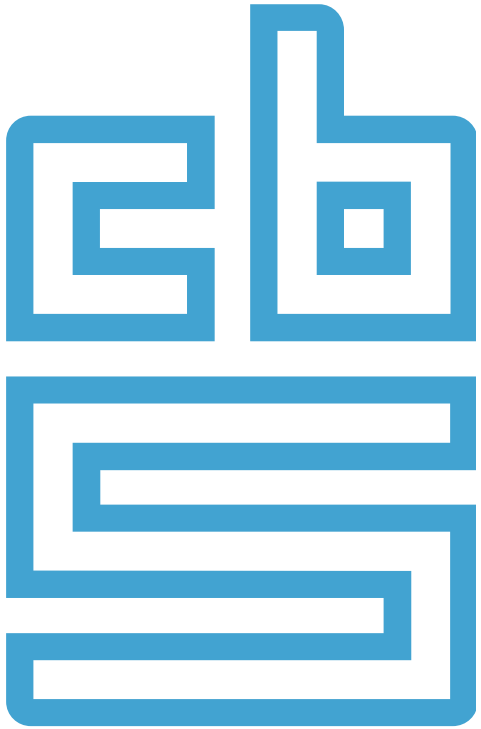


Crosswalking Netherlands Ecosystem Types vs IUCN-GET and USGS-WTE

Patrick Bogaart (CBS Statistics Netherlands)

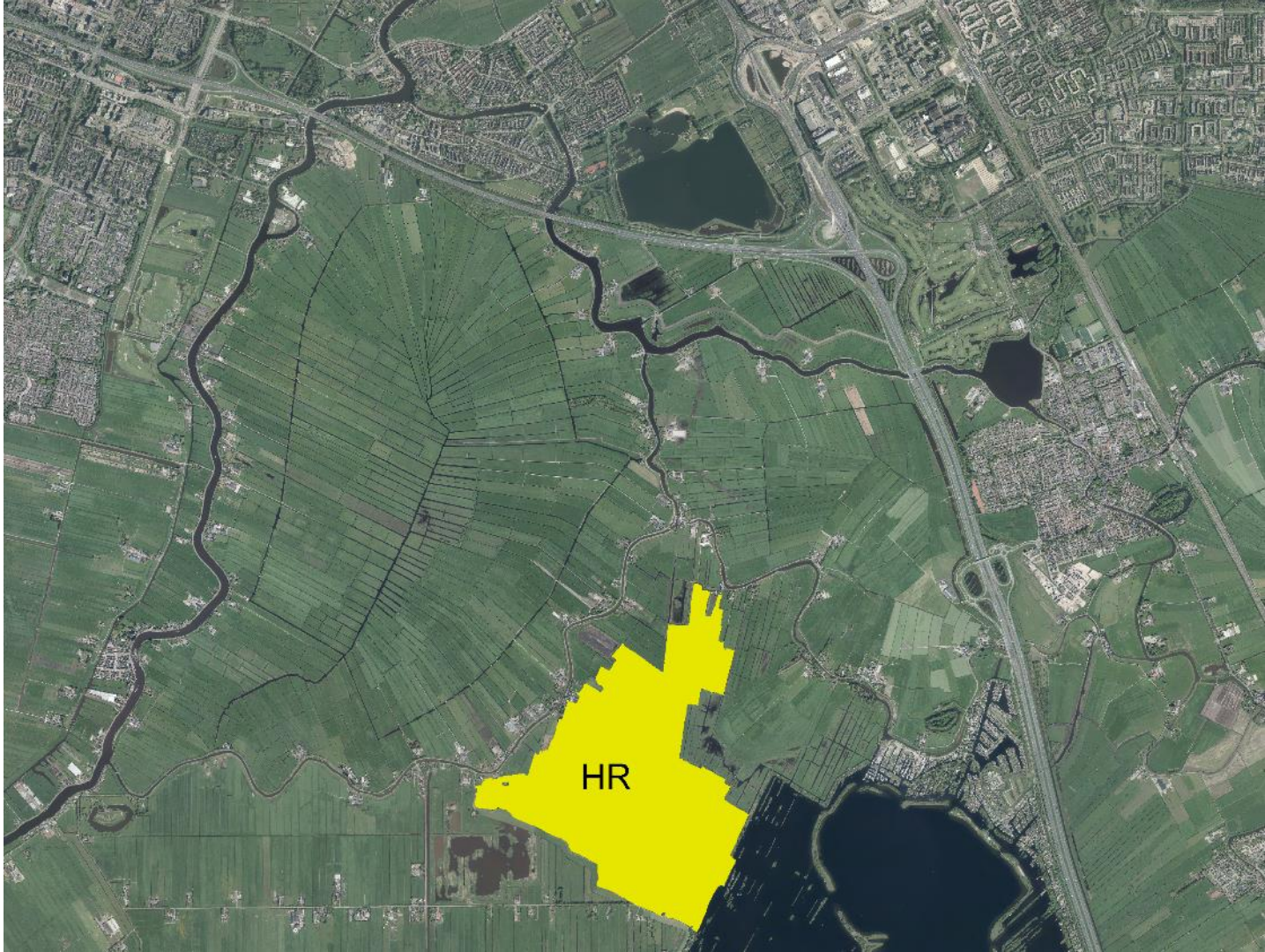
SEEA-EEAForum of Experts; June 23-24, 2020

