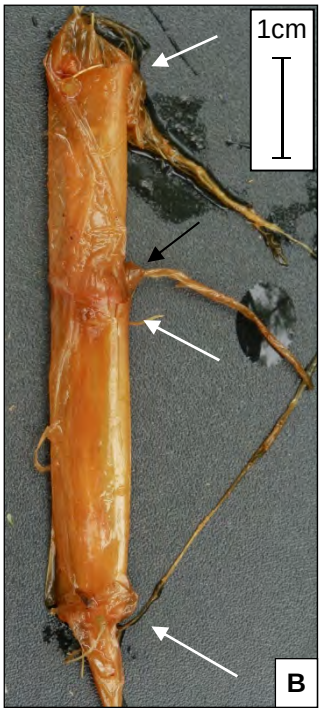
A. *A fruit bearing population of pod grass (*Scheuchzeria palustris*).*

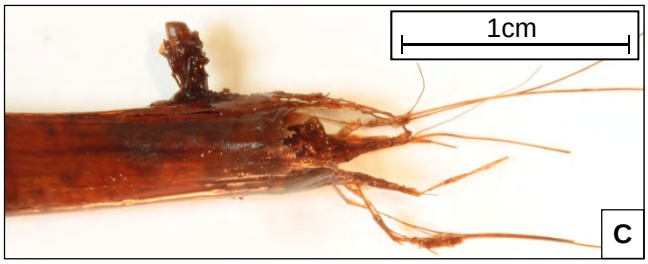
B. *A pod grass plant; the peat forming parts (circled) are: rhizome, roots and stem base.*

C. *Close-up of a rhizome showing nodes (arrows) with adjacent cataphyll leaf sheaths and 1–2 roots.*

Main peat forming macrofossils





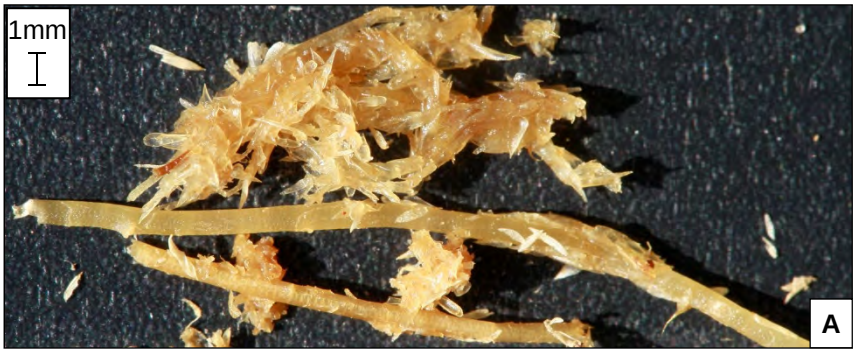


A. *Red-brown rhizome fragment, bearing a node with bristle-like remains of vascular bundles (at the bottom) and an axillary bud without a root (arrow).*

B. *Yellow-brown rhizome fragment with three "pilose" nodes (white arrows) and an axillary bud with a root (black arrow).*

C. *Close-up of the bristle-like remains of vascular bundles.*

Typical admixtures in peat



A. *Remains of peat mosses (in this case* Sphagnum *section* Cuspidata*): proportionally thick, pale to translucent main stems (bottom); side branches with numerous yellowish, dull (not shiny), acute leaflets (top).*

B. *Remains of peat mosses (in this case* Sphagnum *section* Cymbifolia*): densely foliated side branches with reddish-pale brown ovate leaflets.*

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1.9 Horsetail peat

(Equisetum peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.9 Horsetail peat
(Equisetum peat)

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Characteristics for field identification

The easily identifiable remains of horsetail which are relatively resistant to decomposition are mostly embedded in a dark, more highly decomposed matrix. The matrix consists predominantly of more highly decomposed remains of sedge or reed plants, but can also have a gyttja-like character. The most eye-catching remains of horsetail plants are fossilised horizontally running rhizomes. These flattened, mostly ~1 cm (0.5–1.5 cm) wide ribbons are very shiny and deep black (rarely dark brown), and glow dark ruby in back light. They are sharply circumscribed with relatively straight margins and distinctive nodes several centimetres apart. The nodes are often surrounded by denticulate leaf sheaths ('spiky collars'). Roots, very thin to 0.5 cm thick, dull, black and curved, glowing dark ruby in back light, originate from these nodes and can form a considerable part of the peat. They have a slightly (longitudinally) streaked surface and a few single, thin, upright side roots. Fragments of stems can also be preserved. Like the rhizomes, these are easily identifiable by their shiny black colour and the denticulate leaf sheaths at the nodes.
Horsetail peat might, at worst, be confused with some remains of marsh fern; but the black-coloured remains of marsh fern roots are obviously stiff and they do not glow dark ruby in back light.

Typical admixtures: moderately to highly decomposed rootlets and rhizomes of sedges, alder wood, gyttja.

Occurrence as pure peat / mixed peat: more frequently as pure peat, but also as sedge - horsetail peat and alder - horsetail peat.

Typical degrees of humification: mostly more highly decomposed, due to the presence of oxygen-rich water (e.g. spring water) or seasonal water level fluctuations during peat accumulation; focus: H6–H8.

Site conditions and ecohydrological indications

Formation conditions

Horsetail peat is accumulated under the influence of predominantly percolating (e.g. spring) water or where the water level is slightly above the ground surface. It forms under mesotrophic acidic, subneutral, calcareous or eutrophic conditions.

Occurrence and position in the landscape

This rare peat type forms preferentially at the margins of depressions and in depressions of end and ground moraines, and less frequently on glacial outwash plains in morainic landscapes.

Peat forming plant communities

Horsetail peat is formed by pure stands of water horsetail (*Equisetum fluviatile*) or by sedge (*Carex* spp.) communities dominated by water horsetail.

Occurrence in hydrogenetic mire types

Mainly: spring mire, terrestrialisation mire; rarely: percolation mire.

Occurrence in ecological mire types

Mainly: mesotrophic subneutral and eutrophic mires; rarely: mesotrophic acidic and mesotrophic calcareous mires.

• Trophic conditions of horsetail peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
24–17	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of horsetail peat:

Spectrum of measured pH values	Associated base saturation group and pH range
4.5–6.5	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

Spring pot in a mesotrophic subneutral spring mire that is potentially forming horsetail peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
herbaceous peats	reed peats	Equisetum peat (Hnq)

According to TGL 24 300/04
not included

1.9 Horsetail peat
(Equisetum peat)

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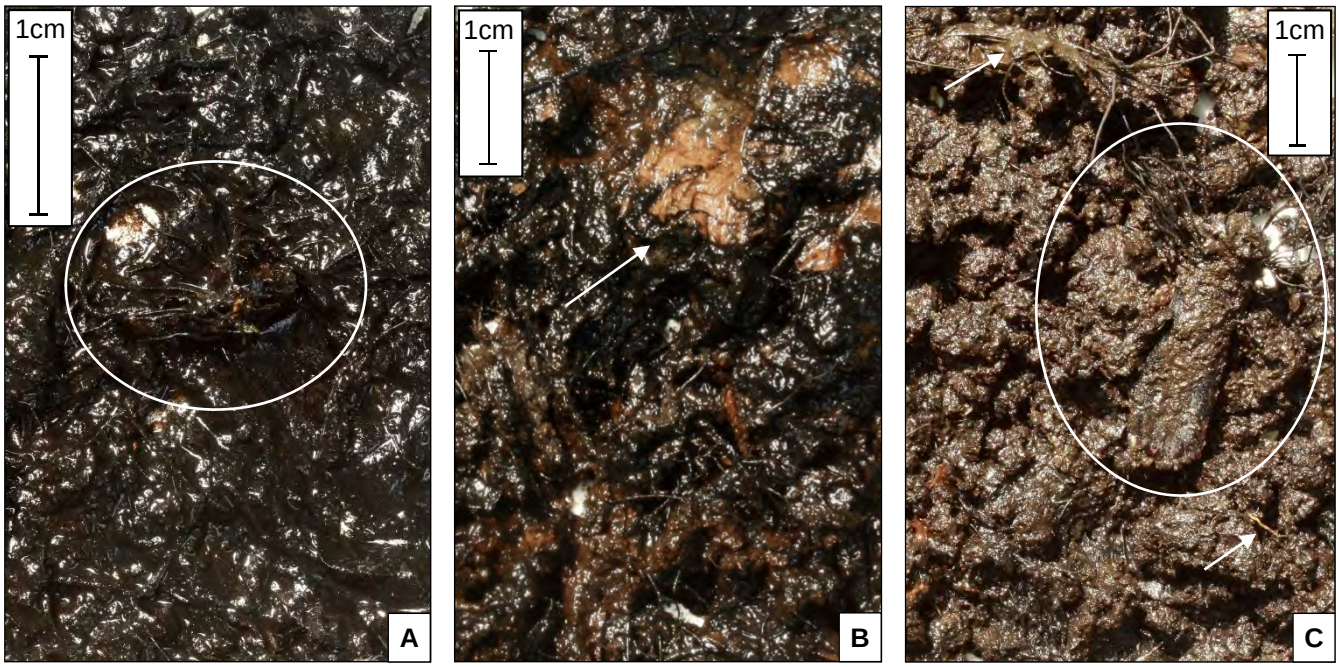
Typical appearance of peat in corer

Moderately decomposed horsetail peat (H5): numerous fine black horsetail rootlets in a brown matrix are visible even before removal from the corer.

Close-up of exposed peat

Deep black shiny remains of horsetail - fine roots (e.g. circle) and rhizomes with denticulate leaf sheaths ("spiky collars"; arrow) - embedded in a brown matrix.

Varieties and peculiarities of peat



A. *Gyttja-like, vibrant dark brown horsetail peat with well preserved denticulate leaf sheaths (circle).*

B. *Alder - horsetail peat: deep black remains of horsetail and pale brown fragments of alder roots (arrow) embedded in a highly decomposed matrix. A frequently occurring mixed peat.*

C. *Sedge - horsetail peat: typical remains of horsetail (circle) and <1–4 mm wide, flattened, grey-yellow to dark brown fragments of sedge rhizomes (upper arrow) and fine pale grey to yellow-grey sedge rootlets (lower arrow). A frequently occurring mixed peat.*

1.9 Horsetail peat
(Equisetum peat)

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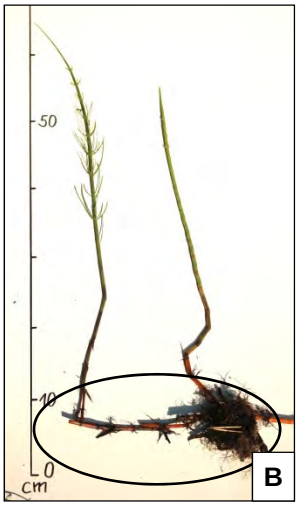
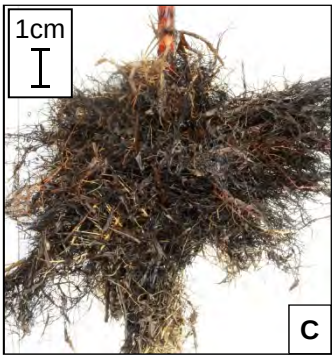
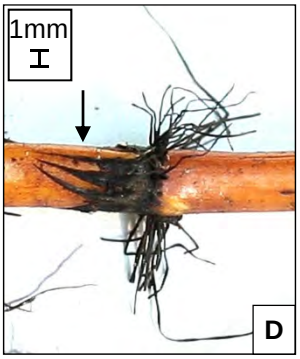
Main peat forming living plants

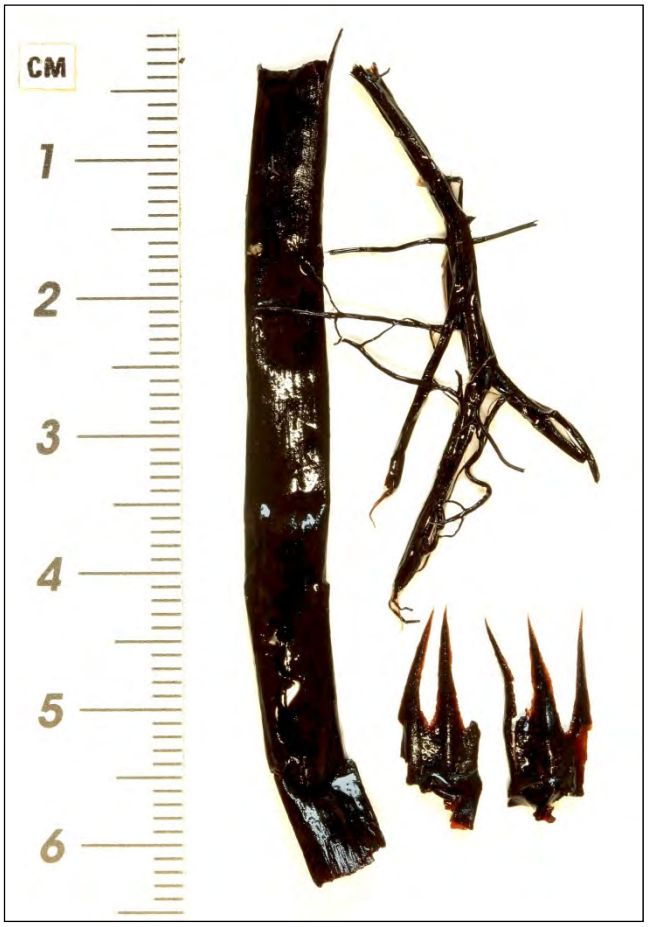






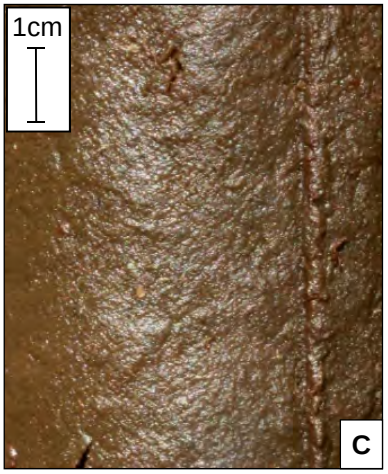
A. *A population of water horsetail (*Equisetum fluviatile*).*
B. *A water horsetail plant; the peat forming parts (circled) are the rhizomes and roots.*
C. *Close-up of roots.*
D. *Close-up of a rhizome with "spiky collar".*

Main peat forming macrofossils



Characteristic black, very shiny (glowing dark ruby in back light) remains of horsetail: flattened rhizome (left); thick root with thin side roots (top right); and fragments of "spiky collars" (denticulate leaf sheaths) (bottom right).

Typical admixtures in peat



A. *Typical remains of sedges: <1–4 mm wide, flattened, grey-yellow to dark brown fragments of rhizomes (left); and fine, <1 mm to a few mm thick, hollow, pale grey rootlets (right).*
B. *Pale brown, very easily squeezable root wood of black alder.*
C. *Gyttja: a homogeneous elastic mass with colour variation from light to dark brown.*

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1.10 Salt marsh peat

(Juncus peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.10 Salt marsh peat
(Juncus peat)

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Characteristics for field identification

Salt marsh peat consists predominantly of a felty mass of fine roots embedded in a dark brown to black (more rarely light brown) matrix that is highly compressed and noticeably difficult to core. The matrix is mainly formed by substantial mineral components (sand, silt and clay) washed in by floodwater, varying fractions of unstructured organic material and occasionally also gyttja. Characteristic plant remains are the rootlets and rhizomes of grass-like plants, especially saltmeadow rush. Remains of aerial plant parts, such as leaves and stems, are very rarely found. The most common remains are the strongly interwoven (felty), mostly <1 mm thick, hollow, pale grey to bright brown rootlets and rootlet fragments. It is not possible to identify specific plant species in the field. Remains of flattened, 1–4 mm wide, dull, grey-yellow to dark brown rhizomes can also be found in the peat.
In distinguishing this type from fine and coarse sedge peats, it is necessary to consider the location. Due to the close affinity of salt marsh peat with the regularly flooded areas around the Baltic Sea, only peat with the described characteristics (especially high compression and high mineral fraction) found in these areas can be identified with certainty as salt marsh peat.

Typical admixtures: mineral components (sand, silt, clay), gyttja, very rarely common reed.

Occurrence as pure peat / mixed peat: mostly as mineral-rich pure peat, very rarely as common reed - salt marsh peat.

Typical degrees of humification: predominantly moderately decomposed, due to periodically fluctuating water levels during peat accumulation; focus: H6.

Site conditions and ecohydrological indications

Formation conditions
Salt marsh peat accumulates under eutrophic conditions in regularly flooded areas around the Baltic Sea that are additionally used as pastures grazed by cattle and (rarely) horses. Although salt marshes are located above the mean level of the Baltic Sea, grazing-induced soil compaction and irregular flooding by water with varying salinity lead to reduced decomposition of organic matter and thus enable the formation of peat.

Occurrence and position in the landscape
This peat type is almost exclusively formed in salt marshes that are closely bound to the regularly flooded coastal areas around Baltic Sea bays. Very rarely, it also occurs in inland salt-meadows used as pastureland.

Peat forming plant communities
Salt marsh peat is formed by dense, short to medium height pasture which is rich in rushes (*Juncus* spp.), grasses (*Poaceae*) and herbaceous plants that are salt-tolerant and tolerant to trampling. The characteristic species for these locations is saltmeadow rush (*Juncus gerardii*). Depending on salinity, intensity of grazing and soil moisture, typical accompanying plants are, for example, sea plantain (*Plantago maritima*), sea aster (*Aster tripolium*), cosmopolitan bulrush (*Bolboschoenus maritimus*), carpet bentgrass (*Agrostis stolonifera*) and common arrowgrass (*Triglochin maritima*).

Occurrence in hydrogenetic mire types
Mainly: coastal flood mire; very rarely: spring mire (inland salt meadows only).

Occurrence in ecological mire types
Eutrophic mires.

• Trophic conditions of salt marsh peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
18–14	eutrophic (<20–10)

• Base saturation conditions of salt marsh peat:

Spectrum of measured pH values	Associated base saturation group and pH range
5.1–5.2	subneutral (4.8–6.4)

A eutrophic coastal flood mire used as pastureland that is potentially forming salt marsh peat.

Classifications

According to KA5
not included

According to TGL 24 300/04	
peat type group	peat type
reed peat (h-r)	Juncus peat (h-rf)

1.10 Salt marsh peat
(Juncus peat)

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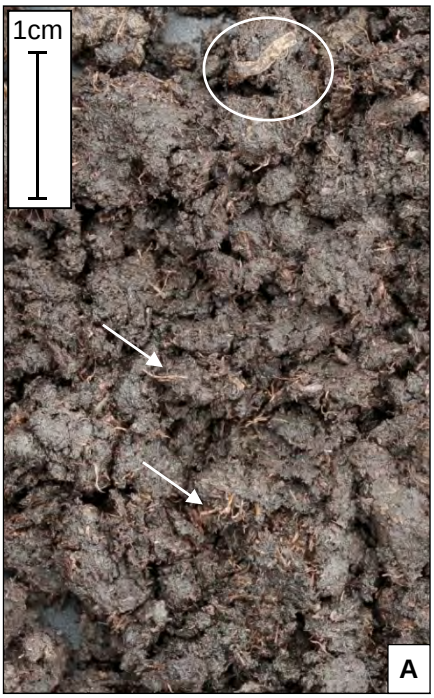
Typical appearance of peat in corer

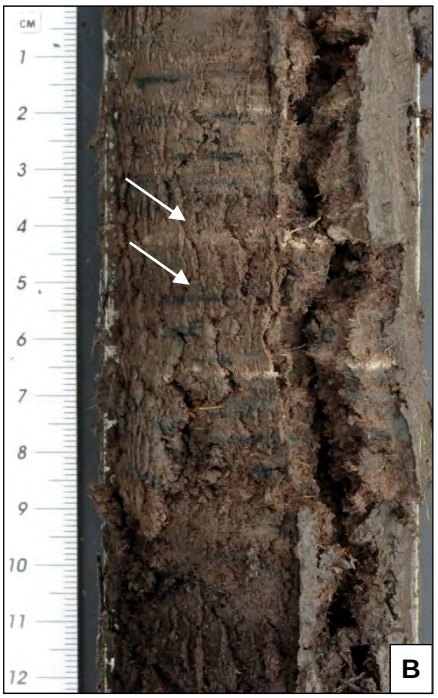
Moderately decomposed salt marsh peat: dark brown, dull, highly compressed matrix in corer.

