E1.B Heavy-metal grassland of western and central Europe

Summary

This habitat comprises short open swards with a distinctive metallophyte component, occurring on shallow, skeletal soils over natural rock exposures with heavy metals in Western and Central Europe, on mine spoil or ground contaminated by dust and waters from such sources. Such grasslands form a highly localised element in other landscapes, colonising slowly and sustained by the extreme environment, though also sometimes dependent on grazing by wild herbivores for maintaining early successional stages which are richer in cryptogams. Encroachment from around by shrubs and trees, quarrying, land development and disturbance pose threats and there have been very substantial losses in extent and quality. With limited potential for restoration, the best appproach to sustaining the habitat is protection.

Synthesis

Based on a recent reduction of over 50% in area, the habitat type is Endangered (EN). Both the long-term quantitative reduction and the small current area of occurrence would result in a Vulnerable status (VU). A significant reduction in biotic and abiotic quality results in a Near-threatened status (NT).

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Endangered	A1	Endangered	A1

Sub-habitat types that may require further examination

No sub-habitats need to be distinguished for further assessment.

Habitat Type

Code and name

E1.B Heavy-metal grassland of western and central Europe

Heavy metal grassland in Theux in Belgium, the type locality of *Viola calaminaria* (Photo: J.A.M. Janssen).

Heavy metal grassland in Breiningerberg, Germany (Photo: J.A.M. Janssen).

Habitat description

This habitat comprises dry, short grasslands on soils with a high natural or anthropogenic content of heavy metals such as zinc, lead, copper, nickel, cobalt, cadmium or chromium, occurring in western and central Europe. The characteristic plant taxa (mostly subspecies or ecotypes) are metallophytes, species that developed various mechanisms for tolerating these heavy metals in the soil. The vegetation often has an

open cover of vascular plants and is rich in lichens and mosses. The typical grasslands of the order *Violetalia calaminaria* are dominated by metallophytes, but on non-optimal sites also grasslands of other types (belonging to the classes *Koelerio-Corynephoretea*, *Festuco-Brometea*, *Molinio-Arrhenatheretea*) may contain lower numbers of metallophytes, and these also are regarded as belonging to this Red List type.

Heavy metal grasslands of this habitat are found in Ireland, England and Scotland, Northeast-Belgium and adjacent Netherlands, Northern France, Germany, Poland, Austria and Slovenia. They occur on natural sites where bedrocks with zinc or lead lie close to or at the surface. Secondary habitats have been created by mining the metal ores, which has resulted in contaminated soils in the vicinity of mines, along transporting routes and in storage areas. Tertiary locations occur where heavy metals have contaminated the soil by air or water transport from other sources. In many places, grazing by wild herbivores such as rabbits helps maintain an open sward and prevents the disappearance of cryptogam-rich early stages in the development of the vegetation and the greater dominance of grasses and dicotyledons.

Exploitation of the heavy metals ores is recorded from Roman times, but has probably occurred since the Bronze Age. Exploitation increased strongly from the Middle Ages, with an optimum industrial exploitation in the 19th century. In that period, the Belgian area of La Calamine (Kelmis) and Plombières (Bleiberg) was the world centre of zinc mining. Ores were transported to this area from mines in the surrounding to be washed and processed and because of this industry large amounts of zinc have been loaded into the environment, especially into the river Geul (Geulle), resulting in tertiary sites of metallophytes in its floodplain grasslands. The maximum distribution of the habitat type probably occurred in the first half of the 20th century.

In habitat type E1.B only those heavy metal grasslands are included that have traditionally been placed in the order *Violetalia calaminariae*. In several countries, inside and outside the range of this order, other habitats occur on metal-rich soils, like grasslands and scree vegetation on ultramafic soils (serpentine soils and other copper-rich soils). These habitats are not included here, but are considered under other grassland or scree types. According to this definition, the resulting Red List type E1.B is equivalent to the Annex 1 habitat type 6130.

Indicators of good quality:

In good conditions these grasslands are rich in and dominated by metallophytes. In heavily contaminated spots even 100 years after mining no plants may grow at all. In soils with low concentration of heavy metals and where grazing declines, succession slowly leads to overgrowing with taller grasses (for instance *Holcus lanatus*) or shrubs and trees. In such cases, sites may be managed by mowing, removing trees and shrubs or sod cutting. Eutrophication, manuring and addition of chalk reduces the availability of zinc to the plants, causing a decrease in metallophytes.

The following characteristics are indicators of good quality:

·   High cover of metallophytes

·   Areas with open soil and characteristic lichens

·   Low vegetation structure

·   Low cover of encroaching tall grasses, tall herbs and shrubs

Characteristic species:

Flora

Vascular plants: *Agrostis capillaris*, *Armeria maritima* subsp. *halleri* (including subsp. *bottendorfensis* and subsp. *hornburgensis*), *Cardaminopsis halleri*, *Cochlearia pyrenaica*, *Festuca ovina* subsp. *ophioliticola*,

Festuca rubra, *Galium verum*, *Holcus mollis*, *Minuartia verna* var. *hercynica*, *Pimpinella saxifraga*, *Potentilla tabernaemontani*, *Rumex acetosella*, *Silene otites*, *Silene vulgaris* subsp. *humilis*, *Spergularia rubra*, *Thlaspi caerulescens* subsp. *calaminaria*, *Viola calaminaria*, *Viola guestphalica*.