NLD

polder area

Just South of Amsterdam

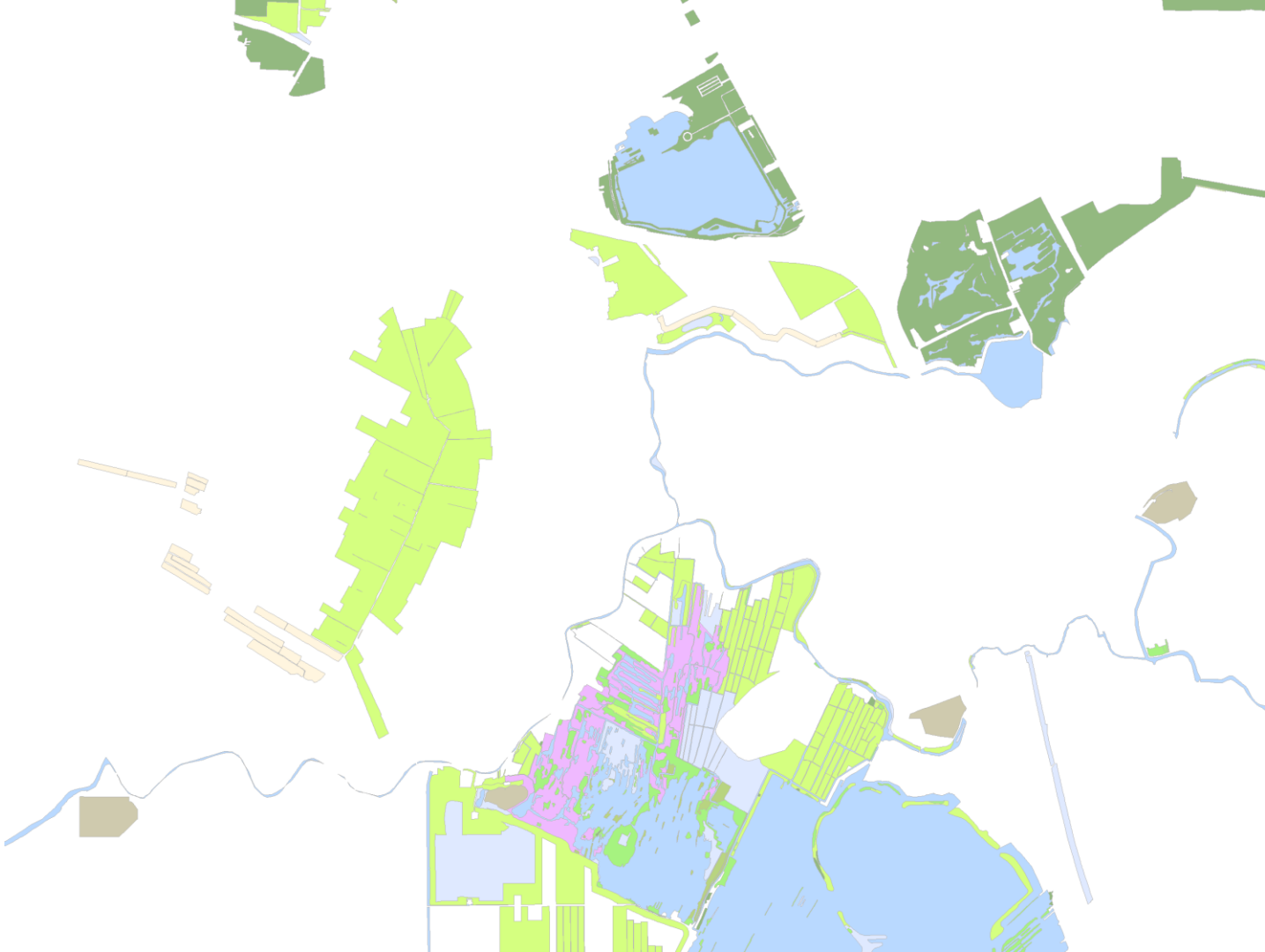
Natura-2000



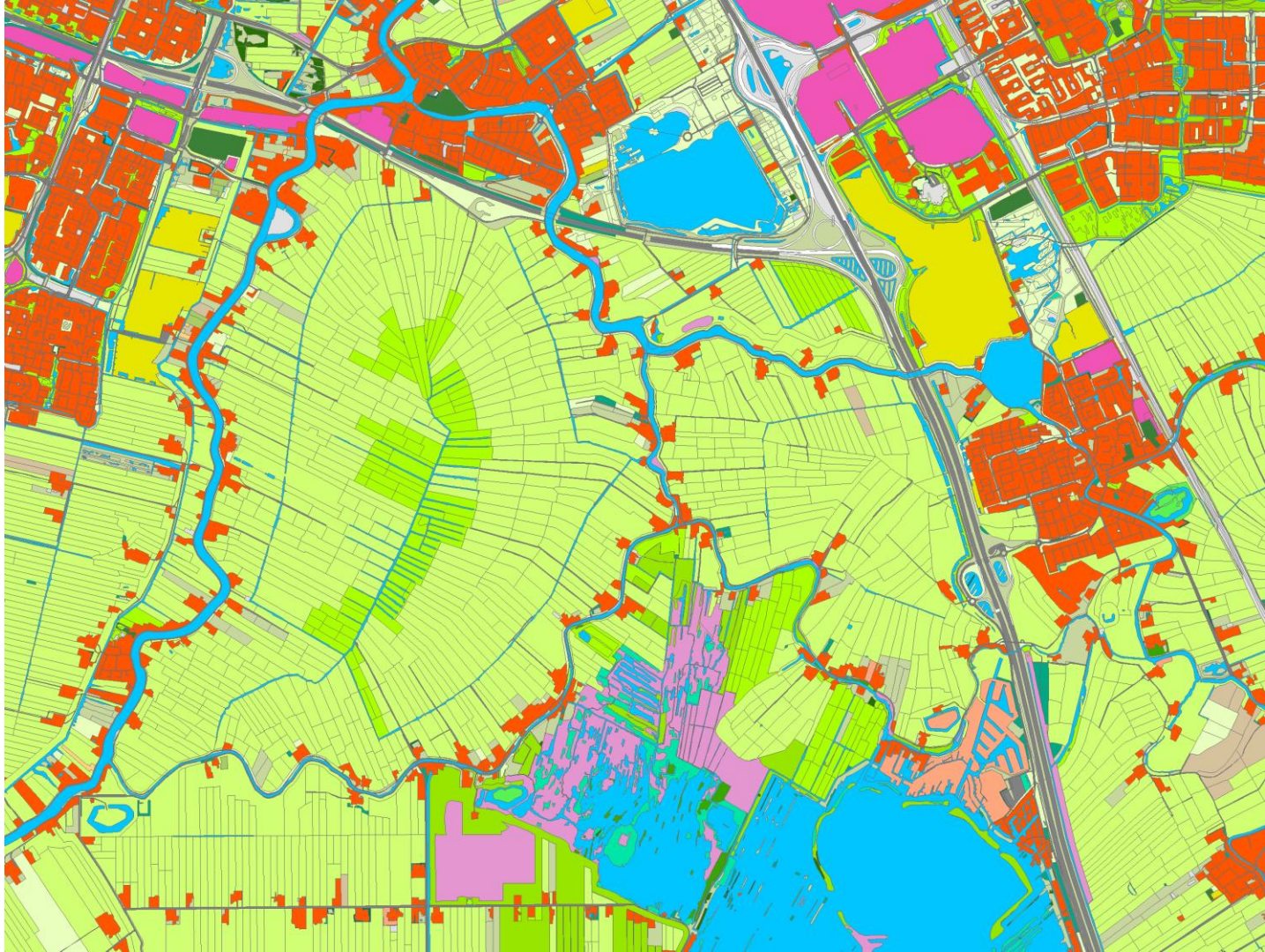
1:10.000 topographic maps

Agricultural parcel registry

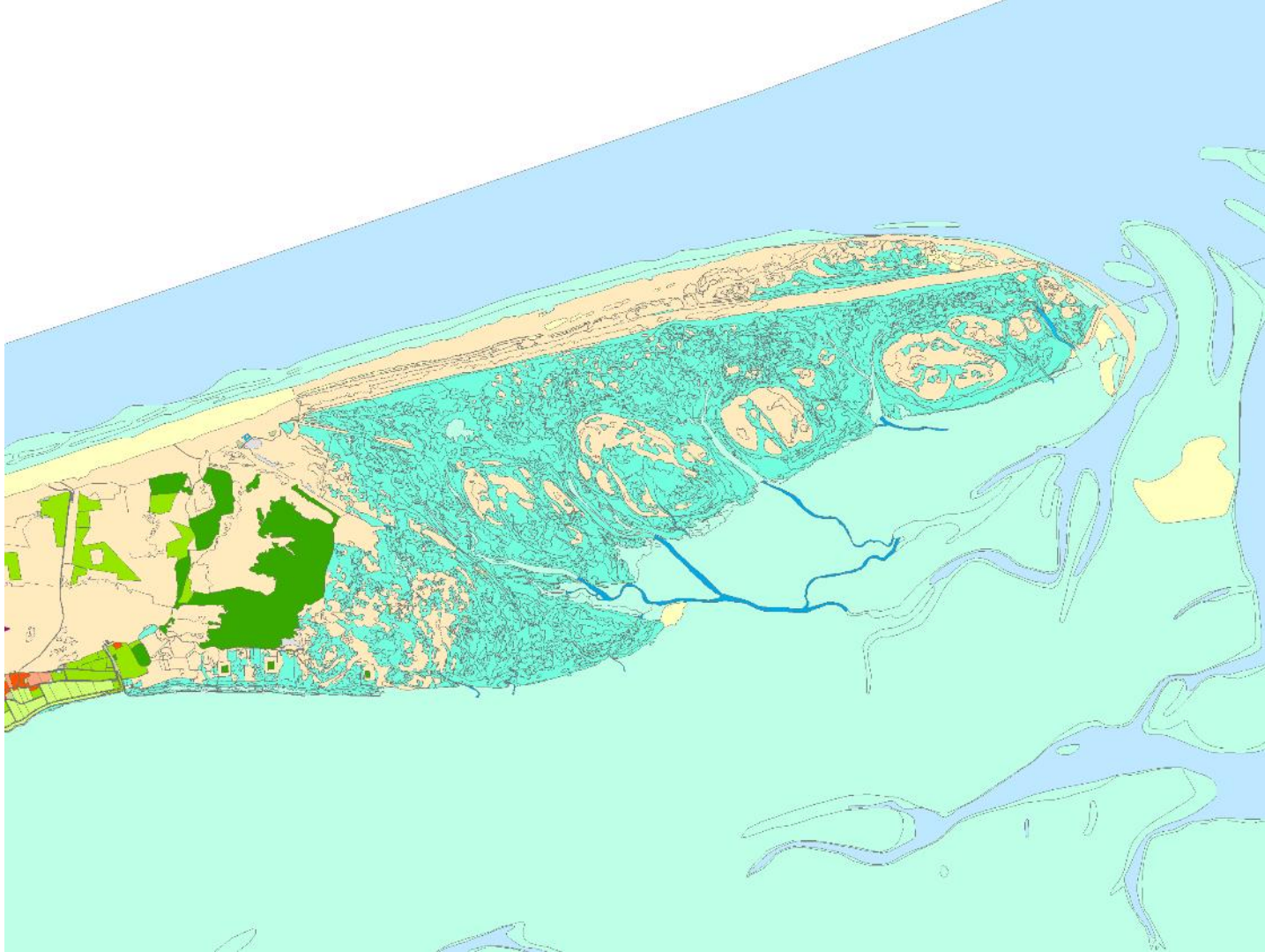
Nature managemen types



Ecosystem Types



Ecosystem Types



Identifying Ecosystem Types by linking local Nature management types to IUCN GET

IUCN			NL Ecosystem Types		Nature Management Types	EUNIS Habitat types
Realm	Biome	Functional group	2006/2013	2018	(Eng)	(Eng)
Terrestrial	T1 Tropical-subtropical forests	(none)				
	T2 Temperate-boreal forests & woodlanc	T2.1 Boreal and temperate montane forests and woodlands				
		T2.2 Temperate deciduous forests	*21 Deciduous forest*	***Semi-natural forest***	N14.03 Carpinus/Fraxinus forest	9160 : Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpini
			11 Coastal dunes (veg.)		N15.01 Dune forests	2180 : Wooded dunes of the Atlantic, Continental and Boreal region
			23 Mixed forest		N15.02 Pine/oak/beech forest	9190 : Old acidophilous oak woods with Quercus robur on sandy plains
						9120 : Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the
						9110 : Luzulo-Fagetum beech forests
		T2.3 Oceanic temperate rainforests				
		...				
	T3 Shrublands & shrubby woodlands	T3.1 Seasonally dry tropical shrublands				
		T3.2 Seasonally dry temperate heaths and shrublands				
		T3.3 Cool temperate heathlands	24 Heathland	**Dry heath**	N07.01 Dry heathland	2310 : Dry sand heaths with Calluna and Genista
						2320 : Dry sand heaths with Calluna and Empetrum nigrum
						4030 : European dry heaths
						5130 : Juniperus communis formations on heaths or calcareous grasslands
			25 Driftsand	**Driftsand**	N07.02 Inland dunes	2330 : Inland dunes with open Corynephorus and Agrostis grasslands
		T3.4 Rocky pavements, screes and lava flows				
	T4 Savannas and grasslands	T4.1 Trophic savannas				
		...				
		T4.5 Temperate grasslands	*27 Semi-nat. grasslands*	**Semi-natural grasslands**	N10.01 Wet poor meadows	6410 : Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion ca
						7140 : Transition mires and quaking bogs
						7230 : Alkaline fens
					N10.02 Moist hay meadows	6510 : Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
~						6410 : Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion ca
						7140 : Transition mires and quaking bogs
						7230 : Alkaline fens
					N11.01 Dry poor meadows	6210 : Semi-natural dry grasslands and scrubland facies on calcareous substrates (Fe
						6130 : Calaminarian grasslands of the Violetalia calaminariae
						6230 : Species-rich Nardus grasslands, on silicious substrates in mountain areas (and
						6210 : Semi-natural dry grasslands and scrubland facies on calcareous substrates (Fe
					N12.02 Herb-rich grassland	6510 : Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
						1330 : Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
					N12.03 Arrhenatherum hay meadow	6510 : Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)
					N12.04 Saline and flooded grassland	1330 : Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
						1310 : Salicornia and other annuals colonizing mud and sand