Close-up of exposed peat

Felty and partially dense (e.g. circle) root mass consisting of pale to light brown rootlets, mostly <1 mm thick, embedded in a mineral-rich, brownish matrix.

Varieties and peculiarities of peat





A. *Highly decomposed (H7) salt marsh peat: unstructured grey-brown matrix with numerous light brown rootlet fragments (arrows) and some rhizomes (circle).*

B. *Moderately decomposed (H5) salt marsh peat in corer, showing characteristic lamination with alternating mineral ribbons consisting of sand, clay or silt (arrows) embedded in a brownish matrix with root felt. Frequently found.*

C. *Light brown salt marsh peat with a high fraction of sand and dense root accumulation (circle). Rarely found.*

1.10 Salt marsh peat
(Juncus peat)

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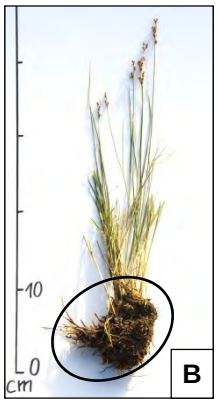
Main peat forming living plants



A. *Saltmedow rush (*Juncus gerardii*) growing in a pasture lawn rich in rushes, sedges and herbaceous plants.*

B. *A saltmeadow rush plant; the peat forming parts (circled) are subsurface rhizomes and roots.*

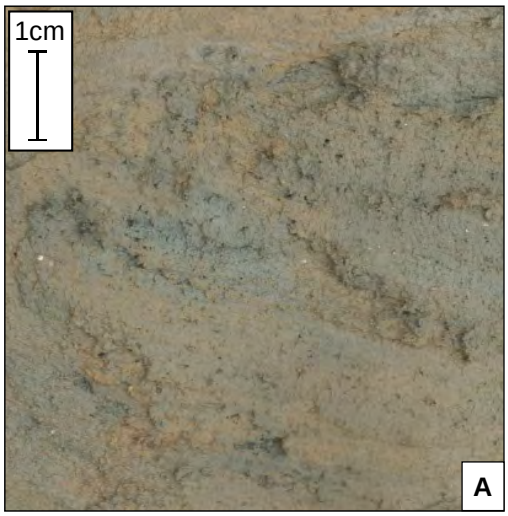
C. *Close-up of the peat forming components of saltmeadow rush.*

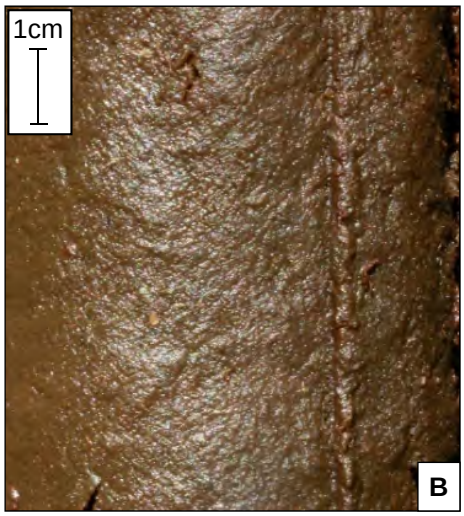
Main peat forming macrofossils

A. *Characteristic light brown rootlets and rootlet fragments of different grasslike plants, mostly <1 mm thick, hollow and highly felty.*

B. *Dense bundle of flattened brown rhizomes.*

Typical admixtures in peat





A. *Mineral components, in this case sandy clay (exposed).*

B. *Gyttja: a homogeneous elastic mass, varying in colour from light to dark brown.*

C. *Fragments of common reed rhizomes, 1–3 cm wide, flattened, shiny yellowish to olive-coloured.*

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1.11 Alder peat

(Alnus peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.11 Alder peat
(Alnus peat)

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Characteristics for field identification

Alder peat is characterised by a substantial fraction (at least 15 %) of black alder remains, mostly embedded in a highly decomposed brown to black matrix. When only slightly decomposed, the matrix may be formed by rhizomes and rootlets of sedges or common reed. This rather heavy peat has a coarsely brittle crumbly structure, and falls apart when loosened.
The black alder remains are mainly subsurface plant parts (roots, root stocks) and, less frequently, above-ground branches and cones. The fossilised pale brownish to pale greyish root wood is very soft and easily squeezable. Thin root bark is occasionally preserved. This is brown in fresh condition, dull or slightly shiny, and features fine lengthswise cracks. In contact with air, the root bark rapidly turns black. Branch or trunk wood is also conspicuously soft and characterised by a dark ruby colour.
Birch peat is distinguished from alder peat by the orange-tinted birch wood with characteristically white or silvery shiny bark. Pine wood differs from soft alder wood in that it is tough and often features scaly bark.

Typical admixtures: wood and bark of birch and willow; when slightly decomposed, rhizomes and rootlets of sedges and common reed.

Occurrence as pure peat / mixed peat: frequently as pure peat, sedge - alder peat and birch - alder peat; occasionally as common reed - alder peat.

Typical degrees of humification: mostly well preserved wood remains embedded in a highly decomposed matrix, due to seasonal water-level fluctuation or incomplete water saturation of topsoil during peat accumulation; focus: H7–H9.

Site conditions and ecohydrological indications

Formation conditions

Alder peat accumulates under the influence of eutrophic or (less frequently) mesotrophic acidic, subneutral or calcareous mineral soil water. The formation condition is a stagnant or periodically fluctuating peatland water level that enables extensive establishment of trees.

Occurrence and position in the landscape

This common peat type occurs (mainly) in the lowlands of morainic landscapes, along lowland rivers, in depressions on ground and end moraines, and (rarely) on slopes in low mountain ranges.

Peat forming plant communities

Alder peat is formed by carr vegetation whose tree layer is dominated by black alder (*Alnus glutinosa*). Different birch (*Betula*) and willow (*Salix*) species may be admixed. The herb layer is mostly formed by tall sedges (*Carex* spp.), marsh fern (*Thelypteris palustris*), aquatic plants (in transient open water bodies) or (occasionally) peat mosses (*Sphagnum* spp.).

Occurrence in hydrogenetic mire types

Mainly: water rise mire, spring mire, flood mire; frequently: margins of terrestrialisation mire; rarely: margins of percolation mire, sloping mire; very rarely: kettle hole mire.

Occurrence in ecological mire types

Mainly: eutrophic mires; rarely: mesotrophic acidic, subneutral and calcareous mires.

• Trophic conditions of alder peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
30–17	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of alder peat:

Spectrum of measured pH values	Associated base saturation group and pH range
3.9–6.8	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

A eutrophic water rise mire that is potentially forming alder peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
wood peats	carr peats	Alnus carr peat (Hnle)

According to TGL 24 300/04	
peat type group	peat type
wood peat (h-h)	Alnus peat (h-he)

1.11 Alder peat
(Alnus peat)

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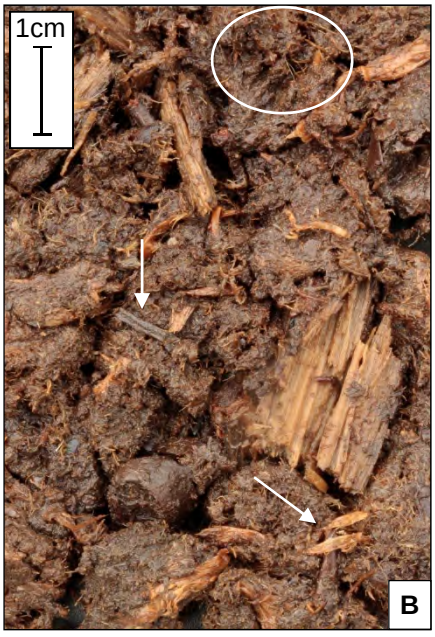
Typical appearance of peat in corer

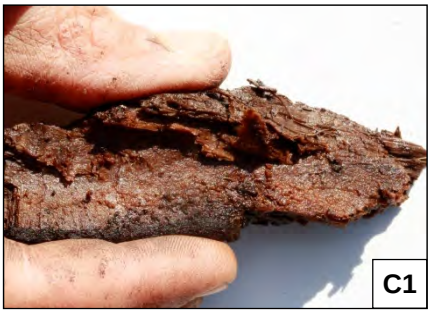
Alder peat with a very high fraction of alder wood in an unstructured dark brown matrix.

Close-up of exposed peat

Alder peat with characteristic coarsely brittle structure containing soft, pale brownish remains of black alder roots.

Varieties and peculiarities of peat





A. *Slightly decomposed (H4) alder peat: a large fraction of alder wood embedded in a light brown matrix of well-preserved sedge rhizomes and rootlets. Seldom found.*

B. *Sedge - alder peat (H6): contains a small fraction (<15 %) of alder wood along with flattened, grey-yellow to dark brown fragments of sedge rhizomes (arrows) and numerous fine, pale grey to yellow-grey rootlets (e.g. circle). A frequently found mixed peat.*

C1 & C2. *Squeeze test (before and after): alder wood found in peat is very soft and easily squeezable, in contrast to rather tough birch wood and very tough pine wood.*

1.11 Alder peat
(Alnus peat)

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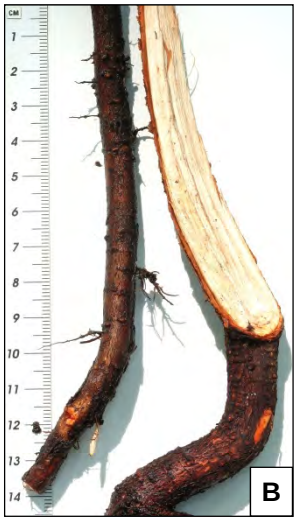
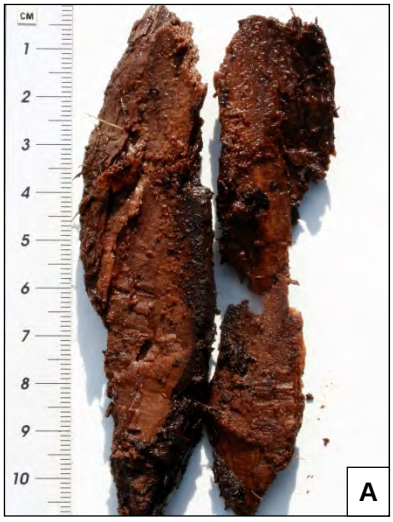
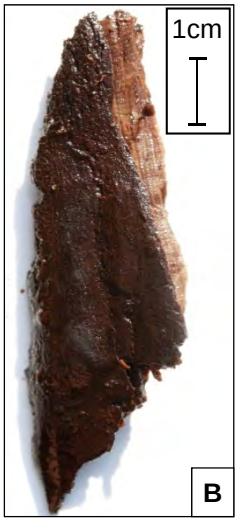
Main peat forming living plants



A. *A population of black alder (*Alnus glutinosa*).*
B. *Alder roots and bark with fine lengthwise cracks.*
C. *Cones of black alder.*

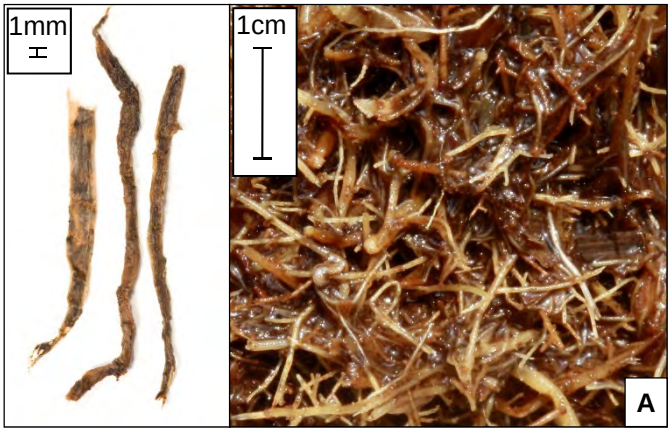
Main peat forming macrofossils

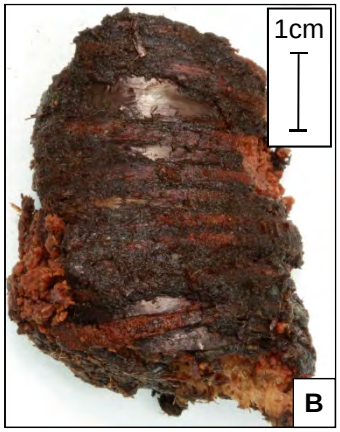




A. *Soft, pale brownish root wood.*
B. *Pit fresh root wood with slightly shiny brown bark and fine lengthwise cracks.*
C. *Characteristic dark ruby branch wood.*

Typical admixtures in peat





A. *Characteristic remains of sedges: flattened, <1–4 mm wide, grey-yellow to dark brown fragments of rhizomes (left); fine (<1 mm to a few mm thick), hollow, pale grey to yellow-grey rootlets (right).*
B. *Fragment of birch root with characteristic orange-tinted wood and remains of shiny, silvery grey-brown bark.*
C. *Flattened, 1–3 cm wide, shiny yellowish to olive-coloured fragments of common reed rhizomes.*

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1.12 Birch peat

(Betula peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.12 Birch peat
(Betula peat)

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Characteristics for field identification

A substantial occurrence of birch remains (at least 15%), that are mostly embedded in a highly decomposed orange-red to dark brown matrix, is charachteristic for this peat type. The matrix has a greasy shine, sometimes, and consists of the remains of peat mosses, sedges or amorphous substance.
The remains of birch are mainly subsurface plant parts (roots, root stocks), along with above ground remains (branches and bark), sometimes. The root remains consist of rather firm, orange tinted or reddish wood. The silvery, grey-brown, smooth, shiny root bark is preserved frequently and features a conspicuous, lateral, lip-like cross-structure (lenticels). Birch branches, mostly 1 - 2 cm thick, are found occasionally in the peat. They also feature the conspicuous, typically white-grey bark with fine, blackish cross-structures. Often, only the bark of roots and branches, which is very resistant to decomposition, is preserved. Wood and bark of the different birch species can not be differentiated in the field.
Birch peat can be distinguished from pine peat by the very tough pine wood with frequently scaly bark. In contrast to birch, the wood remains of alder are very soft, and the root wood of alder is pale brownish, the branch wood of alder is dark ruby coloured. A certain indication for the designation of birch peat is the presence of the characteristic silvery or white bark.

Typical admixtures: highly decomposed peat mosses, rhizomes and rootlets of sedges, alder wood, pine wood.

Occurence as pure peat / mixed peat: sometimes as pure peat; mostly as peat moss - birch peat, sedge - birch peat, alder - birch peat or pine - birch peat.

Typical degrees of humification: mostly well preserved wood remains embedded in a highly decomposed matrix, due to seasonal water-level fluctuation or incomplete water saturation of topsoil during peat accumulation; focus: H7.

Site conditions and ecohydrological indications

Formation conditions

Birch peat accumulates under the influence of mesotrophic acidic or subneutral mineral soil water. The formation condition is a stagnant or periodically fluctuating peatland water level which allows extensive establishment of trees.

Occurrence and position in the landscape

This less-frequent peat type is not closely associated with a specific landscape. It occurs in depressions on glacial outwash plains, ground and end moraines; at seashores; on slopes in low mountain ranges; and in the foothills of the Alps.

Peat forming plant communities

Birch peat is formed by carr vegetation whose tree layer is dominated by birch - mainly downy birch (*Betula pubescens*). Black alder (*Alnus glutinosa*), different pine (*Pinus*) and willow (*Salix*) species may be admixed. The herb layer comprises mostly sedges (*Carex* spp.) or peat mosses (*Sphagnum* spp.).

Occurrence in hydrogenetic mire types

Mainly: kettle hole mire, sloping mire, water rise mire; rarely: terrestrialisation mire, margins of bog and percolation mire.

Occurrence in ecological mire types

Mesotrophic acidic and subneutral mires.

• Trophic conditions of birch peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
24–21	mesotrophic (33–20)

• Base saturation conditions of birch peat:

Spectrum of measured pH values	Associated base saturation group and pH range
3.7–5.5	acidic (<4.8)
	subneutral (4.8–6.4)

Mesotrophic acidic kettle hole mire that is potentially forming birch peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
wood peats	carr peats	Betula carr peat (Hulb)

According to TGL 24 300/04	
peat type group	peat type
wood peat (h-h)	Betula peat (h-hi)

Portraits of peatland deposits Germany

1.12 Birch peat
(Betula peat)

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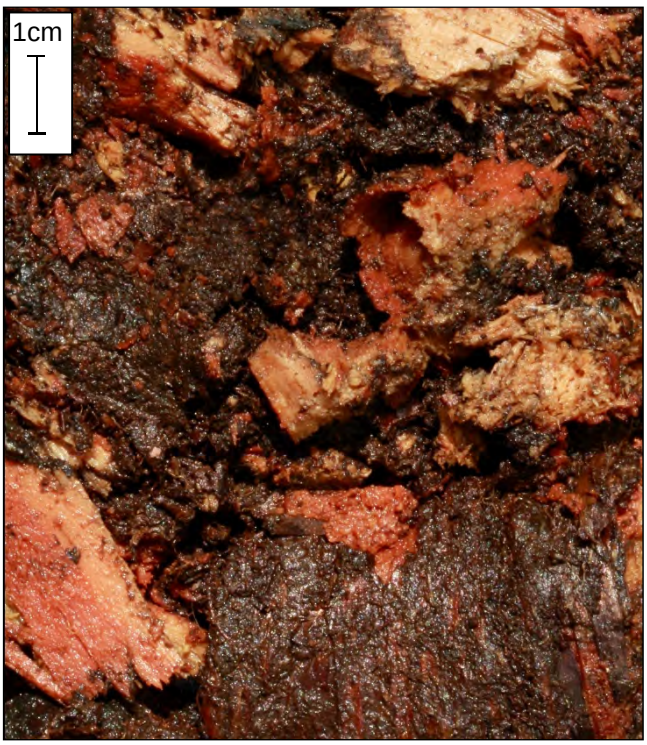
Typical appearance of peat in corer

Birch peat: a large fraction of birch wood remains embedded in a greasy brown matrix consisting of highly decomposed peat mosses.

Close-up of exposed peat



Numerous orange-reddish-tinted fragments of birch wood and, at the lower edge of the picture, a large root fragment with characteristically shiny, smooth bark.