Bryophytes: *Polytrichum piliferum, Riccia bischoffii.*

Lichens: *Cladonia pocillum, Diploschistes scruposus.*

Fauna

The heavy metal vegetation typically contains fauna species of dry, steppic grasslands, which are also (and in higher numbers) found in other dry grasslands and heathlands.

Classification
This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

E1.B Heavy metal grasslands

EuroVegChecklist:

Thlaspion calaminarii Ernst 1965

Armerion halleri Ernst 1965

Annex 1:

6130 Calaminarian grasslands of the *Violetalia calaminariae*

Emerald:

E1.B Heavy-metal grassland

MAES-2:

Terrestrial grasslands

IUCN:

4.4 Temperate grassland

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?
No

<u>Justification</u>
Geographic occurrence and trends

EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Austria	Present	1 Km^2	Decreasing	Decreasing
Belgium	Present	0.51 Km^2	Unknown	Decreasing
France	France mainland: Present	1.5 Km^2	Decreasing	Decreasing
Germany	Present	2 Km^2	Decreasing	Decreasing
Ireland	Present	0.14 Km^2	Decreasing	Decreasing
Netherlands	Present	0.006 Km^2	Decreasing	Decreasing

EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Slovenia	Present	0.79 Km^2	Stable	Stable
UK	Northern Island: Uncertain United Kingdom: Present	8 Km^2	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	1505800 Km^2	186	15 Km^2	
EU 28+	1505800 Km^2	186	15 Km^2	

Distribution map
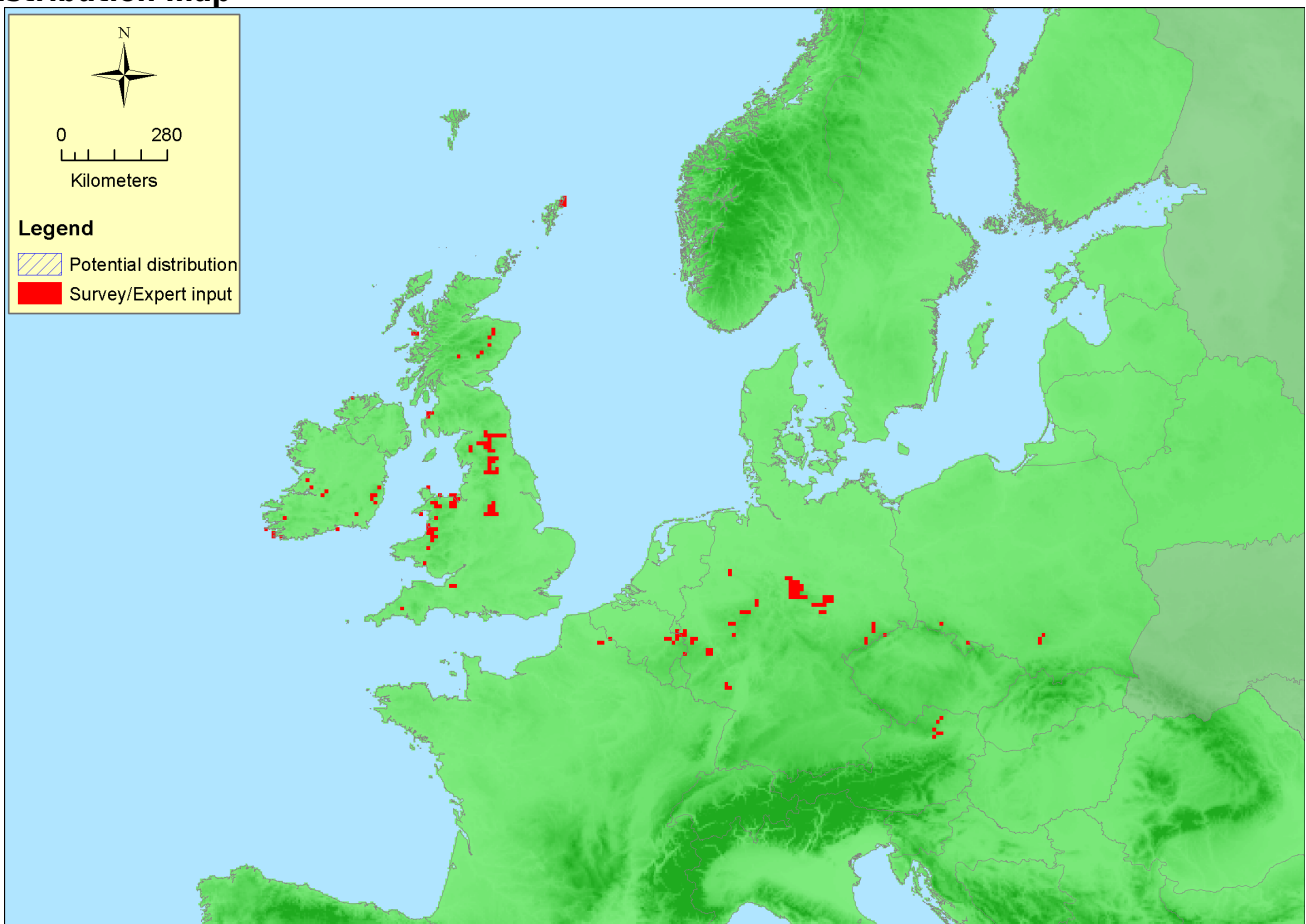
The map is rather complete. Data sources: Art17, EVA.