Extensively managed semi-natural grasslands

T7 Intensive land use systems	T7.1 Croplands	1 Annuals	**Cropland (intensive)**	–	
		2 Perennials	**Perennials (intensive)**	–	
	T7.2 Sown pastures and old fields	4 Pastures	**Pastures (intensive)**	–	
	T7.3 Plantations	*21 Deciduous forest*	**Production and other forest**	*N16.03 Dry production forest*	*9190 : Old acidophilous oak woods with Quercus robur on sandy plains*
					9120 : Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or I
		22 Needleleaf forest		*N16.04 Moist production forest*	*91E0 : Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*
					9120 : Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or I
					9160 : Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli
					9190 : Old acidophilous oak woods with Quercus robur on sandy plains
	Txx Intensive horticulture	3 Greenhouses	**Greenhouses**		
		(none)	**Open-air container horticulture**		
	T7.4 Urban and infrastructure land	41 Residential	**Residential (urban)**		
			Residential (rural)		
		42-48 Offices and businesses	**Industrial/business parks**		
			Mining pits etc.		
		27 Public green space	**Public green space**		
			Sports park		
			Semi-public recreational		
			Recreation (accomodation)		
		45 Infrastructural / paved	**Infrastructure**		
		6 Farmyards and barns	**Residential (rural)**		
T8* Extensive land use systems	T8.1* Extensive croplands	1 Annuals	**Cropland (extensive)**	N12.05 Herb-rich cropland	
				A01.02 Croplands (fauna supporting)	
				A01.03 Geese foraging areas	
				A02.02 Croplands w. high floral value	
				A12.01 Croplands (breeding birds habitat)	
				A12.02 Croplands (winter birds habitat)	
				A12.03 Croplands (Hamster habitat)	
		2 Perennials	**Perennials (extensive)**	L01.09 Traditional orchards	
	T8.2* Extensive pastures	27 Semi-nat. grasslands	**Pastures (extensive)**	N13.01 Moist farmland bird grassland	
				N13.02 wintering migrant bird meadow	
				A01.01 Meadow birds	
				A01.03 Geese foraging areas	
				A01.04 Insect-rich grassland	
				A02.01 Pastures w. high floral values	
				A11.01 Meadow birds (open landscape)	
				A11.02 Meadow birds (reed, high veg.)	
				A11.03 Winter birds	
	T8.3* Extensive Plantations	*21 Deciduous forest*	***Semi-natural forest***	N17.02 Dry coppice	9190 Old acidophilous oak woods with Quercus robur on sandy plains
		22 Needleleaf forest			9120 : Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae c
		23 Mixed forest			9110 : Luzulo-Fagetum beech forests
					2180 : Wooded dunes of the Atlantic, Continental and Boreal region
				N17.06 Moist coppice	91E0 : Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion) incanae, Salicion albae)
					91F0 : Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, al
					9160 : Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli
				N17.03 historical estate forest	
				N17.04 Duck decoys	
				N17.05 Willow coppice	91E0 : Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	T8.4* Other extensive rural	5 Field borders, hedgerows etc	**Hedgerows etc**	N12.01 flower dyke	
				L01.02 Tree hedge	
				L01.03 Alnus tree hedge	
				L01.05 Clipped hedgerow	
				L01.06 Shrub hedgerow	
				L01.07 Tree-lined lane	
		-		L01.08 Pollard tree	
		29 Other unpaved	**Fallow & other extensive use**		
				N12.06 Rough grass and shrubs	

Terrestrial Ecosystem Types

Group	Ecosystem Type	Functional group	T2.1 Boreal and montane needle-leaved forest and woodland	T2.2 Temperate deciduous forests and shrublands	T3.2 Seasonally dry temperate heaths and shrublands	T3.3 Cool temperate heathlands	T3.4 Rocky pavements, screes and lava flows	T4.4 Temperate wooded savannas	T4.5 Temperate grasslands	T5.4 Cool temperate deserts	T7.1 Croplands	T7.2 Sown pastures and old fields	T7.3 Plantations	T7.4 Urban and infrastructure lands		Tally check	max	#candidate EFGs
Wet semi natural	Seminat. forest		0.2	0.8												1	0.8	2
	other forest		0.2	0.2									0.6			1	0.6	3
	tree lines			0.33									0.3			0.66	0.33	2
	Heathland					1										1	1	1
	Driftsand					0.2										0.2	0.2	1
	Seminat. Grassland							0.25	0.25			0.25				0.75	0.25	3
	Other unpaved															0	0	0
Agriculture	Cropland (intensive used)										1					1	1	1
	Cropland (extensive)										0.5					0.5	0.5	1
	Pasture (intensive)											1				1	1	1
	Pasture (extensive)								0.5			0.5				1	0.5	2
	Perennials (intensive)												0.8			0.8	0.8	1
	Perennials (extensive)												0.4			0.4	0.4	1
	Field borders										0.2	0.2				0.4	0.2	2
	Fallow										0.5	0.5				1	0.5	2
	Green houses													1		1	1	1
	Pots & container horticulture										0.2		0.2	0.2		0.6	0.2	3
Built-up	Built up (urban)													1		1	1	1
	Built up (rural)													1		1	1	1
	Industrial estate													1		1	1	1
	Other terrain use													1		1	1	1
	Infrastructure													1		1	1	1
	Sport park													1		1	1	1
	Public park													0.5		0.5	0.5	1
	Leisure													0.5		0.5	0.5	1
	Recreational residence													0.5		0.5	0.5	1