Varieties and peculiarities of peat

A. *Sedge - pine - birch peat (H4): shiny, silvery grey-brown root bark and white-grey branch or trunk bark of birch (white arrows), along with very tough fragments of pine wood and bark (black arrows), embedded in a light brown matrix consisting of moderately decomposed rhizomes and rootlets of sedges (e.g. circle). A mixed peat that is sometimes found.*

B. *Slightly decomposed birch peat: fragments of birch wood embedded in a bright matrix of well-preserved peat mosses and sedge remains. Seldom found.*

C. *Squeeze test: in contrast to alder wood remains, which are soft and easily squeezable, fossilised birch wood is rather firm and hardly squeezable, but softer than pine wood (not squeezable).*

Portraits of peatland deposits Germany

1.12 Birch peat
(Betula peat)

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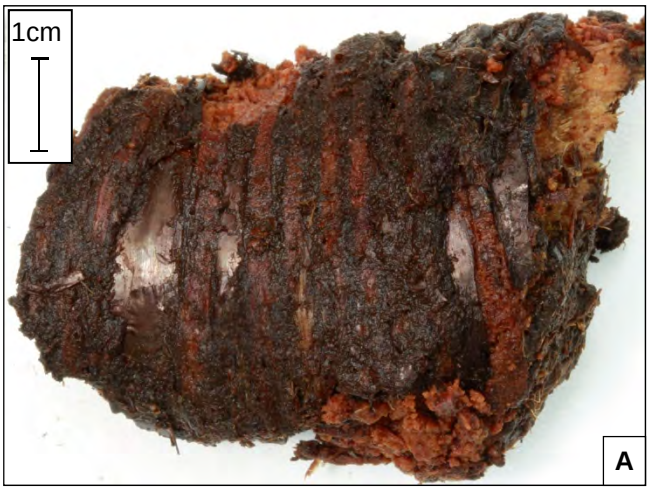
Main peat forming living plants

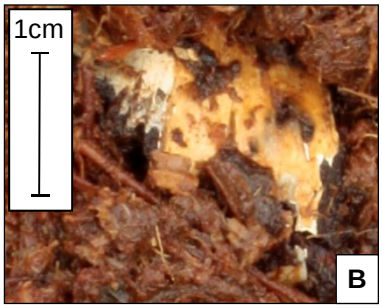
A. *A population of downy birch (*Betula pubescens*).*

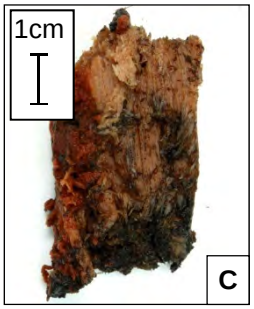
B. *A downy birch trunk; note the typically white-grey bark with fine blackish cross-structures.*

C. *Root bark of downy birch: smooth, shiny, silvery grey-brown with conspicuous lip-like lateral cross-structures.*

Main peat forming macrofossils





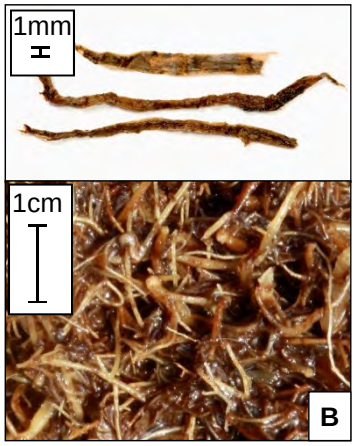


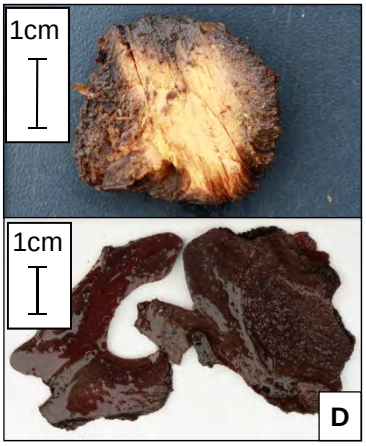
A. *Root fragment with remains of shiny, silvery grey-brown bark.*

B. *Conspicuous white-grey branch or trunk bark with fine blackish cross-structures.*

C. *A fragment of wood without bark, showing the characteristic orange-reddish colour on its left side.*

Typical admixtures in peat





A. *Remains of peat mosses (in this case* Sphagnum *section* Cuspidata*): relatively thick, bright brown, translucent main stems (left); and side branches with numerous bright brown, acute, dull (not shiny) leaflets (right).*

B. *Characteristic remains of sedges: flattened, <1–4 mm wide, grey-yellow to dark brown fragments of rhizomes (top); and fine (<1 mm to a few mm thick), hollow, pale grey to yellow-grey rootlets (bottom).*

C. *Very easily squeezable pale brown root wood of black alder.*

D. *Top photo: very firm, fibrous, dark brown to red-brown (beige to light brown when sliced) pine root wood; bottom photo: dark brown pine bark.*

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1.13 Pine peat

(Pinus peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

1.13 Pine peat
(Pinus peat)

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Characteristics for field identification

Pine peat is characterised by a substantial fraction (at least 15 %) of pine remains, mostly embedded in a highly decomposed matrix. The matrix is usually amorphous, dark brown to red-brown, and darkens in contact with air. Rather decomposed peat mosses, sedge rhizomes and rootlets or dwarf shrub remains are sometimes visible in the matrix.
The pine remains are mostly subsurface plant parts (roots, root stocks) but sometimes include above-ground parts (branches, bark, needles, cones). The root remains consist of conspicuously firm, tough, fibrous wood which varies in colour from beige-light brown (when sliced) to reddish brown and dark brown. The preserved roots are often thick and have sometimes retained the characteristically scaly bark. Roots, which are only a few millimetres thick and do not have bark, are rarely found. Scots pine and mountain pine can be distinguished from one another only if cones or needle remains are available.
Pine peat can be distinguished from birch peat because birch wood is orange-tinted with characteristically white or silvery shiny bark; and from alder peat because alder wood is very soft and easily squeezable.

Typical admixtures: highly decomposed peat mosses, rhizomes and rootlets of sedges, birch wood, remains of different dwarf shrubs.

Occurrence as pure peat / mixed peat: sometimes as pure peat; mostly as peat moss - pine peat, sedge - pine peat, birch - pine peat or dwarf shrub - pine peat.

Typical degrees of humification: mostly well preserved wood remains embedded in a moderately to highly decomposed matrix, due to seasonal water-level fluctuations or incomplete water saturation of topsoil during peat accumulation; focus: H7.

Site conditions and ecohydrological indications

Formation conditions

Pine peat accumulates under the influence of oligotrophic or mesotrophic acidic mineral soil water or rainwater. The formation condition is a stagnant or periodically fluctuating peatland water level which allows extensive establishment of trees.

Occurrence and position in the landscape

This rare peat type is found mainly in areas with high precipitation (Northwest Germany), at seashores and in the northern foothills of the Alps. It sometimes accumulates in catchments with base-poor mineral deposits (glacial outwash plains and end moraine landscapes, crystalline rocks in low mountain ranges).

Peat forming plant communities

Pine peat is formed by carr vegetation whose tree layer is dominated by Scots pine (*Pinus sylvestris*) or mountain pine (*Pinus mugo*). Few modern plant communities form pine peat; the main formation phase was presumably terminated at the end of the early warm period (Boreal).

Occurrence in hydrogenetic mire types

Mainly: margins of bog, kettle hole mire; rarely: water rise mire, sloping mire.

Occurrence in ecological mire types

Oligotrophic and mesotrophic acidic mires.

• Trophic conditions of pine peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
34–28	oligotrophic (>33)
	mesotrophic (33–20)

• Base saturation conditions of pine peat:

Spectrum of measured pH values	Associated base saturation group and pH range
3.2–4.1	acidic (<4.8)

Mesotrophic acidic margin of a bog that is potentially forming pine peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
wood peats	carr peats	Pinus carr peat (Hulk)

According to TGL 24 300/04	
peat type group	peat type
wood peat (h-h)	Pinus peat (h-hk)

1.13 Pine peat
(Pinus peat)

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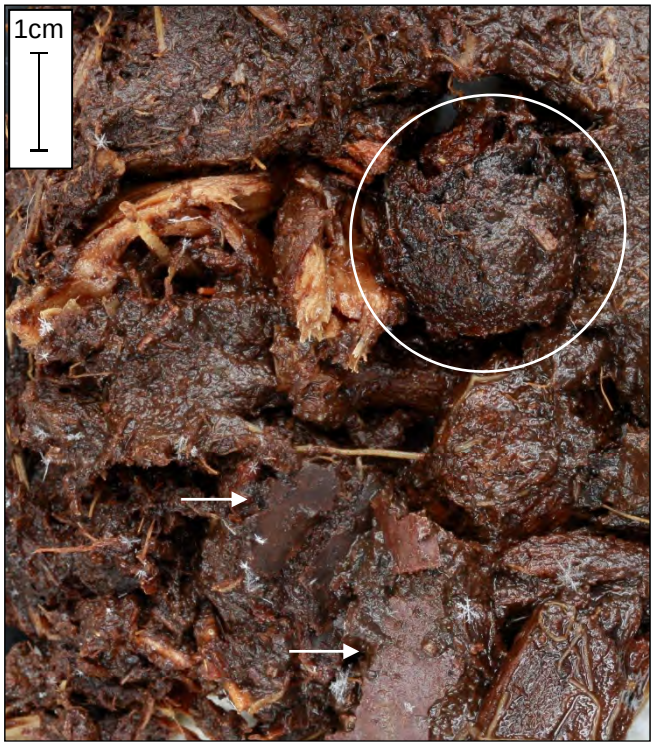
Typical appearance of peat in corer

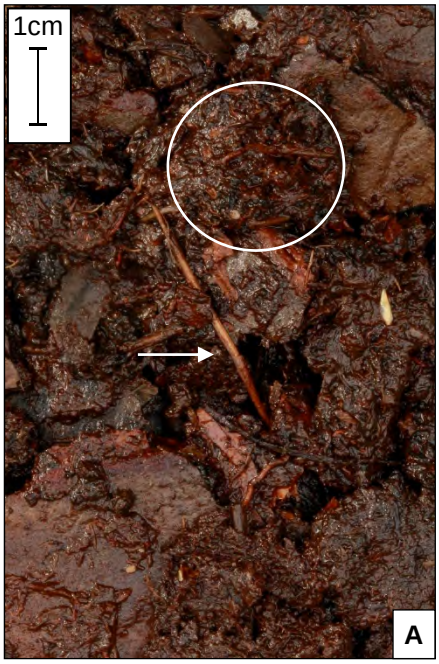
Highly decomposed (H7) pine peat: light brown pine wood (sliced by the corer) embedded in a dark brown matrix.

Close-up of exposed peat



Numerous light and dark brown fragments of pine wood, a cone (circle) and remains of bark (arrows) in a rather amorphous brown matrix.

Varieties and peculiarities of peat



A. *Pine peat with pine needles (arrow) and numerous reddish-brown fragments of pine bark in a brown matrix consisting of moderately decomposed sedge rhizomes and rootlets (e.g. circle).*

B. *Sedge - birch - pine peat (H4): pine wood and bark (black arrows) along with shiny, silvery grey-brown root bark and characteristically white-grey branch bark of birch (white arrows), embedded in a light brown matrix consisting of moderately decomposed sedge rhizomes and rootlets (e.g. circle). An occasionally occurring mixed peat.*

C. *Squeeze test: pine wood is very firm and tough; so is hardly squeezable, even with considerable effort.*

1.13 Pine peat
(Pinus peat)

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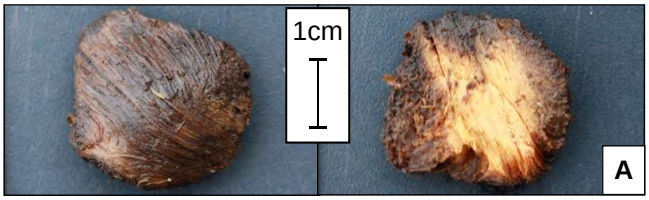
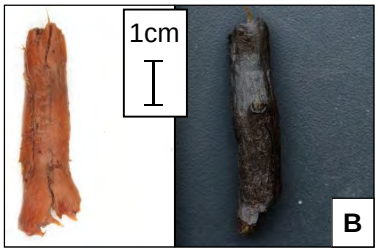
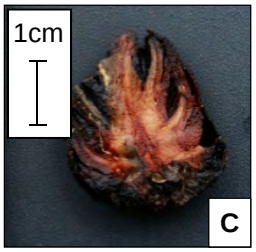
Main peat forming living plants

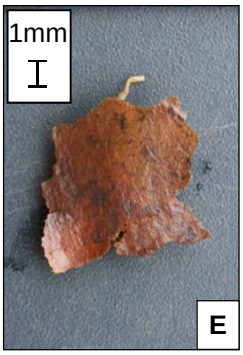
A. *Scots pine (*Pinus sylvestris*) growing on peatland.*
B. *Pine root with scaly bark.*
C. *Branch with scaly bark; note the needle attachments on side branches.*
D. *Needles of Scots pine (two per short shoot).*
E. *Cones of Scots pine.*

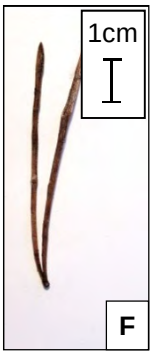
Main peat forming macrofossils





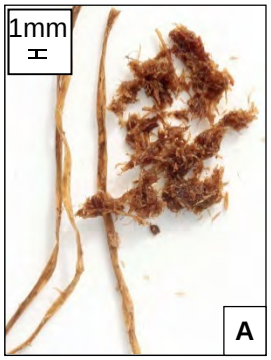


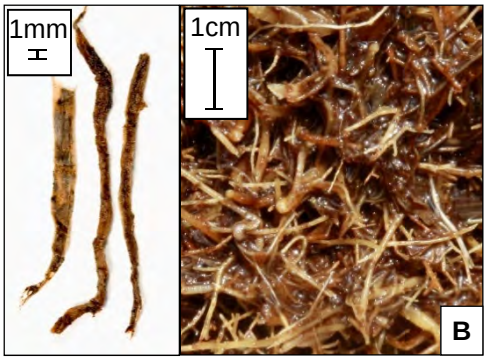


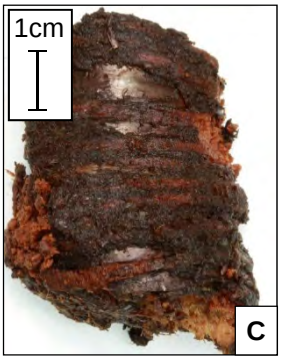


A. *Characteristically fibrous pine root wood: dark brown (left), beige to light brown when sliced (right).*
B. *Fragments of pine root, varying in colour from red-brown to dark brown.*
C. *Sliced pine cone.*
D. *Pine bark.*
E. *Very thin bark scale.*
F. *Flattened needles of Scots pine.*

Typical admixtures in peat







A. *Remains of peat mosses (in this case* Sphagnum *section* Cuspidata*): relatively thick, light brown, translucent main stems (left) and side branches with numerous light brown, acute, dull (not shiny) leaflets (right).*
B. *Characteristic remains of sedges: flattened, <1–4 mm wide, grey-yellow to dark brown fragments of rhizomes (left) and fine (<1 mm to a few mm thick), hollow, pale grey to yellow-grey rootlets (right).*
C. *Fragment of birch root with orange-tinted wood and characteristically shiny, silvery grey-brown bark.*
D. *2–5 mm thick fragment of heather stem with dull, brown to red-brown bark showing fine lengthwise structure and four longitudinal rows of former leaf attachments.*

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1.14 Dwarf shrub peat

(Ericaceae peat)

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 4: living plants (B): Sven Dahlke; **References:** see part B: Annotations

1.14 Dwarf shrub peat
(Ericaceae peat)

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Characteristics for field identification

Dwarf shrub peat is characterised by a substantial fraction (at least 15 %) of dwarf shrub remains embedded in a moderately to highly decomposed matrix. The matrix either consists of peat moss remains or is amorphous and dark brown.
The dwarf shrub remains are usually subsurface shoots (stems) and occasionally leaflets of species belonging mostly to the heather family (*Ericaceae*). Root remains cannot reliably be assigned to a specific plant species in the field. The most frequent remains are stem fragments of **heather** (*Calluna vulgaris*), 2–5 mm thick with dull, brown to red-brown bark showing fine lengthwise structure. Former leaf attachments leave decussate hole-like depressions about 1 mm across, which are distinctively arranged in four longitudinal rows. Sometimes, remains of **bog heather** (*Erica tetralix*) stems are also found in Northwest Germany. These are 1–2 mm thick and their leaf scars are loosely arranged in whorls of four. The occasionally preserved bog heather leaflets are rather thick, have parallel leaf margins, and are curled into narrow 'needles'. Stem remains of **bog blueberry** (*Vaccinium uliginosum*) are quite frequently found, especially in South Germany. These are usually 4–10 mm thick and rather smooth with alternate leaf attachments. Shoots of **bog rosemary** (*Andromeda polifolia*) mostly occur as an admixture; they are 1–2 mm thick with acute-angled branches and feature a smooth, slightly shiny bark with inconspicuous alternate leaf scars. Elongate (1–2 cm long) leaflets, cuspidate on both sides and with distinctly reflexed margins, are sometimes also preserved. Stem fragments of **small cranberry** (*Oxycoccus palustris*) may also be found. These are long, shiny, bristle-thin (<1 mm thick), reddish-brown in colour, and have rather thick, leathery, ovate leaflets with reverted margins.
The comparatively thin stems of dwarf shrubs make this peat type easily distinguishable from other wood peats.

Typical admixtures: leaf sheath bundles of tussock cotton grass, quite highly decomposed peat mosses, wood and bark of pine.

Occurence as pure peat / mixed peat: rarely as pure peat; sometimes as cotton grass - dwarf shrub peat, peat moss - dwarf shrub peat or pine - dwarf shrub peat.

Typical degrees of humification: mostly well-preserved remains of dwarf shrubs embedded in a moderately to highly decomposed matrix, due to incomplete water saturation of topsoil during peat accumulation; focus: H6–H8.

Site conditions and ecohydrological indications

Formation conditions

Dwarf shrub peat usually accumulates as a result of climate-induced dehydration of the peatland topsoil. During drier periods and under oligotrophic to mesotrophic acidic conditions, different dwarf shrubs may expand over large areas. If the water supply subsequently increases, the dwarf shrubs are overgrown by peat mosses and become incorporated into the peat deposit.

Occurrence and position in the landscape

This rare peat type is mainly found in bog-rich parts of Northwest Germany and in the northern foothills of the Alps. It sometimes accumulates in catchments with base-poor mineral deposits (e.g. on glacial outwash plains, end moraine landscapes, crystalline rocks in low mountain ranges).

Peat forming plant communities

Dwarf shrub peat is formed by various dwarf shrub communities that are dominated by heather (*Calluna vulgaris*), bog heather (*Erica tetralix*), bog blueberry (*Vaccinium uliginosum*), bog rosemary (*Andromeda polifolia*), crowberry (*Empetrum nigrum*) or small cranberry (*Oxycoccus palustris*).

Occurrence in hydrogenetic mire types

Mainly: bog; rarely: sloping mire, kettle hole mire.

Occurrence in ecological mire types

Mainly: oligotrophic acidic mires; rarely: mesotrophic acidic mires; very rarely: mesotrophic subneutral mires.

• Trophic conditions of dwarf shrub peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
40–29	oligotrophic (>33)
	mesotrophic (33–20)

• Base saturation conditions of dwarf shrub peat:

Spectrum of measured pH values	Associated base saturation group and pH range
3.0–5.6	acidic (<4.8)
	subneutral (4.8–6.4)

Mesotrophic acidic sloping mire that is potentially forming dwarf shrub peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
dwarf shrub peats	bog dwarf shrub peats	Calluna peat (Hhi)

According to TGL 24 300/04	
peat type group	peat type
wood peat (h-h)	dwarf shrub peat (h-hr)

1.14 Dwarf shrub peat
(Ericaceae peat)

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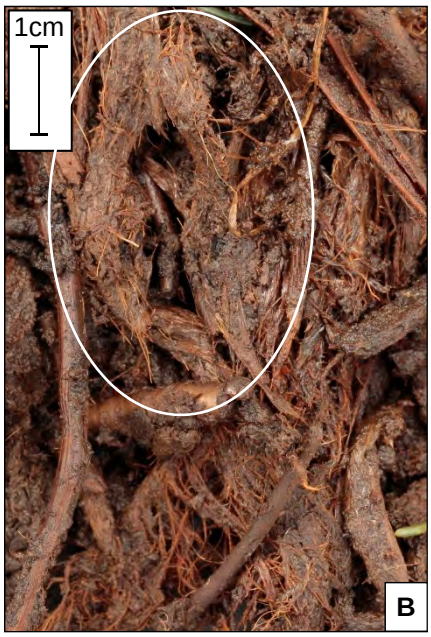
Typical appearance of peat in corer

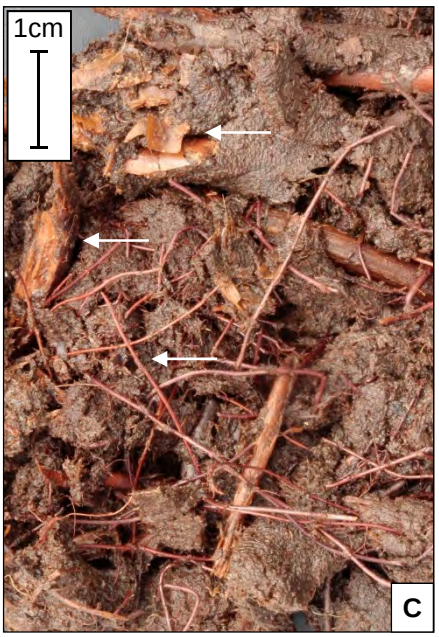
Highly decomposed (H7) dwarf shrub peat: submerged stem remains of various dwarf shrub species in a dark brown matrix.