How much of the current distribution of the habitat type lies within the EU 28?

100%

Trends in quantity

Recent trend EU28: -55% - EU28+: -55% (based on 96.6% of the total area reported). Long-term trend EU28: -60% - EU28+: -60% (based on 20% of the total area reported). For the future, most countries assume a continuation of the decrease, while Germany expects +/- stable areas and Belgium even a slight increase.

- Average current trend in quantity (extent)
  EU 28: Decreasing
  EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?
  No
  Justification
  EOO is >> 50,000 km².
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  No
  Justification
  Although the overall AOO is very small, the locations few and small, the overall range EOO is >> 50,000 km².

Trends in quality

Within EU28, 60% of the remaining area are degraded with 43% severity. Since the habitat type is restricted to EU28, the values for EU28+ are the same.

- Average current trend in quality
  EU 28: Decreasing
  EU 28+: Decreasing

Pressures and threats

The main threat to this habitat is the slow natural succession that occurs on metal-rich rocks or after the heavy-metal rich contaminants have been deposited. With time part of the heavy metals are leached or become less plant available, so that the site conditions become less extreme, allowing the development towards other habitat types. Also grazing by wild herbivores often assists in keeping the cover of vascular pl;ants low. Furthermore, nowadays no new sites are established since laws would prevent open deposition of heavy metal rich material. The remaining small sites might also be negatively affected by afforestation, abandonment of grazing systems, trampling or atmosphreic eutrophication.

List of pressures and threats

Agriculture

>   Abandonment of pastoral systems, lack of grazing

Sylviculture, forestry

>   Forest planting on open ground (native trees)

Natural System modifications

>   Recultivation of mining areas

Natural biotic and abiotic processes (without catastrophes)

  Abiotic (slow) natural processes
  Biocenotic evolution, succession

Conservation and management

Ultimately, the gradual shrinkage of the area of this habitat type due to abiotic and biotic succession can hardly be prevented. Grazing by stock, which is one standard measure to keep other semi-natural habitats open, cannot be recommended in this case because the plant material contains toxic concentrations of heavy metals, though access to wild herbivores can be maintained. The only sure way to counteract

succession and keep at least some sites of the endemic heavy metal plants can be mowing and removal of woody encroachment, but also then the question is how to get rid of this contaminated plant material. Since the remaining sites are small, they should at least be legally protected and any damage by quarrying, construction activities or trampling be prevented as far as possible.

List of conservation and management needs

No measures

No measure known / impossible to carry out specific measures

Measures related to agriculture and open habitats

Maintaining grasslands and other open habitats

Measures related to spatial planning

Establish protected areas/sites

Conservation status

Annex I:

6130 ALP U1, ATL U2, CON XX, MED U1

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

When overgrown by tall forbs or woody species, mowing or removal of woody encroachment can help, but this cannot counteract in the long run the leaching of heavy metals.

Effort required

10 years
Through intervention

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	55 %	Unknown %	Unknown %	60 %
EU 28+	55 %	Unknown %	Unknown %	60 %

The values for A1 and A3 are calculated from the territorial data sheets, which provided trend data for 8 and 3 countries, for the 50-yr and long-term trend, respectively. The provided data were far too incomplete to allow assessment of A2a and A2b.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km^2	-	-		<= 50	-	-		no
EU 28+	>50000 Km^2	-	-		<= 50	-	-		no

EOO is far larger than the criterion B1. However, the occurrences are highly localised to sites with heavy metal mining, so that the area of occurrence (AOO) likely equals about 50 grid cells.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	60 %	43 %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	60 %	43 %	Unknown %	Unknown %	Unknown %	Unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	Unknown %	Unknown%	Unknown %	Unknown%	Unknown %	Unknown%
EU 28+	Unknown %	Unknown%	Unknown %	Unknown%	Unknown %	Unknown%

The data for C/D1 were calculated from the territorial data sheets, which provided assessments for 9 countries. No data were available for C/D2 and C/D3. The degradation quality refers to both biotic features and abiotic circumstances.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	Unknown
EU 28+	Unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat type.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	EN	DD	DD	VU	LC	VU	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	EN	DD	DD	VU	LC	VU	LC	NT	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Endangered	A1	Endangered	A1

Confidence in the assessment
Medium (evenly split between quantitative data/literature and uncertain data sources and assured expert knowledge)

Assessors
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