Close-up of exposed peat

Numerous brown to red-brown stem fragments of different dwarf shrubs, mostly 1–5 mm thick, embedded in a matrix of highly decomposed peat mosses.

Varieties and peculiarities of peat





A. *Dwarf shrub peat (H7) composed of coarse (up to 10 mm thick), rather smooth bog blueberry stem fragments.*

B. *Cotton grass - dwarf shrub peat (H5): numerous dwarf shrub remains mixed with bundles of brown fibrous tussock cotton grass leaf sheaths several centimetres long (e.g. circle). An occasionally occurring mixed peat.*

C. *Pine - dwarf shrub peat (H8): numerous dwarf shrub remains, especially the long, shiny, bristle-thin (<1 mm thick), reddish-brown stem fragments of small cranberry (e.g. lower arrow), along with a few pine remains, namely: very firm, fibrous, red-brown pine root wood (middle arrow) and very thin bark scales (upper arrow). An occasionally occurring mixed peat.*

1.14 Dwarf shrub peat
(Ericaceae peat)

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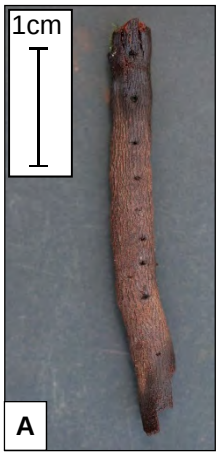
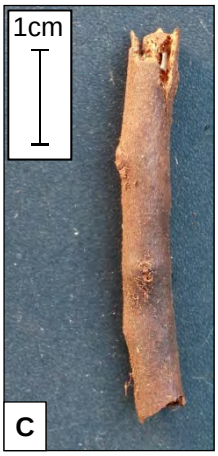
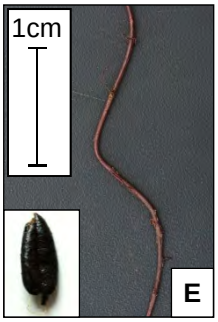
Main peat forming living plants

A. *Heather (*Calluna vulgaris*).*
B. *Bog heather (*Erica tetralix*).*
C. *Bog blueberry (*Vaccinium uliginosum*).*
D. *Bog rosemary (*Andromeda polifolia*).*
E. *Small cranberry (*Oxycoccus palustris*).*
Peat forming: mainly stem fragments, occasionally leaflets.

Main peat forming macrofossils

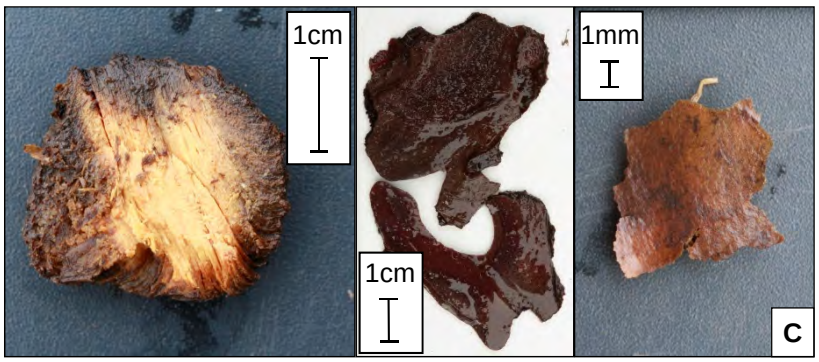






A. *Stem fragment of heather, 2–5 mm thick with dull, brown to red-brown bark showing fine lengthwise structure and four longitudinal rows of former leaf attachments.*
B. *Stem fragment of bog heather, 1–2 mm thick with leaf scars loosely arranged in whorls of four.*
C. *Bog blueberry stem remnant, 4–10 mm thick and rather smooth with alternate leaf attachments.*
D. *Bog rosemary stem remnant, 1–2 mm thick with smooth bark and acute-angled branching; and leaflets that are cuspidate on both sides and have reflexed margins (inset).*
E. *Shiny red-brown stem (<1 mm thick) and leathery, ovate leaflet of small cranberry.*

Typical admixtures in peat



A. *Slightly shiny, tough, dense, medium to dark brown leaf sheath bundles of tussock cotton grass.*
B. *Remains of peat mosses (in this case* Sphagnum *section* Cuspidata*): proportionally thick, bright to translucent main stems (left) and side branches with numerous yellowish, acute, dull (not shiny) leaflets (right).*
C. *Remains of pine: very firm, fibrous, dark brown to red-brown (beige to light brown when sliced) root wood (left); dark brown bark (centre); very thin bark scale (right).*

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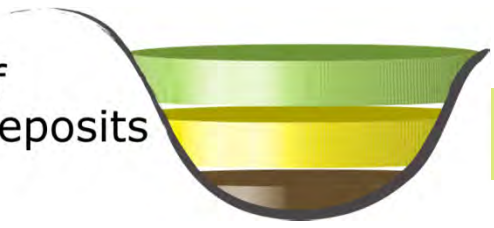
1.15 Highly decomposed peat

Portraits of peatland deposits
Germany



Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 3: soil column: Jutta Zeitz & Michael Zauft; **References:** see part B: Annotations

1.15 Highly decomposed peat

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Characteristics for field identification

Highly decomposed peat is a mainly homogeneous, unstructured (amorphous), compact, dark brown to black mass. It may contain a few plant remains, but most of these cannot be assigned to specific plant species due to the high degree of decomposition.
The consistency of this peat is muddy to mushy when wet and comparable to a squeezed-dry sponge when dry. Highly decomposed peat can occur both at the surface and in deeper layers of peatlands. Drainage-induced highly decomposed peat beneath degraded topsoil (earthified or murshified peat) often has a characteristic aggregate or pillar structure.
Highly decomposed peat might be confused with earthified or murshified peat. However, the latter two peat types are closely associated with drainage and agricultural or sylvicultural land use, and are found almost exclusively at the peatland surface. In contrast to highly decomposed peat, they have a conspicuous crumb or fine granular structure and their consistency is smeary to smeary-granular when wet and crumbly to powdery-dusty when dry.

Typical admixtures: hardly any admixtures; at most a few decay-resistant, rather highly decomposed dead wood fragments and fibres; roots of living plants.

Occurrence as pure peat / mixed peat: only as pure peat due to high degree of decomposition.

Typical degrees of humification: principally highly decomposed (H8–H10).

Site conditions and ecohydrological indications

Formation conditions

Highly decomposed peat accumulates in natural peatlands with seasonal water-level fluctuations and/or irregular or oxygen-rich supplies of mineral soil water in various trophic and base saturation conditions. The accumulated plant remains are increasingly decomposed (humified) during short-term phases of oxygen supply, which leads to slow mire growth.

Highly decomposed peat can also be the result of a long-term climate-induced dry period or human drainage. In these cases, the peat is not an outcome of natural, geogenic peat accumulation, but rather the result of oxygen-induced humification of another peat type.

Occurrence and position in the landscape

This peat type is not closely associated with a specific landscape but, when naturally formed, it occurs more frequently in morainic landscapes than in the precipitation-rich parts (Northwest Germany), low mountain ranges and the foothills of the Alps; its occurrence being linked to the irregular or oxygen-rich water supply which is characteristic for the margins of many peatlands. If it results from drainage, this peat type can occur in any landscape.

Peat forming plant communities

Highly decomposed peat can be formed by numerous plant communities dominated by species that are adapted to wet conditions like black alder (*Alnus glutinosa*) and various sedges (*Carex*), or by species indicating fluctuating water levels like common reed (*Phragmites australis*) and water horsetail (*Equisetum fluviatile*).

Occurrence in hydrogenetic mire types

Possible in all hydrogenetic mire types; mainly: water rise mire, spring mire, flood mire.

Occurrence in ecological mire types

Mainly: eutrophic, mesotrophic subneutral and calcareous mires; more rarely: mesotrophic and oligotrophic acidic mires.

• Trophic conditions of highly decomposed peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
48–13	oligotrophic (>33)
	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of highly decomposed peat:

Spectrum of measured pH values	Associated base saturation group and pH range
2.8–7.3	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

A eutrophic spring mire that is potentially forming highly decomposed peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
amorphous peats (Ha)	-	-

According to TGL 24 300/04	
peat type group	peat type
amorphous peat (h-a)	highly decomposed peat (h-az)

1.15 Highly decomposed peat

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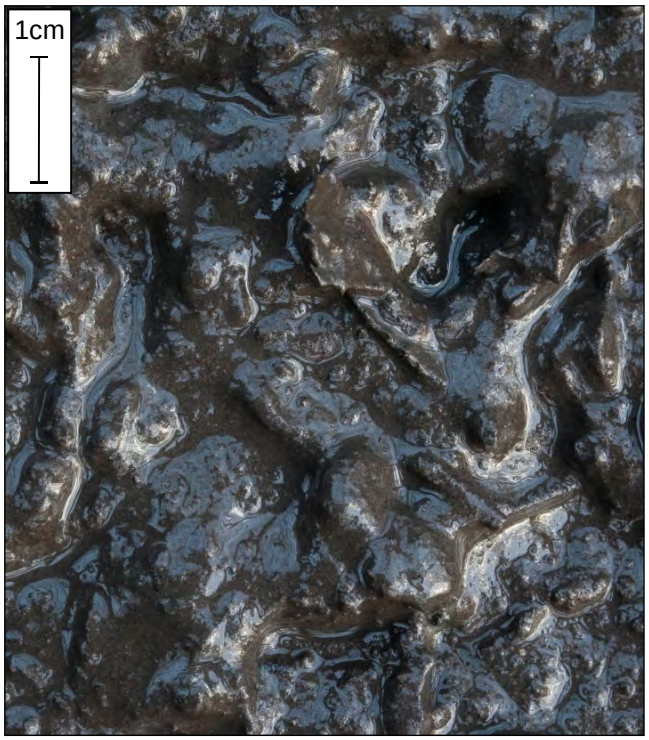
Typical appearance of peat in corer

A dark brown, relatively compact and mainly unstructured mass with one visible wood fragment (arrow).

Close-up of exposed peat

Dark brown mass with a few plant remains (arrows) that are not assignable to a specific plant species.

Close-up of exposed peat (wet)



Very wet highly decomposed peat: muddy appearance and mushy texture, hardly coherent in the corer.

Typical appearance (soil column)

Compact dark brown highly decomposed peat (circle) beneath black murshified peat.

1.15 Highly decomposed peat

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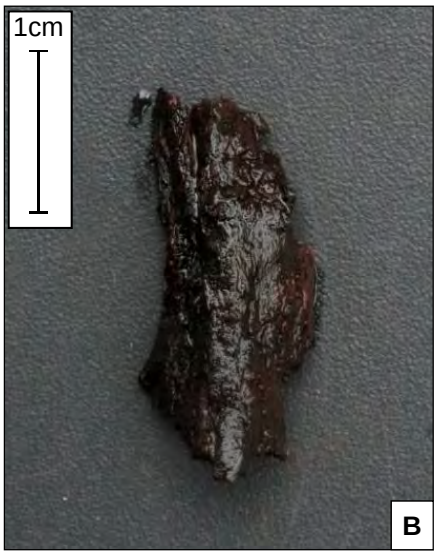
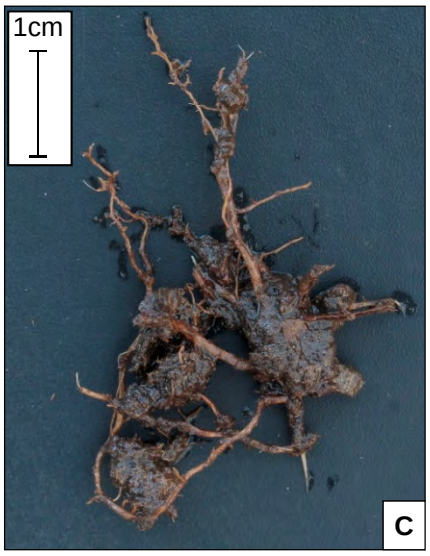
Varieties and peculiarities of peat

Admixed wood fragments (arrow) embedded in highly decomposed peat; not assigned to wood peat because the wood fraction (<15 %) is too small. Frequently found.

Highly decomposed peat above gyttja, which is brightly coloured in this case. Occurs occasionally.

Typical admixtures in peat





A. *Small wood fragment; not assignable to a specific tree species in the field.*
B. *Fragment of tree root bark.*
C. *Roots of living plants; characteristic for highly decomposed peat layers found at the peatland surface.*

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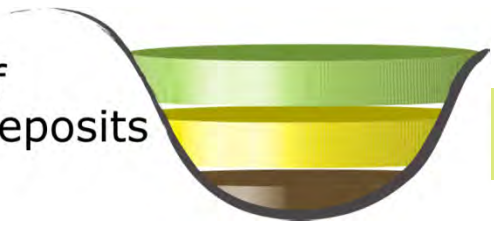
1.16 Earthified peat

Portraits of peatland deposits
Germany



Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 3: soil column: Jutta Zeitz & Michael Zauft; **References:** see part B: Annotations

1.16 Earthified peat

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Characteristics for field identification

Earthified peat is a mass similar to garden mould, that is penetrated by roots of living plants. When the mass is slightly earthified, it is dark brown in colour and has a sponge-like 'crumb' grain structure. A minor fraction of fossilised plant remains, not assignable to specific plant species, is occasionally found. More strongly earthified peat is characterised by a black-brown colour and a distinct crumb structure without visible fossilised plant remains. The grain structure of earthified peat consists of differently sized (mostly >1 mm) round 'crumbs' of bonded soil particles with rough, dull surfaces, and is especially distinctive when dry. The consistency of the peat is smeary when wet, and crumbly but never powdery-dusty when dry.
This peat type usually occurs as peatland topsoil. The thickness of the earthified layer ranges from ~5 cm to a maximum of 30 cm, depending on the depth of drainage. Peats below the earthified layer are mostly highly decomposed (but not yet earthified) and are frequently brighter in colour than the earthified peat.
In contrast to highly decomposed peat, earthified peat has a characteristic crumb structure and occurs almost exclusively in drained peatlands. Murshified peat, in contrast, has a fine granular structure (smeary-granular when wet and crumbly to powdery-dusty when dry) and has a black colour.

Typical admixtures: roots of living plants; sometimes a minor fraction of fossilised plant remains not assignable to specific plant species.

Occurrence as pure peat / mixed peat: only as pure peat, due to earthification of primary deposits.

Typical degrees of humification: the 'degree of humification' system is not applicable to this peat type.

Site conditions and ecohydrological indications

Formation conditions
Earthified peat is usually formed as a result of moderately direct or indirect drainage and extensive human land use. Rarely, it can also develop in formerly water-saturated peatlands after rather long climate-induced dry periods. The formation condition is a summer groundwater level ~10 cm to a maximum of 80 cm below the peatland surface, which results in aeration leading to decomposition of the formerly water-saturated topsoil peat. Due to this decomposition and the formation of a crumb structure due to shrinking and swelling of peat as well as the activity of soil animals (e.g. earthworms), the peat becomes earthified. This peat type is not a direct result of peat accumulation but, rather, the outcome of oxygen-induced humification and degradation of another peat type.

Occurrence and position in the landscape
This common peat type is closely associated with anthropogenic drainage and use of peatlands, and not with any specific landscape.

Typical plant communities
Plant communities growing on earthified peat are not peat forming due to the deficit of water in the topsoil. Depending on the type of land use, different herb- and sedge-rich populations of moist meadows or pastures, tall forbs, and populations dominated by black alder (*Alnus glutinosa*) or common ash (*Fraxinus excelsior*) are characteristic.

Occurrence in hydrogenetic mire types
Possible in all hydrogenetic mire types (almost exclusively as a peatland topsoil).

Occurrence in ecological mire types
Possible in all primary ecological mire types; as a result of human activity, mostly in eutrophic mires but sometimes also in mesotrophic acidic, subneutral or calcareous mires.

• Trophic conditions of earthified peat:

Spectrum of measured C/N values	Associated trophic group and C/N range
26–11	mesotrophic (33–20)
	eutrophic (<20–10)

• Base saturation conditions of earthified peat:

Spectrum of measured pH values	Associated base saturation group and pH range
4.6–6.9	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

A moderately drained water rise mire used as a moist meadow, which may potentially have earthified peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
amorphous peats (Ha)	-	-

According to TGL 24 300/04	
peat type group	peat type
amorphous peat (h-a)	earthified peat (h-av)

1.16 Earthified peat

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Typical appearance of peat (soil profile)

Slightly earthfied peat: a dark brown layer ~1 dm thick, with sponge-like crumb structure.

Typical appearance of peat (soil column)

Clearly brighter slightly decomposed peat beneath a 2 dm thick earthified layer.

Typical appearance of peat (shallow pit)

Wet earthified peat; distinguished from murshified peat by the presence of a few visible fossilised plant remains (circle).

Typical appearance of peat (corer)

A compact, smeary mass penetrated by the roots of living plants.

1.16 Earthified peat

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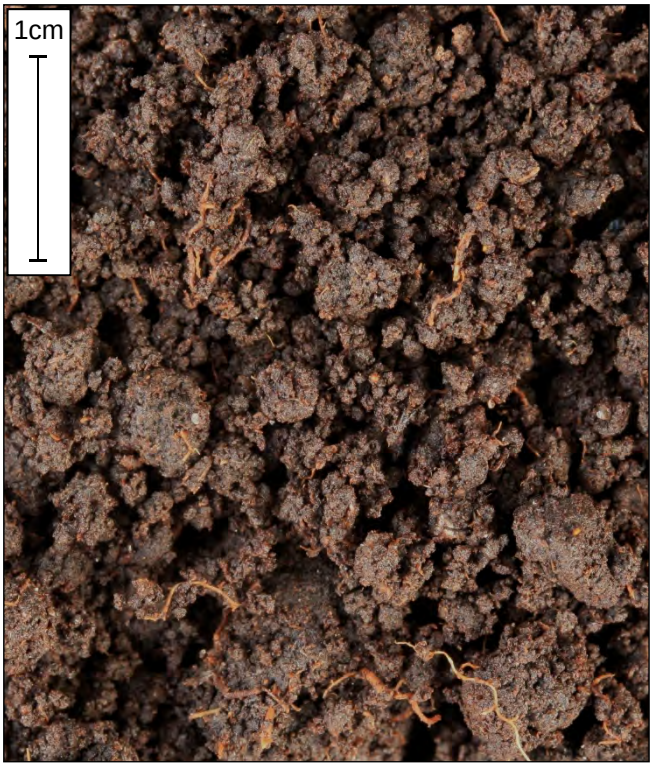
Close-up of exposed peat (wet)

Wet earthified peat: a smeary dark brown mass with numerous roots of living plants.

Close-up of exposed peat (moist)

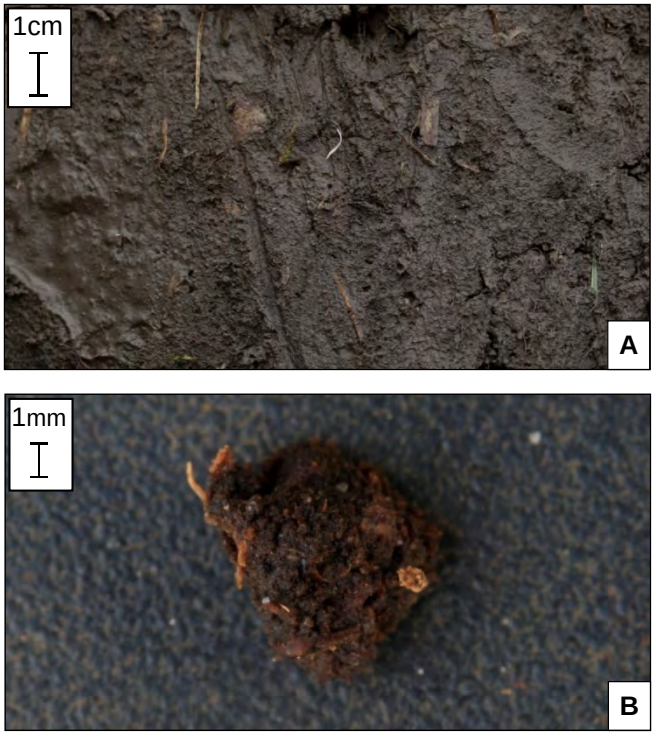


Moist earthified peat: similar to garden mould, with 'crumb' grain structure.

Close-up of exposed peat (dry)

Dry earthified peat: distinctive crumb structure with round 'grains' of different sizes, mostly >1 mm.

Peculiarities of peat



A. *The smeary consistency of wet to moist earthified peat.*

B. *A single crumb of bonded soil particles with rough, dull surface.*

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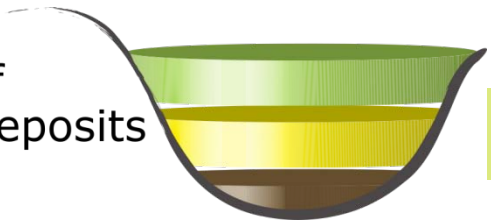
1.17 Murshified peat

Portraits of peatland deposits
Germany



Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 3: soil column: Jutta Zeitz & Michael Zauft; **References:** see part B: Annotations

1.17 Murshified peat

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Characteristics for field identification

Slighty murshified peat is a loose black-brown mass with fine granular structure. More strongly murshified peat is black to deep black in colour. In dry condition, the peat is difficult to moisten with water and characterised by a fine granular structure that is similar to dust and easily blows away. In both variants there are no fossilised plant remains but numerous roots of living plants are present. The soil structure is formed predominantly by <1 mm granules of bonded-together soil particles with rough, dull surfaces. The consistency of this peat type is smeary-granular when moist, and in dry condition it is distinctly granular, powdery-dusty and resembles loose coal slack. Wet murshified peat forms a thick, silty mass.
Murshfied peat is almost exclusively found as topsoil in peatlands. This topsoil layer is 15 cm thick on average (maximum thickness 30 cm) and can continue downwards in wedge shapes. Peats below the murshified layer are usually highly decomposed (but not yet earthified or murshified) and disaggregate as clumps. Often, murshified peatlands are dotted with molehills.
In contrast to highly decomposed peat, murshified peat develops only in intensively drained (and usually intensively used) peatlands and is characterised by the distinctive fine granular structure. Earthified peat is distinguishable from murshified peat on the basis of its dark brown colour, its clear crumb structure and its smeary consistency in wet condition. Earthified peat is never powdery-dusty, even when dry.

Typical admixtures: roots of living plants.

Occurence as pure peat / mixed peat: only as pure peat due to murshification of primary deposits.

Typical degrees of humification: the ‘degrees of humification‘ system is not applicable to this peat type.

Site conditions and ecohydrological indications

Formation conditions

Murshified peat is formed as a result of intensive drainage and (usually) intensive human use of formerly water-saturated peatlands. The formation condition is a summer groundwater level more than 80 cm below the surface. The resulting aeration of the topsoil leads to decomposition of the formerly water-saturated peat. This decomposition, with the involvement of soil animals and shrinking and swelling of peat, leads first to the formation of a crumb structure (earthification). Then, during an ongoing process of drying, the crumb structure falls apart to form powdery murshified peat.
This peat type is not a direct result of peat accumulation but, rather, the oxygen-induced humification and degradation of another peat type.

Occurrence and position in the landscape

This common peat type is closely associated with intensive anthropogenic drainage and use of peatlands, and not with any specific landscape.

Typical plant communities

Plant communities growing on murshified peat are not peat forming. Depending on the type of land use, different grassland populations with sown grasses, agricultural crops (e.g. corn) or, sometimes, forestry are characteristic. Abandoned sites are rapidly populated by tall forbs.

Occurrence in hydrogenetic mire types

Possible in all hydrogenetic mire types except bogs (almost exclusively as peatland topsoil).

Occurrence in ecological mire types

Possible in all primary ecological mire types except oligotrophic acidic mires; as a result of murshification, only in eutrophic or polytrophic mires.

• Trophic conditions of murshified peat :

Spectrum of measured C/N values	Associated trophic group and C/N range
5–14	eutrophic (<20–10)
	polytrophic (<10)

• Base saturation conditions of murshified peat:

Spectrum of measured pH values	Associated base saturation group and pH range
4.6–7.1	acidic (<4.8)
	subneutral (4.8–6.4)
	calcareous (>6.4)

Intensively drained grassland with numerous molehills, which may potentially have murshified peat.

Classifications

According to KA5		
botanical peat type unit	botanical peat type subunit	botanical peat type
amorphous peats (Ha)	-	-

According to TGL 24 300/04	
peat type group	peat type
amorphous peat (h-a)	murshified peat (h-am)

1.17 Murshified peat

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Typical appearance of peat (soil profile)

Murshified peat: a black layer, ~1 dm thick, with loose fine granular structure, penetrated by roots of living plants.

Typical appearance of peat (soil column)

Surface layer of murshified peat ~1.2 dm thick and clumpy disaggregation of deeper layers.

Typical appearance of peat (shallow pit)

Black-brown moist murshified peat without fossilised plant remains.

Typical appearance of peat (corer)

Loose, fine granular structure visible in corer; the peat frequently falls out of the corer when it is opened.

1.17 Murshified peat

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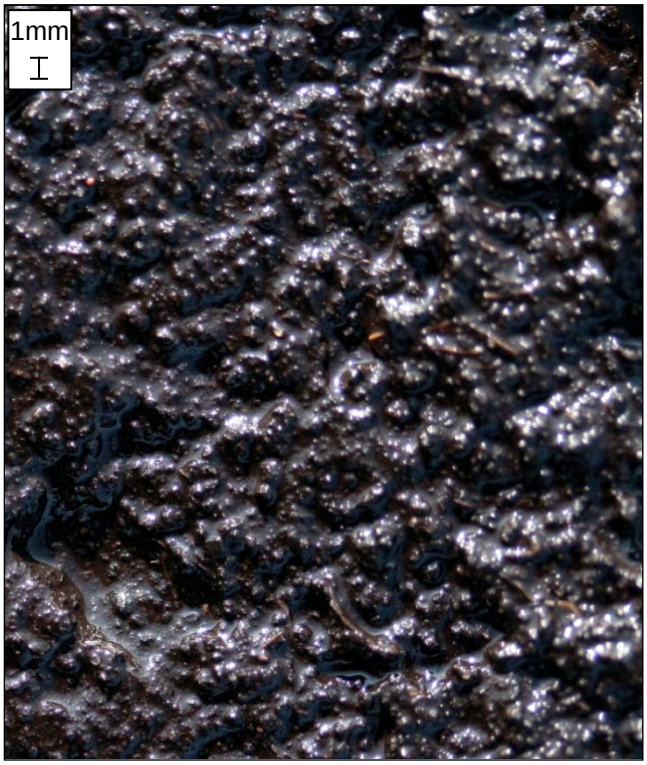
Close-up of exposed peat (wet)



Wet murshified peat: a thick, black silty mass.

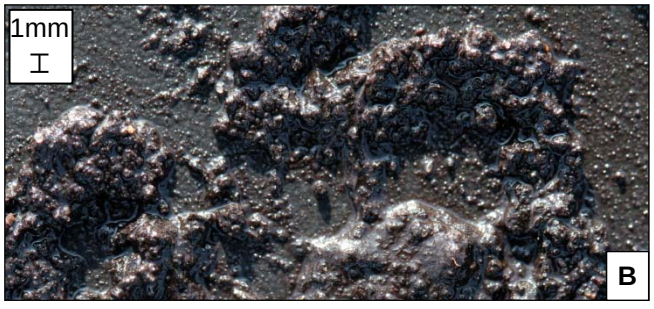
Close-up of exposed peat (moist)

Moist murshified peat: fine granular structure with smeary consistency.

Close-up of exposed peat (dry)

Dry murshified peat: most soil particles clearly <1 mm in diameter, powdery-dusty and easily blown away; resembling loose coal slack.

Peculiarities of peat



A. *Water retaining layer with platy structure several centimetres below the surface, caused by heavy machinery being driven over the peatland. Frequently found.*

B. *Wet murshified peat with granular-smeary consistency.*

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2.1 Detritus gyttja

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2.1 Detritus gyttja

Characteristics for field identification

Detritus gyttja is a homogeneous, dense, plastic to slightly elastic, mainly unstructured mass of decomposed organic material. The decomposed organic remains are very fine (<0.6 mm) in fine detritus gyttja, medium-sized (0.6–12 mm) in medium detritus gyttja, and consist of coarse slightly decomposed detritus (>12 mm) in coarse detritus gyttja. Readily identifiable larger remains of aquatic plants (seeds, fruits, vegetative parts) may be embedded; and silicates and lime can be admixed in various fractions. The colour is usually greenish brown but can also be greyish, yellowish, bluish, reddish or black. The deposition of coarse detritus gyttja often leads on to peat accumulation.

Material composition

Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	≥30	no specification	no specification
TGL	>30	<30	<70

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

The most frequently found gyttja is detritus gyttja, which usually forms as thick deposits of sediment at the bottoms of oligotrophic to eutrophic, mostly noncalcareous standing waters (lakes). It consists mainly of dead plant and animal (organic) material at various stages of decomposition. The TGL classification distinguishes between fine, medium and coarse detritus gyttja on the basis of size of the plant remains. Fine detritus gyttja is an almost pure deposition of plankton in deep standing waters with little water movement. Coarse detritus gyttja is deposited in shallow water (up to 2 m depth) with substantial involvement of aquatic vascular plants. Medium detritus gyttja is formed under intermediate conditions. Silicates (sand, silt, clay) and lime are only minor components or not involved in formation.

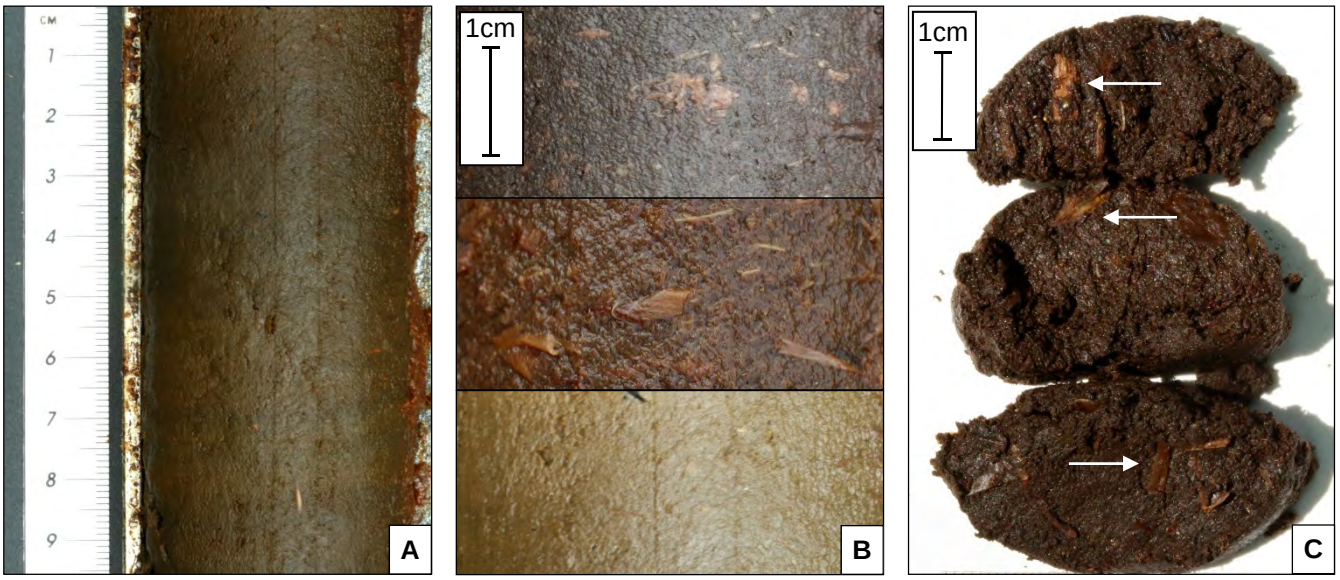
The formation of detritus gyttja is almost entirely restricted to longer-term water bodies in terrestrialisation and flood mires. More rarely, detritus gyttja is found in other hydrogenetic mire types, but only as a thin stratum (e.g. in deep hollows).

Classifications

According to KA5	
gyttja form	gyttja type
organic gyttjas (Fh)	detritus gyttja (Fhg)

According to TGL 24 300/04	
gyttja type group	gyttja type
organic gyttja (y-o)	coarse detritus gyttja (y-odg)
	medium detritus gyttja (y-odm)
	fine detritus gyttja (y-odf)

Typical appearance



A. *Typical appearance of detritus gyttja in corer: a homogeneous, dense, greenish brown, plastic mass.*

B. *Three colour variants of detritus gyttja in corer: greyish brown (top); brown with visible detritus (centre); yellowish olive (bottom).*

C. *Teased-apart dark brown (medium) detritus gyttja with embedded vegetative remains of plants (arrows).*

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2.2 Algal gyttja

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2.2 Algal gyttja

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Characteristics for field identification

Algal gyttja is a markedly homogeneous mass, formed by very fine plant remains (algae) that are barely visible or invisible to the naked eye. A distinctive characteristic is its thick, rubber-like, elastic, gelatinous texture, reminiscent of raw liver. This texture results from the gel fractions of particular algae. If strongly grasped, the gyttja fractures suddenly, splitting into shell-like pieces with sharp edges. Silicates and lime can be admixed in various fractions. The colour is often distinctly greenish brown, but can also be reddish brown and rarely also yellowish brown. Algal gyttja is often slightly shiny.

Material composition:
Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	≥30	no specification	no specification
TGL	>30	<30	<70

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

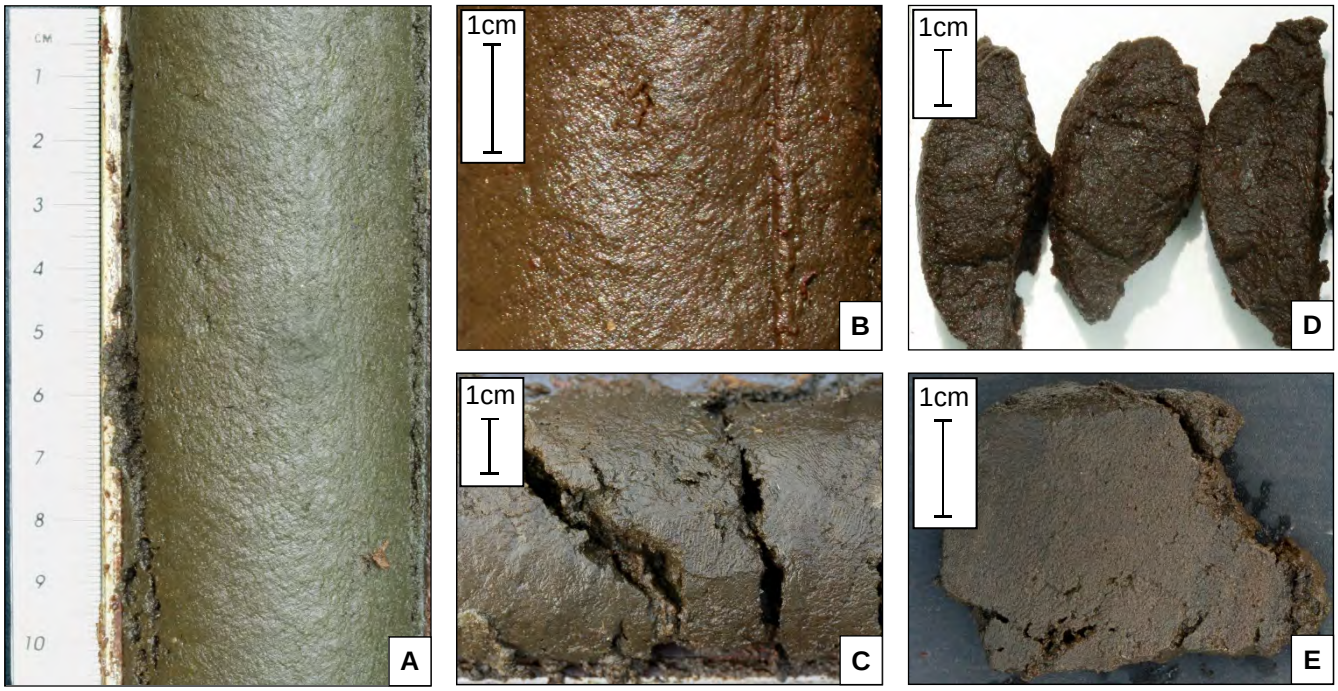
Algal gyttja sediments in deep areas of oligotrophic to mesotrophic, acidic to subneutral standing waters (lakes) that are rich in algae but poor in vascular plants. It consists mainly of finely decomposed remains of dead algae. Silicates (sand, silt, clay) and lime are only minor components or not involved in its formation.
Algal gyttja is occasionally found in the deeper strata of terrestrialisation mires. Its formation is restricted to long-term water bodies with the characteristics outlined above.

Classifications

According to KA5	
gyttja form	gyttja type
organic gyttjas (Fh)	algal gyttja (Fhl)

According to TGL 24 300/04	
gyttja type group	gyttja type
organic gyttja (y-o)	algal gyttja (y-ol)

Typical appearance



A. *Typical appearance of algal gyttja in corer: homogeneous, thick, gelatinous texture with distinctly greenish-brown colouring.*
B. *Slightly shiny reddish-brown algal gyttja.*
C. *Algal gyttja that has split when strongly grasped.*
D. *Shell-like pieces of fractured algal gyttja*
E. *Sliced algal gyttja: distinctly homogeneous without visible plant remains.*

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2.3 Calcareous gyttja

Portraits of peatland deposits
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2.3 Calcareous gyttja

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Characteristics for field identification

Calcareous gyttja is usually a homogeneous, unstructured, thick plastic mass that consists of very finely decomposed organic material with finely distributed limescale. In examples with large lime deposits, a granular structure is occasionally visible. Remains of mollusc shells are frequently embedded, along with occasional readily identifiable remains of (usually) aquatic plants. The plant remains are very fine (< 0.6 mm) in fine calcareous gyttja and appear as coarse, slightly decomposed detritus (>12 mm) in coarse calcareous gyttja. Silicates may be admixed in various fractions. The colour is mainly whitish grey to whitish yellow. Depending on the type and quantity of organic material, it can also be yellow-brown, reddish yellow, greenish yellow or even dark brown.
Tip for field identification: The presence of lime is confirmed by applying a few drops of 10 % hydrochloric acid, which dissolves the lime. If the lime content is greater than ~10 %, there is a strong continuous foaming with development of bubbles. Lime content can be assessed as the loss of substance from a small piece of gyttja after repeated application of hydrochloric acid until there are no more reaction effects; the residue may consist of organic material and/or silicates, in different cases.

Material composition:
Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	5 to <30	no specification	no specification
TGL	5 to <70	>30	<70

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

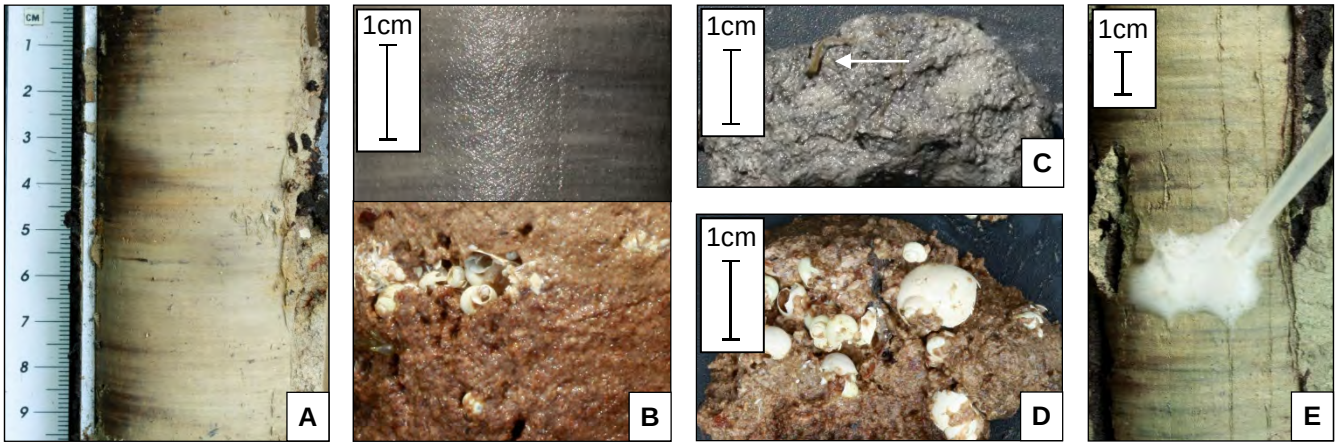
Calcareous gyttja often forms as thick deposits at the bottoms of mostly mesotrophic standing waters (lakes) that are fed by lime-rich groundwater. It consists mainly of sedimented lime particles deposited in the water or calcareous components of dead organisms (e.g. stoneworts, molluscs), along with an organic fraction originating from dead plants and animals. Depending on the sizes of the plant remains, a distinction is made between fine and coarse calcareous gyttja in the TGL classification. Fine calcareous gyttja is deposited in areas of deep standing water with little water movement, and the organic part consists mainly of plankton. Coarse calcareous gyttja sediments in shallow water with (essential) involvement of vascular aquatic plants. Silicates (sand, silt, clay) are only minor components or not involved in its formation.
Calcareous gyttja is typically found in terrestrialisation mires; its formation is restricted to long-term water bodies with the characteristics outlined above.

Classifications

According to KA5	
gyttja form	gyttja type
organo-mineral gyttjas (Fm)	calcareous gyttja (Fmk)

According to TGL 24 300/04	
gyttja type group	gyttja type
calcareous gyttja (y-c)	fine calcareous gyttja (y-cf)
	coarse calcareous gyttja (y-cg)

Typical appearance



A. *Typical appearance of calcareous gyttja in corer: a yellowish white, homogeneous, thick plastic mass.*
B. *Two colour variants in corer: whitish grey (top) and yellowish brown with remains of mollusc shells (bottom).*
C. *Teased-apart whitish grey fine calcareous gyttja: clearly homogeneous with a few fine plant remains (arrow).*
D. *Teased-apart yellowish brown calcareous gyttja with granular structure and numerous shell fragments.*
E. *Strong, continuous foaming on application of 10 % hydrochloric acid, due to solution of the lime fraction.*

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2.4 Sand gyttja

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2.4 Sand gyttja

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Characteristics for field identification

Sand gyttja is a homogenous, thick, inelastic, rough mass. Its structure is cohesive granular due to a high fraction of sand (= silicate mineral, grain size 0.063 to <2 mm) mixed with very finely decomposed organic material. Larger remains of aquatic plants are rarely found, but lime can be admixed in various fractions. Depending on the type and quantity of organic material present, the colour of sand gyttja ranges from ochre through (mostly) different grey and brown shades to black.

Material composition:
Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	5 to <30	no specification	predominant
TGL	5 to <30	<30	>40

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

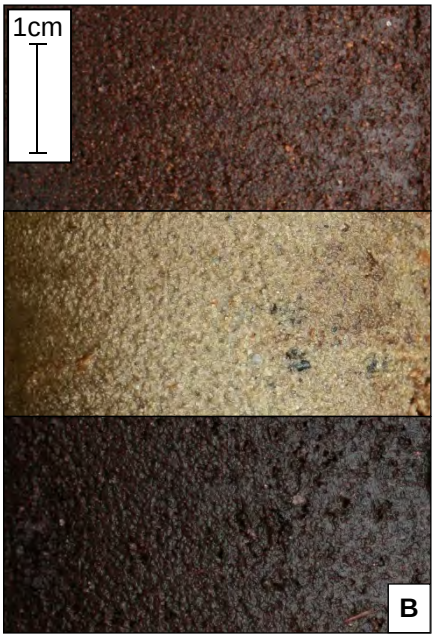
Sand gyttja sediments at the bottoms of oligotrophic to eutrophic, acidic to calcareous standing waters with widely vegetation-free surroundings, where sand arrives by illuviation and/or as aeolian particles. It usually forms a thin stratum on the lake floor because the landscape was generally vegetation-free in the early post-glacial period, when lake formation began. An organic fraction formed by sedimentation of (mainly) plankton, without significant amounts of vascular plant material, is also typical for early postglacial lakes. Thin ribbon-like strata that formed later, due to e.g. woodland clearance or fires in the catchment area, are occasionally found. Lime is only a minor component or not involved in its formation.
Sand gyttja is found at the bottoms of terrestrialisation mires whose formation was associated with water bodies that existed for a long time. It also occurs in flood mires that are flooded with sand-rich water from lakes and rivers for extended periods.

Classifications

According to KA5	
gyttja form	gyttja type
organo-mineral gyttjas (Fm)	sand gyttja (Fms)

According to TGL 24 300/04	
gyttja type group	gyttja type
silicate gyttja (y-s)	sand gyttja (y-ss)

Typical appearance



A. *Typical appearance of sand gyttja in corer: a greyish, homogenous, thick, inelastic mass.*
B. *Three different colour variants in corer: vibrant brown (top), pale ochre due to a small proportion of organic material (centre) and black due to a high proportion of organic material (bottom).*
C. *Close-up of teased-out sand gyttja: clearly visible fine-grained structure due to a high fraction of sand.*
D. *Clearly palpable particles of sand when rubbed between fingertips.*

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2.5 Silt gyttja

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

2.5 Silt gyttja

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Characteristics for field identification

Silt gyttja is a homogenous, thick, in fresh condition slightly plastic mass consisting of a high silt fraction (= silicate mineral, grain size 0.002 to <0.063 mm) mixed with very finely decomposed organic material. Larger remains of aquatic plants are rarely found. Lime can be admixed in various fractions. The colour is typically bright to dark grey, but can also be yellowish brown or greenish brown depending on the type and quantity of organic material. Silt gyttja is conspicuously fast-drying, thereby becoming brighter and losing cohesion to form a powder with a 'velvety flour' texture that sticks in skin grooves when rubbed between the fingertips.

Material composition:
Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	5 to <30	no specification	predominant
TGL	5 to <30	<30	>40

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

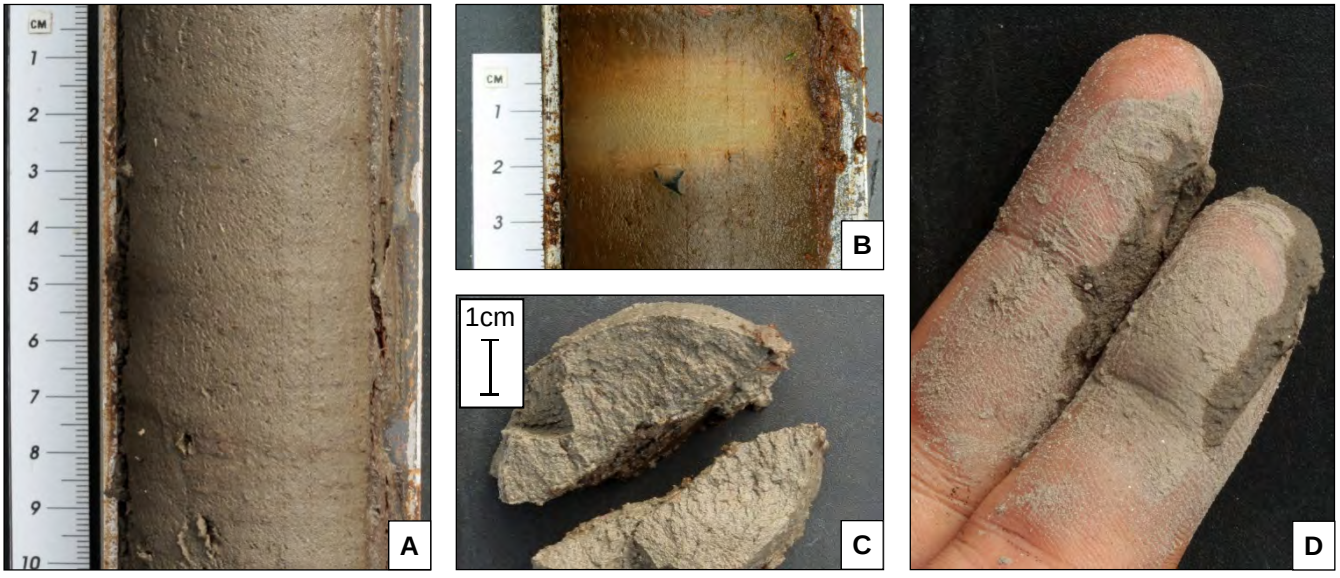
Silt gyttja sediments at the bottoms of oligotrophic to eutrophic, acidic to calcareous standing waters. This gyttja type is formed by inputs of illuvial and/or aeolian silt particles from widely vegetation-free surrounding areas. The silt can also originate from distant areas, since it can be transported over vast distances by wind. Silt gyttja is widespread in Old Drift morainic landscapes and in the Thuringian Basin. It is usually found as a thin bottom stratum in standing waters because the landscape was extensively vegetation-free in the early post-glacial period, when lake formation began. An organic fraction formed by sedimentation of (mainly) plankton, without significant amounts of vascular plant material, is also typical for early postglacial lakes. Thin ribbon-like strata that formed later, due to e.g. woodland clearance or fires in the catchment area, are occasionally found. Lime is only a minor component or not involved in the formation of silt gyttja.
Silt gyttja is found at the bottoms of terrestrialisation mires whose formation was associated with water bodies that existed for a long time. It also occurs in flood mires that are flooded with silt-rich lake and/or river water for extended periods.

Classifications

According to KA5	
gyttja form	gyttja type
organo-mineral gyttjas (Fm)	silt gyttja(Fmu)

According to TGL 24 300/04	
gyttja type group	gyttja type
silicate gyttja (y-s)	silt gyttja (y-su)

Typical appearance



A. *Typical appearance of silt gyttja in corer: a greyish, homogeneous, thick, slightly plastic mass.*
B. *Ribbon of yellowish brown silt gyttja embedded in organic gyttja.*
C. *Teased-out silt gyttja: clearly homogeneous without visible plant remains.*
D. *Finger test: silt gyttja adhering in finger grooves, having dried quickly (thereby becoming brighter) to a powder with 'velvety flour' texture; silt granules not or hardly palpable between the fingertips, but noticeable when placed on the tongue.*

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2.6 Clay gyttja

Portraits of peatland deposits
Germany

Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz; **References:** see part B: Annotations

2.6 Clay gyttja

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Characteristics for field identification

Clay gyttja is a homogenous, very thick, sticky-plastic, very tough, soapy-smeary mass that consists of a high clay fraction (= silicate mineral, grain size <0.002 mm) and mostly very finely decomposed organic material. Larger remains of aquatic plants are rarely found. Various fractions of lime may be admixed. The typical colour is bright to dark grey. Depending on the types and quantities of organic material and other mineral components, the grey colour can be greenish, bluish, brownish or blackish. Clay gyttja is distinctly difficult to core, due to its strong cohesion, which also makes it exceedingly formable and very finely rollable. When rubbed between the fingers, its texture becomes smooth and shiny; when dry, it becomes hard and rough.

Material composition:
Depending on the classification system, there are partially different threshold values for the fractions of organic material, lime ($CaCO_3$) and silicates (sand, silt, clay). Threshold values are highlighted in colour:

	Organic fraction (%)	Lime fraction ($CaCO_3$) (%)	Silicate fraction (%)
KA5	5 to <30	no specification	predominant
TGL	5 to <30	<30	>40

Generally, gyttja types can only be identified with certainty on the basis of laboratory analyses of their material composition.

Site conditions and ecohydrological indications

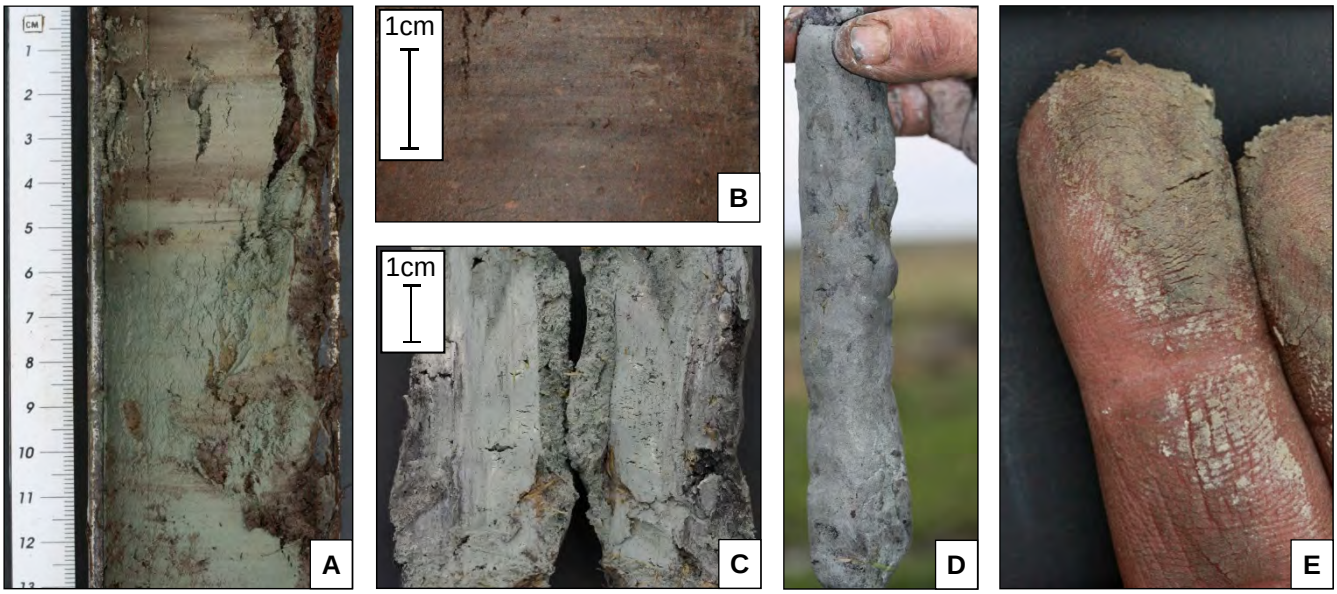
Clay gyttja sediments at the bottom of oligotrophic to eutrophic, acidic to calcareous standing waters situated in clay-rich landscapes. This gyttja type is formed by illuviation of clay particles from extensively vegetation-free surrounding areas. It is usually found as thin strata at the bottoms of standing waters (lakes), because the landscape was generally vegetation-free in the early post-glacial period when lake formation began. An organic fraction formed by sedimentation of (mainly) plankton, without significant amounts of vascular plant material, is also typical for early postglacial lakes. Thin ribbon-like strata that formed later, due to e.g. woodland clearance or fires in the catchment area, are occasionally found. Lime is only a minor component or not involved in the formation of clay gyttja.
Clay gyttja is found at the bottoms of terrestrialisation mires whose formation was associated with water bodies that existed for a long time. It also occurs in flood mires that are flooded with clay-rich lake and river water for extended periods.

Classifications

According to KA5	
gyttja form	gyttja type
organo-mineral gyttjas (Fm)	clay gyttja (Fmt)

According to TGL 24 300/04	
gyttja type group	gyttja type
silicate gyttja (y-s)	clay gyttja (y-st)

Typical appearance



A. *Typical appearance of clay gyttja in corer: a homogeneous, greyish, very thick and tough mass.*
B. *Greyish brown clay gyttja.*
C. *Sliced clay gyttja: generally homogeneous, with smeary surface and few plant remains.*
D. *The high plasticity and very strong cohesion of clay gyttja.*
E. *Finger test: clay granules are not palpable; clay gyttja develops a hard, brittle texture when drying.*

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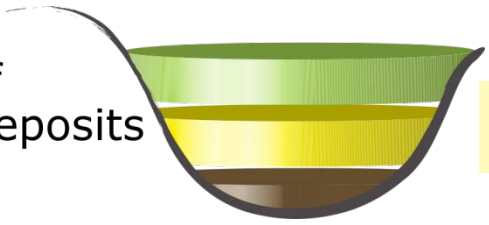
3

Other peatland deposits

Portraits of peatland deposits
Germany



Text and design: Corinna Schulz, Ron Meier-Uhlherr, Vera Luthardt & Hans Joosten; **Photographs:** Ron Meier-Uhlherr & Corinna Schulz, page 2: Limonite (C): Kerstin Koch, Vivianite: Jutta Zeitz, page 4 (B): Heike Stegmann; **References:** see part B: Annotations

3 Other peatland deposits

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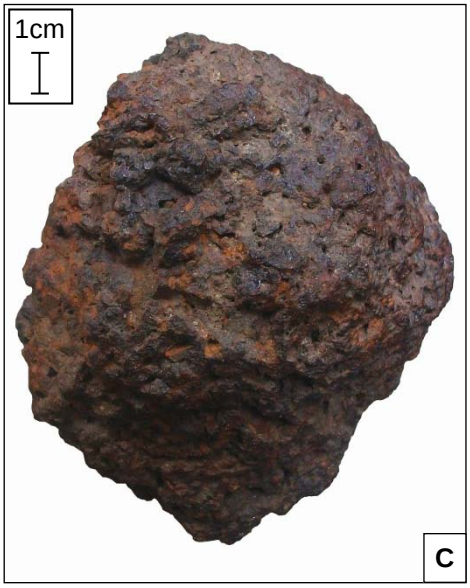
Limonite (synonym: bog iron ore)

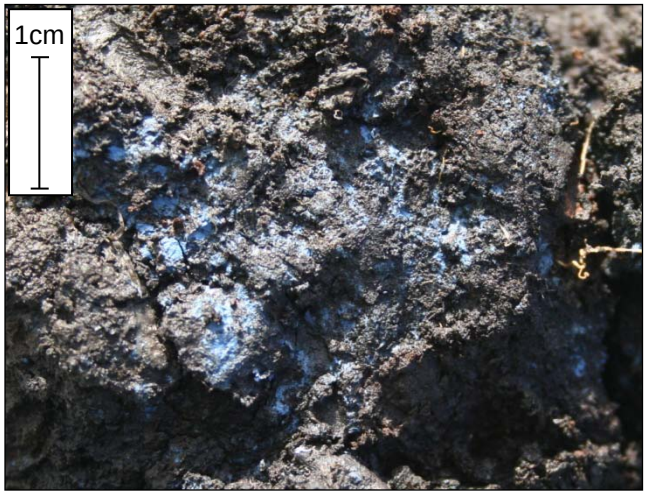
- Iron compounds, deposited in solid form or as a coating on peat.
- Formation requires a supply of ferrous groundwater, from which insoluble iron compounds are deposited through contact with oxygen.
- Occurs mainly in water rise mires located in decalcified, acidophilous, sand-rich landscapes.
- Brown to rust-brown coloured, crumbly to very firm large aggregates or scoria-like pats, depending on age and material composition; solid forms contain up to 40 % iron.



A. *Rust-brown peat, coated and interspersed with iron deposits.*
B. *Peat with ribbons of crumbly, very firm iron ore aggregates.*
C. *Isolated large, solid aggregate of iron ore.*

Vivianite (synonym: blue iron ore)

- Deposited iron phosphate compounds.
- Formed by deposition of divalent iron and phosphate in soils with high water content.
- Occurs in fens situated in phosphorus-rich landscapes (e.g. Spree Forest in Brandenburg).
- Colourless under water-saturated conditions, becoming intensely blue (cornflower blue) after a few minutes in contact with air.



Siderite (synonym: spathic iron ore)

- Deposited iron carbonate compounds.
- Formed by deposition of divalent iron and carbonate in water-saturated peatlands fed by iron-rich water.
- Occurs only (and rather rarely) in fens.
- An unstructured, grey-whitish-beige mass, partly gel-like, with cheese-like texture in pit-fresh condition; grasping leaves an oily impression; zero or (at most) very slight reaction to hydrochloric acid (unlike lake marl).

3 Other peatland deposits

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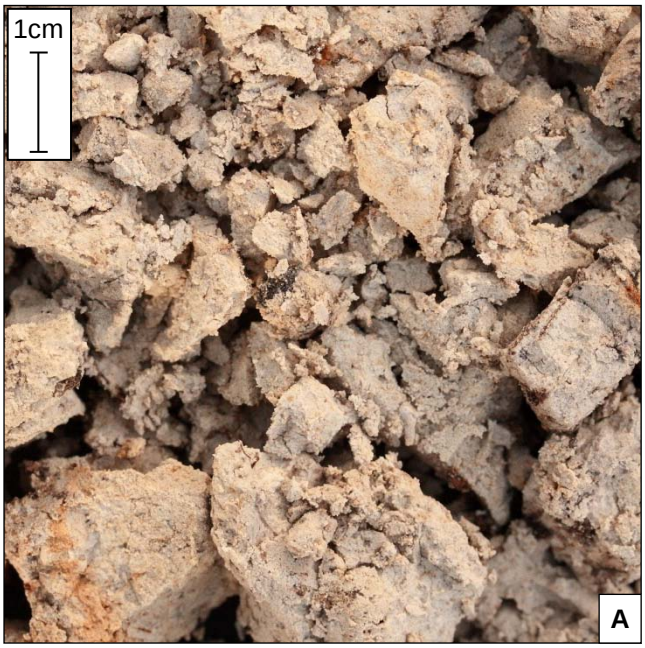
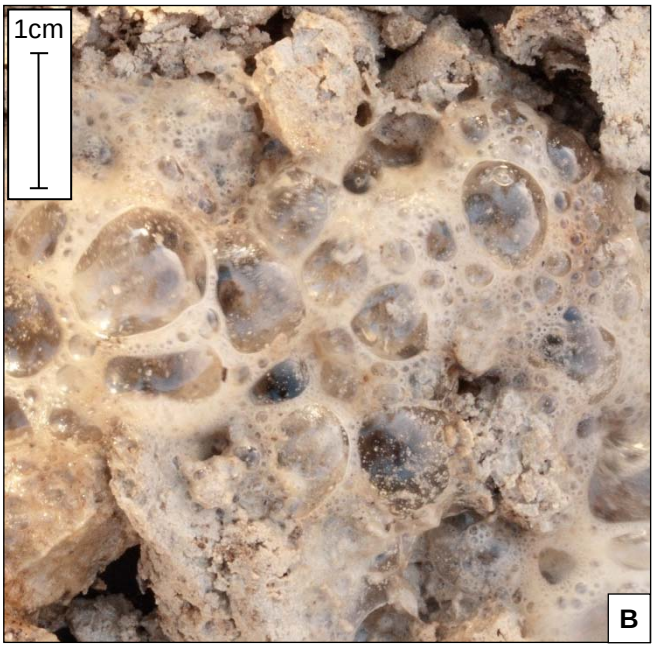
Lake marl

- Almost pure limescale; lime fraction >90 %, organic fraction <5 %.
- Formed by deposition of lime in water bodies fed by calcareous water.
- Occurs mainly in terrestrialisation mires in landscapes with base-rich or calcareous glacial deposits and in landscapes formed from lime-rich rocks; deposited in shallow parts of calcareous water bodies.
- White to yellowish white in colour, with firm to soft texture; in the case of firm texture, like chalk; inelastic, mostly fine-grained, containing some silt or clay and frequently rich in remains of mollusc shells; differentiation from calcareous gyttja may be difficult in the field.





A. *Exposed lake marl with typical whitish colouring.*
B. *Strong, continuous foaming with large bubbles when 10 % hydrochloric acid is applied.*

Lake Laach (Laacher See) tephra

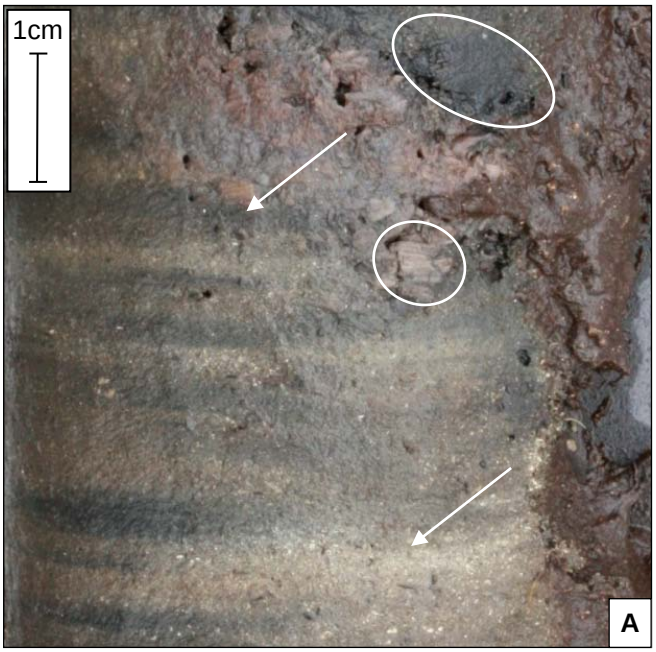
- Ash (tephra) deposit from the last eruption of Lake Laach volcano (Eifel Mountains) ~12,900 years ago.
- Tephra from Lake Laach was deposited across the whole of Germany; frequently found embedded in gyttjas at the bottoms of deep peatlands.
- A greyish ribbon ranging in thickness from a few mm to several cm, depending on proximity to the volcano; grain size <0.2 mm; feels like fine glass splinters if placed on the tongue.

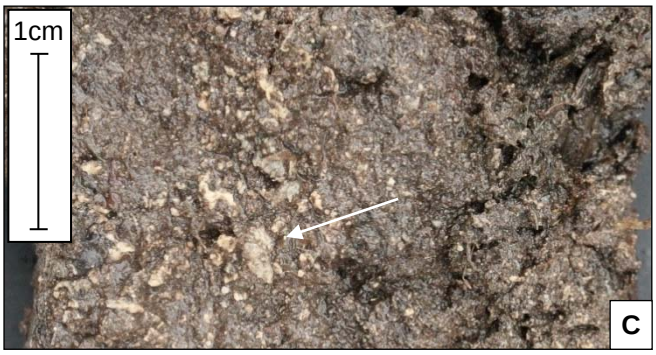
Burnt layer

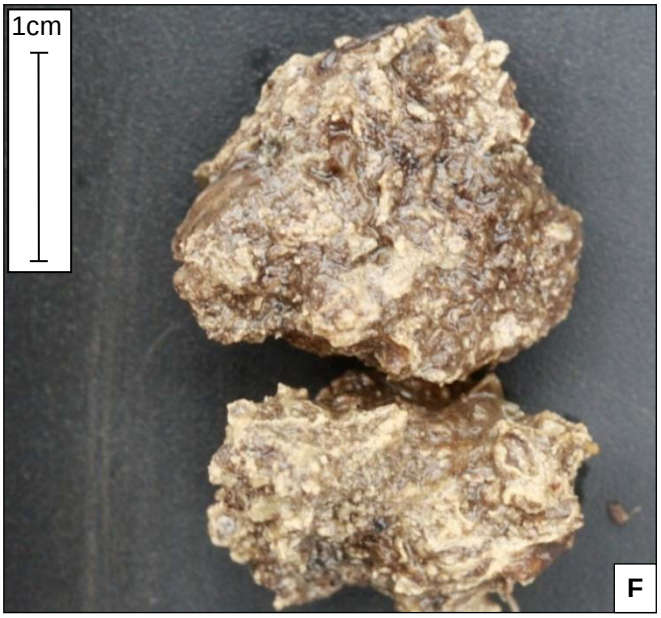
- Burnt layers reflect historical peat fires during phases of dry climate and/or fire-based agriculture.
- May be found in all landscapes and peatland types.
- Blackish colour; in comparison with adjacent layers, a mostly solid, unstructured, ash-containing substance; sand or silt frequently admixed; fragments of wood charcoal indicate that the peatland was wooded when it burned.

Spring deposit layer

- Conspicuous ribbon-like layers of multifaceted deposits, varying at fine scale.
- High variety of deposits due to different intensities and/or fluctuations of groundwater supply, without formation of permanent water bodies; lime deposits occur if the groundwater is calcareous.
- Usually found in spring mires in morainic landscapes, hills and low mountain ranges.
- Narrow striping of different deposits: almost pure lime formations with varying composition and size, from fine-grained to grit-like or bulbous (synonyms: spring lime, calc-sinter); more highly decomposed, occasionally wood-rich peats (spring peats with lime fractions = spring lime peats); gyttjas; mineral components (e.g. sand, silt); iron deposits.
- Wide colour spectrum, from bright grey through ochre to brown and black; in the case of lime deposits, pure white or mottled with white.







A. *Layer of spring deposits in corer, showing conspicuous striping due to small-scale variation in the deposits: highly decomposed, very lime-rich peat (upper arrow); alder wood (circles); spring lime (lower arrow).*

B. *Striped layer of spring deposits in corer (lying crosswise).*

C. *Highly decomposed, unstructured peat with a high fraction of grit-like lime (e.g. arrow).*

D. *Thin layer of highly decomposed, black, unstructured peat.*

E. *Remains of mollusc shells in a muddy layer of spring deposits.*

F. *Large pieces of bulbous lime from a stratum of almost pure spring lime (indicative of strong spring discharge).*

B:

Annotations

Portraits of
peatland deposits
Germany

Peatland deposits

Peats

Classifications

The selection of common German peat types presented in the portraits largely conforms to the latest German soil mapping manual **KA5** (Ad-hoc-AG Boden 2005) and the former German Democratic Republic soil mapping manual **TGL 24300/04** (1985). Further explanations are given in the main text. Peat classifications of KA5 and TGL 24300/04 are compared to the peat types included in the portraits in Tables A1.2 and A1.4 of the main text.

Ecological designation

The ecological designation of peats, in terms of trophic conditions and base saturation conditions, complies with **trophic groups** and **base saturation groups** of peatland sites according to Succow (1988):

Trophic group	C/N value
oligotrophic	>33
mesotrophic	33–20
eutrophic	<20–10
polytrophic	<10

Base saturation group	pH value
acidic	<4,8
subneutral	4,8–6,4
calcareous	>6,4

Degree of peat humification

Degrees of humification (H) values in the portraits refer to the ten-level scale of von Post (1924).

H values describe the extent of decomposition of peats. High and continuous water supply as well as nutrient-poor and acidic conditions result in well preserved plant remains. At higher degree of humification (H), the proportion of amorphous material is higher and the identifiability of plant remains is lower (Göttlich 1990).

In order to determine the degree of humification of wet and pit-fresh peat, a piece of peat of about the size of an egg is squeezed in the fist; and the plant remains, the colour of the water released, the amount of peat outflowing between the fingers and the residue after squeezing are assessed according to the table below (von Post 1924, Grosse-Brauckmann et al. 1977 in Succow 1988, Ekono 1981).

Remarks:

- This concept is applicable to primary peats (the direct results of actual peat accumulation), not to secondarily decomposed peats arising by oxygen-induced degradation of primary peats (*earthified peat* and *murshified peat*).
- In the case of wood peats, the degree of humification of the matrix (not of the wood components) is assessed.
- In general, the botanical peat type is assigned up to degree of humification H7, since the plant remains are very indistinct or unrecognisable at higher degrees of humification (except in wood peat). In the case of degree of humification H8 to H10, the type *highly decomposed peat* according to TGL 24300/04 or *amorphous peat* according to KA5 can be assigned.
- When there is certainly a gyttja fraction in the peat, this part is ignored when applying the squeezing test.

Degree of humification	Features of wet and pit-fresh peat		
	plant remains in the peat:	outflowing between fingers when squeezed:	residue after squeezing:
H1	identifiable	colourless, clear water	not mushy
H2		yellow-brown, almost clear water	
H3		brown, murky water	
H4		brown, distinctly murky water	
H5		distinctly murky water and a small amount of amorphous peat	slightly mushy
H6	somewhat indistinct	up to one third of the peat	highly mushy
H7	indistinct	about one half of the peat	plant remains more distinct than before
H8	very indistinct	about two thirds of the peat	especially decay-resistant remains (e.g. fibres, wood)
H9	hardly recognisable	almost all the peat	
H10	unrecognisable	all the peat	no residue

References
The descriptions in the peat portraits of 'characteristics for field identification', 'formation conditions', 'occurrence and position in the landscape', 'peat forming plant communities' and 'occurrence in hydrogenetic mire types' refer to von Bülow 1929, Grosse-Brauckmann 1962a, 1972, 1974, 1994, 1996, Tolpa et al. 1967, Overbeck 1975, TGL 24300/04 1985, Succow & Jeschke 1986, Jeschke 1987, Succow 1988, Göttlich 1990, Jeschke 1991, Roeschmann et al. 1993, Michaelis 1998, Sauerbrey & Zeitz 1999, Joosten & Succow 2001a, Müller-Motzfeld 2001, Succow 2001b, 2001c, Succow & Stegmann 2001d, Landesumweltamt Brandenburg 2004, Ad-hoc-AG Boden 2005, DIN 11540 2005, MLUV & NaturSchutzFonds Brandenburg 2005 and the authors' field experience. The 'trophic conditions' and 'base saturation conditions' refer to Succow 1988, Koska 2001, Zeitz & Roßkopf 2011 and the authors' own measurements.

Gyttjas

Classifications

The selection of common German gyttja types presented in the portraits largely conforms with **KA5** (Ad-hoc-AG Boden 2005) and **TGL 24300/04** 1985. The gyttja classifications of KA5 and TGL 24300/04 are compared to the gyttja types included in the portraits in Tables A1.3 and A1.5 of the main text.

Degree of gyttja consistency

Comparable to the degree of humification of peats, the degree of consistency can be assigned to gyttjas as measure of firmness and water content (Stegmann et al. 2001).

Gyttja consistency according to KA5

Symbol	Description
ko1	solid (hard)
ko2	semi-solid (crumbly)
ko3	stiff (plastic)
ko4	soft (plastic)
ko5	mushy (plastic)
ko6	viscous

Gyttja consistency according to TGL 24300/16

Symbol	Description
K1	liquid (mostly viscous)
K2	mushy (outflowing between fingers under minor pressure)
K3	very soft (easily squeezable between fingers)
K4	soft (easily kneadable)
K5	stiff (hardly kneadable)

References
The descriptions in the gyttja portraits refer to von Bülow 1929, Merkt et al. 1971, Overbeck 1975, TGL 23400/04 1985, Succow 1988, Göttlich 1990, Succow & Jeschke 1990, Mauersberger & Mauersberger 1997, Stegmann et al. 2001, Ad-hoc-AG Boden 2005, Chmieleski 2006 and the authors' field experience.

Other peatland deposits

References
The descriptions in the portrait of other peatland deposits refer to Merkt et al. 1971, Göttlich 1990, Stegmann & Succow 2001, Theuerkauf 2002, Riede 2007 and the field experience of the authors.

Peatland types

The descriptions in the deposit portraits of 'occurrence in hydrogenetic mire types' and 'occurrence in ecological mire types' refer to the classification system for German peatlands of Succow (1988).

Hydrogenetic mire types

The hydrogenetic mire type refers to the hydrological formation conditions and the resulting deposit composition of a peatland. Thereby, Succow (1988) distinguishes between ombrogenous bogs (water supply exclusively by precipitation) and seven different geogenous fen types (water supply additionally by water that has been in contact with the mineral soil of the catchment area).

Hydrogenetic mire types	Origin of water
mires with horizontal surface	
water rise mire	geogenous
terrestrialisation mire	geogenous
flood mire	geogenous
kettle hole mire	geogenous
mires with sloping surface	
spring mire	geogenous
sloping mire	geogenous
percolation mire	geogenous
bog	ombrogenous

mostly primary mire type
mostly secondary mire type

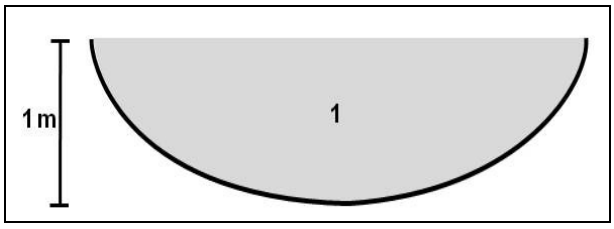
This classification is largely congruent with the suggestions given by Joosten & Clarke (2002) for a global hydrogenetic classification of peatlands.
Furthermore, the eight hydrogenetic mire types can be allocated to *primary* mires, which mostly form directly on mineral soil; and to *secondary* mires, which mostly grow on primary mires. Large mires (especially) can be composed of two or several hydrogenetic mire types in temporal and spatial coexistence.

References
The following descriptions of hydrogenetic mire types refer to Succow 1988, Hutter et al. 1997, Schopp-Guth 1999, Dierssen & Dierssen 2001, Joosten & Succow 2001a, Succow 2001b.

Relation to deposit portraits
In order to identify the hydrogenetic mire type, at least one (central) coring should be conducted. Deposits can be identified using the identification key and the deposit portraits. Subsequently, potential hydrogenetic mire types can be read off from the deposit portrait for each of the deposits recorded. Using a combination of the following descriptions and comparison with the example coring profile, the hydrogenetic mire type can be assessed.
The following descriptions refer to the natural state of peatlands. In drained and/or utilised peatlands, there can be degraded deposits forming a surface layer on all eight hydrogenetic mire types → earthified peat (**1.16**), murshified peat (**1.17**).

Water rise mire

- Formation by slow rise of the groundwater level caused by an increase in water supply (by sea level rise, changes in climate or land use, beaver dams) on the mineral soil.
- Water supply by groundwater.
- Distinct seasonal water-level fluctuations.
- Plane surface, mainly small thickness (shallow).
- Homogenous peat layer (mainly highly or moderately decomposed), sometimes above shallow gyttja layer.



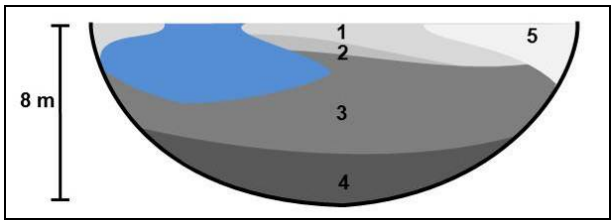
Example profile of a water rise mire:
1 = alder peat

Relation to deposit portraits
Occurring peats
- Mainly alder peat (**1.11**), coarse sedge peat (**1.3**) or highly decomposed peat (**1.15**).
- Frequently common reed peat (**1.5**), birch peat (**1.12**).
- Rarely fine sedge peat (**1.4**), cotton grass peat (**1.7**), peat moss peat (**1.1**) or pine peat (**1.13**).

Occurring gyttjas
- Sometimes basal, shallow gyttja: detritus gyttja (**2.1**) or silicate gyttja (**2.4**, **2.5**, **2.6**) → short aquatic phase.

Terrestrialisation mire

- Formation by infilling of a water body by gyttja and subsequent or contemporaneous peat accumulation by floating mats or peat forming plants growing in shallow water.
- Water supply by groundwater and/or surface inflow from the above-ground catchment area.
- With residual lake in the case of incomplete terrestrialisation.
- Only minor seasonal water-level fluctuations.
- Plane surface, shallow peat thickness (<2 m) above deep gyttja layers.
- Peat layer mainly consisting of different peat types (mainly slightly or moderately decomposed).



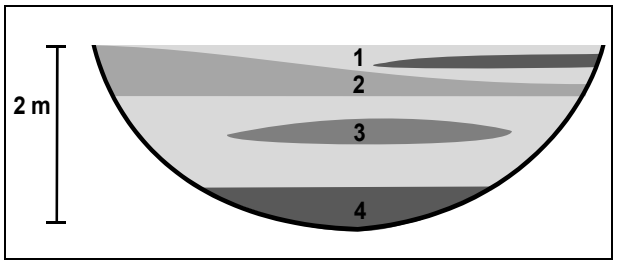
Example profile of a terrestrialisation mire:
1 = common reed peat, 2 = saw-sedge - common reed peat, 3 = detritus gyttja, 4 = algal gyttja, 5 = alder peat

Relation to deposit portraits
Occurring peats
- At mire margins frequently alder peat (**1.11**), more rarely birch peat (**1.12**).
- In central locations mainly wood-free peats: common reed peat (**1.5**), coarse sedge peat (**1.3**), fine sedge peat (**1.4**) or peat moss peat (**1.1**), rarely cotton grass peat (**1.7**).
- Directly above the gyttja frequently common reed peat (**1.5**), brown moss peat (**1.2**), shallow layer of saw-sedge peat (**1.6**), pod grass peat (**1.8**) or horsetail peat (**1.9**), more rarely peat moss peat (**1.1**).

Occurring gyttjas
- Mainly detritus gyttja (**2.1**) or calcareous gyttja (**2.3**), in the case of deep mire (thick peat layer) basal algal gyttja (**2.2**) or silicate gyttja (**2.4**, **2.5**, **2.6**) → aquatic phase.

Flood mire

- Formation and water supply by periodical flooding by rivers (floodplain flood mire) or seas (coastal flood mire).
- Intense water-level fluctuations with overflow and dry periods depending on the level of adjacent waters.
- Plane surface, shallow to deep peat thickness.
- Peat layer mainly consisting of peats rich in minerals (mainly higher decomposed and compacted), intermixed with silicate gyttja and mineral layers (sand, clay).



Example profile of a flood mire:
1 = common reed peat, 2 = alder peat, 3 = alluvial clay, 4 = silicate gyttja (sand, clay or silt gyttja)

Relation to deposit portraits

Floodplain flood mire

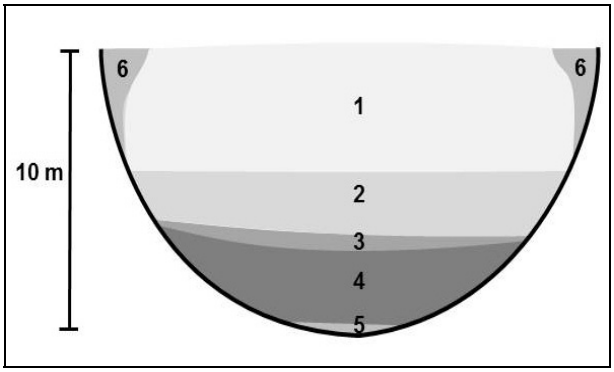
- Mainly alder peat (**1.11**), common reed peat (**1.5**), coarse sedge peat (**1.3**) or highly decomposed peat (**1.15**) in frequent deposit changes, consistently with a high proportion of mineral components (sand, silt, clay).
- Peats intermixed with detritus gyttja (**2.1**), silicate gyttja (**2.4**, **2.5**, **2.6**) → short aquatic phases.

Coastal flood mire

- Mainly common reed peat (**1.5**), in pasture on salt marsh peat (**1.10**), with a high proportion of mineral components (sand, silt, clay).
- Peat layer sometimes intermixed with or underlain by silicate gyttja (**2.4**, **2.5**, **2.6**) → short aquatic phases.

Kettle hole mire

- Formation in kettle hole with steep aboveground catchment area, by inflow of surface water.
- Initial paludification on the mineral soil, followed by lake formation and infill of the water body by gyttja (terrestrialisation); subsequent and constant peat accumulation and gradual sealing of the kettle hole margins with organic material (colmation).
- Only minor seasonal water-level fluctuations.
- Plane surface, mainly deep peat thickness above gyttja layer.
- Homogenous peat layer (mainly slightly decomposed).



Example profile of a kettle hole mire above a terrestrialisation mire:
1 = peat moss - cotton grass peat, 2 = peat moss - fine sedge peat, 3 = pod grass peat, 4 = detritus gyttja, 5 = brown moss peat, 6 = highly decomposed peat

Relation to deposit portraits

Occurring peats

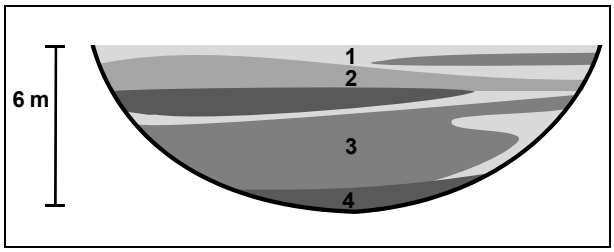
- At the mire margins mainly highly decomposed peat (**1.15**), centrally peat moss peat (**1.1**) and cotton grass peat (**1.7**), frequently above fine sedge peat (**1.4**), close to mire margins sometimes intermixed with birch peat (**1.12**), pine peat (**1.13**) or dwarf shrub peat (**1.14**).
- In the transition area from peat to gyttja frequently pod grass peat (**1.8**), rarer brown moss peat (**1.2**) → terrestrialisation phase.
- As basal layer frequently highly decomposed peat (**1.15**) or more rarely brown moss peat (**1.2**) → paludification phase.

Occurring gyttjas

- Mainly detritus gyttja (**2.1**), more rarely calcareous gyttja (**2.3**), in the case of deep gyttja also algal gyttja (**2.2**) in deeper layers, basal frequently silicate gyttja (**2.4**, **2.5**, **2.6**) with shallow thickness → aquatic phase.

Spring mire

- Formation by constantly high water supply from a spring discharge and backing up of water resulting from peat accumulation.
- Mainly minor water-level fluctuations.
- Sloping surface and water flow mainly on mire surface.
- Shallow to deep peat thickness.



Example profile of a spring mire:
1 = highly decomposed peat, 2 = alder peat, 3 = spring deposit layer, 4 = detritus and clay gyttja

- Heterogenous peat layer consisting of different peat types (mainly highly decomposed due to oxygen-rich spring water) intermixed with iron compounds, limescale, shallow gyttja or sand layers.

Relation to deposit portraits

Occurring peats

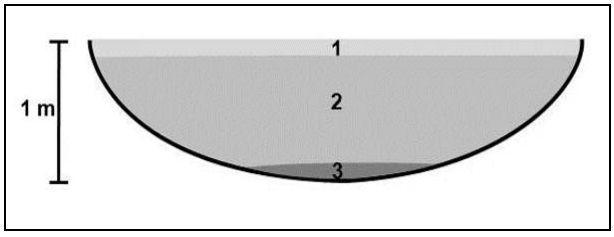
- Close to spring discharge mainly highly decomposed peat (**1.15**), also spring deposit layers (**3**), alder peat (**1.11**), coarse sedge peat (**1.3**), horsetail peat (**1.9**), common reed peat (**1.5**), more rarely brown moss peat (**1.2**), rarely fine sedge peat (**1.4**) or peat moss peat (**1.1**) in multiple deposit changes.

Occurring gyttjas

- Scattered in the peat body: silicate gyttja (**2.4**, **2.5**, **2.6**), detritus gyttja (**2.1**) or calcareous gyttja (**2.3**) → short aquatic phases.

Sloping mire

- Formation on even slopes by surficially converging slope water or soil water leaking on damming mineral subsoil.
- Uphill peat growth due to backing up of the mineral soil water when entering the mire.
- Phased water-level fluctuations.
- Sloping surface and water flow mainly on mire surface.
- Shallow peat thickness and mainly homogenous peat layer lying directly on the mineral subsoil (no gyttja).
- Peat layer mostly homogenous (mainly moderately to highly decomposed).



Example profile of a sloping mire:
1 = peat moss peat, 2 = fine sedge peat, 3 = highly decomposed peat

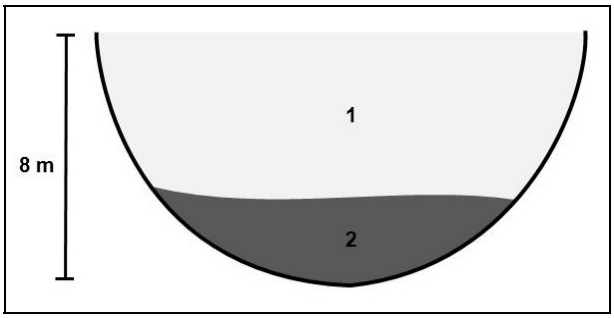
Relation to deposit portraits

Occurring peats

- Mainly peat moss peat (**1.1**), fine sedge peat (**1.4**), more rarely cotton grass peat (**1.7**) or coarse sedge peat (**1.3**).
- Sometimes intermixed with birch peat (**1.12**), more rarely pine peat (**1.13**) or alder peat (**1.11**).
- Directly on the mineral subsoil frequently shallow layers of highly decomposed peat (**1.15**), dwarf shrub peat (**1.14**) or birch peat (**1.12**), more rarely pine peat (**1.13**).

Percolation mire

- Formation at valleys and at valley margins by slow and continuous groundwater leakage.
- Groundwater stream from the valley margin to a receiving water course (mostly rivers, also lakes).
- Rapid peat growth due to backing up of downhill flowing water and high water saturation.
- Hardly any water-level fluctuations.
- Sloping surface and water flow through the whole peat layer.
- Deep peat thickness and homogenous peat layer (slightly or moderately decomposed), frequently above gyttja.



Example profile of a percolation mire above a terrestrialisation mire:
1 = brown moss - fine sedge peat, 2 = calcareous gyttja

Relation to deposit portraits

Occurring peats

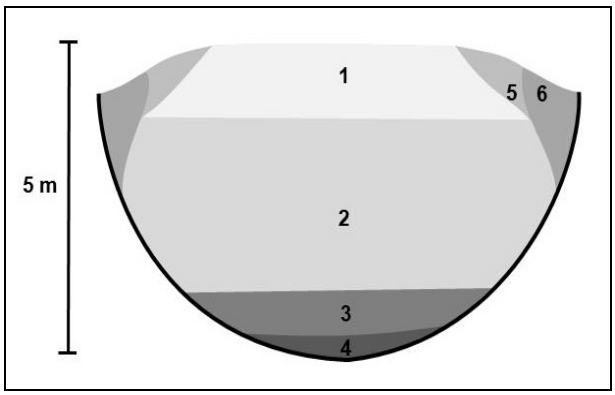
- Mainly brown moss peat (**1.2**) und fine sedge peat (**1.4**) (mainly as mixed peat), sometimes common reed peat (**1.5**) or coarse sedge peat (**1.3**), very rarely horsetail peat (**1.9**) and peat moss peat (**1.1**).
- At the mire margins sometimes alder peat (**1.11**) or birch peat (**1.12**).

Occurring gyttjas

- Mainly calcareous gyttja (**2.3**) and detritus gyttja (**2.1**) → aquatic phase.

Bog

- Formation in areas with a positive climatic water balance (precipitation higher than evaporation and runoff) on precursor mire or in depressions.
- Mire water level raised above the regional groundwater level by special regulation mechanisms as a result of the growing peat layer.
- Water supply exclusively by precipitation.
- Only minor water-level fluctuations in the mire centre.
- Often raised centre, partly sloping corresponding to subsoil relief.
- Deep peat thickness and homogenous peat layer (slightly or moderately decomposed, highly decomposed at the margins), frequently above gyttja.



Example profile of a bog above a terrestrialisation mire: 1 = peat moss peat, 2 = peat moss - cotton grass peat, 3 = peat moss - pod grass peat, 4 = detritus gyttja, 5 = pine peat, 6 = highly decomposed peat

Relation to deposit portraits

Occurring peats

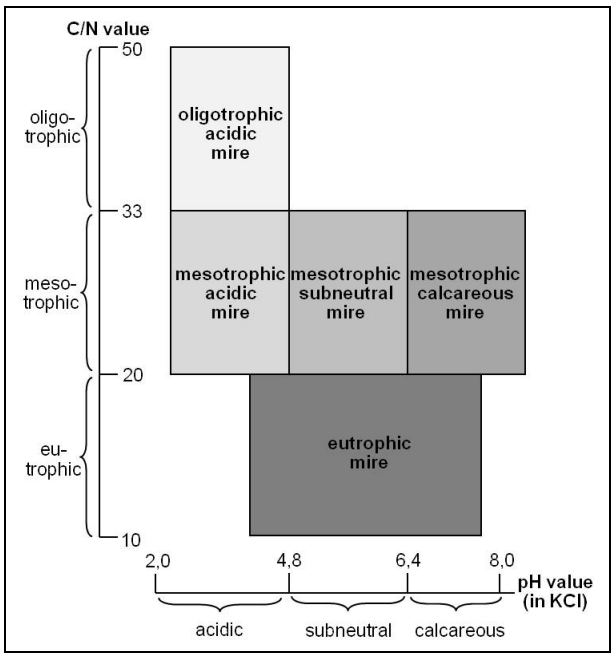
- At the mire margins frequently highly decomposed peat (**1.15**), towards mire centre pine peat (**1.13**), more rarely birch peat (**1.12**), centrally mainly peat moss peat (**1.1**).
- In deeper layers peat moss peat (**1.1**) and cotton grass peat (**1.7**), sometimes intermixed with pine peat (**1.13**), birch peat (**1.12**) or dwarf shrub peat (**1.14**).
- In the transition area from peat to gyttja frequently pod grass peat (**1.8**) or fine sedge peat (**1.4**), more rarely brown moss peat (**1.2**) → terrestrialisation phase.
- Basal peat sometimes highly decomposed peat (**1.15**) or pine peat (**1.13**) → paludification phase.

Occurring gyttjas

- Mainly detritus gyttja (**2.1**) or silicate gyttja (**2.4**, **2.5**, **2.6**), rarely algal gyttja (**2.2**) → aquatic phase.

Ecological mire types

The ecological mire types according to Succow (1988) refer to the chemical quality of the feeding water in terms of trophic conditions (nutrient availability) and base saturation (acidity), which lead to the establishment of different characteristic plant communities under undisturbed conditions. Regarding the trophic conditions, which are classified by the C/N value of the peat, oligotrophic (>33), mesotrophic (33–20) and eutrophic (<20–10) mires are distinguished. The base saturation is derived from the pH value of the peat (measured in KCl): acidic (<4,8), subneutral (4,8–6,4) and calcareous (>6,4). The combination of trophic conditions and base saturation result in five ecological mire types (combined according to distinguishable plant communities), as shown in the following Figure.



In the case of undisturbed mires, the ecological mire type can be identified from the vegetation, to a large extent. Large mires (particularly) can be composed of two or several ecological mire types in temporal and spatial coexistence.

Due to drainage and especially intensive use of peatlands and associated aeration of the peat, mineralisation processes lead to nutrient release and the original nutrient status of the uppermost deposits increases. In these cases, the original ecological mire type can be assessed by the peat types beneath the upper, degraded soil layer.

References

The following descriptions of ecological mire types refer to Succow 1988, Hutter et al. 1997, Schopp-Guth 1999, Succow 2001a.

Relation to deposit portraits

In order to identify the ecological mire type, at least one (central) coring should be conducted. Deposits can be identified using the identification key and the deposit portraits. Subsequently, potential ecological mire types can be read off the deposit portrait for each occurring deposit. In combination with the following descriptions, the original ecological mire type can be assessed.

The following descriptions refer to the natural state of peatlands. In the case of drained and/or utilised peatlands, degraded and mainly eutrophic deposits can form a surface layer on all five ecological mire types → earthified peat (**1.16**), murshified peat (**1.17**).

Oligotrophic acidic mire

- Water supply: exclusively or mainly precipitation; more rarely additional supply by nutrient-poor, acidic mineral soil water.
- Vegetation of natural mires: pure peat moss lawns (*Sphagnum spp.*) or plant communities dominated by peat mosses, accompanied by tussock cotton grass (*Eriophorum vaginatum*), dwarf shrubs as heather (*Calluna vulgaris*), bog heather (*Erica tetralix*), bog blueberry (*Vaccinium uliginosum*), bog rosemary (*Andromeda polifolia*), crowberry (*Empetrum nigrum*) or small cranberry (*Oxycoccus palustris*); wooded sites characterised by scattered pine (*Pinus sylvestris*, *Pinus mugo*).

Relation to deposit portraits

Occurring peats

- Mainly peat moss peat (**1.1**) and cotton grass peat (**1.7**).
- Sometimes pod grass peat (**1.8**), dwarf shrub peat (**1.14**) or pine peat (**1.13**).
- Very rarely fine sedge peat (**1.4**), brown moss peat (**1.2**) or highly decomposed peat (**1.15**).

Mesotrophic acidic mire

- Water supply: moderately nutrient-poor, acidic mineral soil water.
- Vegetation of natural mires: more or less closed peat moss lawns (*Sphagnum spp.*), accompanied by various small or medium sedges such as *Carex rostrata*, *Carex lasiocarpa*, *Carex limosa*, *Carex canescens* or *Carex nigra* and herbaceous plants indicating mineral soil water such as wild calla (*Calla palustris*) or marsh fern (*Thelypteris palustris*); wooded sites characterised by eared willow (*Salix aurita*), downy birch (Betula *pubescens*), more rarely by pine (*Pinus sylvestris*, *Pinus mugo*), black alder (*Alnus glutinosa*) or common spruce (*Picea abies*).

Relation to deposit portraits

Occurring peats

- Mainly peat moss peat (**1.1**) and fine sedge peat (**1.4**).
- Sometimes pod grass peat (**1.8**), common reed peat (**1.5**), birch peat (**1.12**) or pine peat (**1.13**).
- Rarely cotton grass peat (**1.7**), dwarf shrub peat (**1.14**) or highly decomposed peat (**1.15**).
- Very rarely brown moss peat (**1.2**), coarse sedge peat (**1.3**), horsetail peat (**1.9**) or alder peat (**1.11**).

Mesotrophic subneutral mire

- Water supply: moderately nutrient-poor, base-rich mineral soil water.
- Vegetation of natural mires: sedge reeds rich in brown mosses and herbaceous plants; brown mosses (*Bryales*): all peat forming mosses not belonging to the peat moss genus *(Sphagnum)*, mainly comprising the genera *Hypnum*, *Calliergon*, *Scorpidium*, *Drepanocladus*, *Polytrichum*, *Meesia* and *Paludella*; sedges: various small or tall sedges such as *Carex diandra*, *Carex lasiocarpa*, *Carex dioica*, *Carex appropinquata*, *Carex elata*; various herbaceous plants such as bogbean *(Menyanthes trifoliata*), marsh cinquefoil *(Potentilla palustris*) and different orchids; wooded sites characterised by downy birch (Betula *pubescens*), laurel willow (*Salix pentandra*), grey willow (*Salix cinera*), sometimes intermixed with black alder (*Alnus glutinosa*).

Relation to deposit portraits

Occurring peats

- Mainly brown moss peat (**1.2**) and fine sedge peat (**1.4**).
- Sometimes coarse sedge peat (**1.3**), common reed peat (**1.5**), horsetail peat (**1.9**) or birch peat (**1.12**).
- More rarely saw-sedge peat (**1.6**), alder peat (**1.11**) or highly decomposed peat (**1.15**).

Mesotrophic calcareous mire

- Water supply: moderately nutrient-poor, calcareous mineral soil water.
- Vegetation of natural mires: bog-rush-reeds (*Schoenus nigricans, Schoenus ferrugineus*), saw-sedge-reeds (*Cladium mariscus*) or sedge reeds with *Carex lepidocarpa* or *Carex davalliana*, all rich in brown mosses, frequently with loose growing common reed (*Phragmites australis*); different herbaceous plants indicating calcareous mineral soil water such as blunt-flowered rush (*Juncus subnodulosus*), bird's-eye primrose (*Primula farinosa*), common butterwort (*Pinguicula vulgaris*), broad-leaved cotton grass (*Eriophorum latifolium*) and various orchids; wooded sites characterised by downy birch (Betula *pubescens*), laurel willow (*Salix pentandra*), grey willow (*Salix cinera*), sometimes intermixed with black alder (*Alnus glutinosa*).

Relation to deposit portraits

Occurring peats:

- Mainly saw-sedge peat (**1.6**), brown moss peat (**1.2**) and fine sedge peat (**1.4**).
- Sometimes common reed peat (**1.5**).
- More rarely coarse sedge peat (**1.3**), horsetail peat (**1.9**), alder peat (**1.11**) or highly decomposed peat (**1.15**).

Eutrophic mire

- Water supply: nutrient-rich, acidic to calcareous mineral soil water.

- Vegetation of natural mires: often vigorous with a few dominant species; tall sedge reed species such as *Carex acutiformis*, *Carex acuta*, *Carex elata*, *Carex paniculata* or *Carex riparia*; dense reeds dominated by common reed (*Phragmites australis*), reed mannagrass (*Glyceria maxima*) or reed canary grass (*Phalaris arundinacea*); further nutrient indicators such as purple loosestrife (*Lythrum salicaria*), yellow water iris (*Iris pseudacorus*) or marsh marigold (*Caltha palustris*); wooded sites characterised by grey willow (*Salix cinera*) and black alder (*Alnus glutinosa*).

Relation to deposit portraits

Occurring peats

- Mainly coarse sedge peat (**1.3**), common reed peat (**1.5**), alder peat (**1.11**) or highly decomposed peat (**1.15**).
- Sometimes horsetail peat (**1.9**) or salt marsh peat (**1.10**).
- Very rarely brown moss peat (**1.2**) or fine sedge peat (**1.4**).