Wetland/water/coastal ecosystem types

Major type	List of national or regional units	Functional group	TF1.2 Subtropical/temperate forested wetlands	TF1.3 Permanent marshes	TF1.4 Seasonal floodplain marshes	TF1.6 Boreal, temperate and montane peat bogs	TF1.7 Boreal and temperate fens	F 1.2 Permanent lowland rivers	F1.7 Large lowland rivers	F2.1 Large permanent freshwater lakes	F2.2 Small permanent freshwater lakes	F3.1 Large reservoirs	F3.2 Constructed lacustrine wetlands	F3.4 Freshwater Aquafarms	F3.5 Canals and storm water drains	FM 1.2 Permanently open riverine estuaries and bays	M1.7 Subtidal sandy bottoms	M1.8 Subtidal muddy bottoms	M2.1 Epipelagic ocean waters	MT1.2 Muddy Shores	MT1.3 Sandy Shores	MT1.4 Boulder/cobble shores	TM2.1 Coastal shrublands and grasslands	MT3.1 Artificial shores	MFT 1.1 Coastal river deltas	MFT 1.3 Coastal saltmarshes	Tally check	max	#candidate EFGs
Wetlands	Swamp forest		1																								1	1	1
	Fens & marshes			0.5			0.5																				1	0.5	2
	Bogs etc					1																					1	1	1
	Riverine wetlands			0.3	0.66																						0.99	0.66	2
Fresh water	Rivers							0.5	0.5																		1	0.5	2
	Streams							1																				1	1	1
	Canals															1														
	Freshwater lakes									0.3	0.3	0.1	0.3														1	0.3	4
	Brackish lakes									0.2	0.2															0.2		0.6	0.2	3
Coastal	Open coastal dunes																							1				1	1	1
	Beaches																					1						1	1	1
	Salt marshes																						0.2				0.8	1	0.8	2
	Tidal mudflats															0.2												0.2	0.2	1
	Wadden sea (water)															1												1	1	1
	Wadden sea (floor)																0.5	0.5												
	Estuaria															1												1	1	1
	Sea (water)																		1											
	Sea (floor)																1											1	1	1

Conclusions 1: IUCN-GET

- Most (30/44; 68%) national ET's match single EFG
  - Otherwise: 0 (1x); 2 (9x); 3(3x) 4 (1x) EFGs
- Most (28/44; 64%) are fully covered by EFGs
  - Otherwise: 11x less than 50%
- Many issues with non-equilibrium semi-natural ETs
  - Extensively managed (former) pastures, tree lines, etc.
  - Heathland, driftsand, etc.
- Many urban ETs
  - GET-EFGs too coarse for national purposes

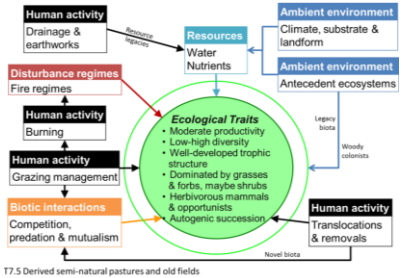
T7.5 Derived semi-natural pastures and old fields

Biome: T7 Intensive anthropogenic terrestrial ecosystems ***Realm***: Terrestrial

Ecological traits: Extensive 'semi-natural' grasslands and open shrublands exist where woody components of vegetation have been removed or greatly modified for agricultural land uses. Hence they have been 'derived' from a range of other ecosystems (mostly from biomes T1-T4, a few from T5). Remaining vegetation includes a substantial component of local indigenous species, as well as an introduced exotic element, providing habitat for a mixed indigenous and non-indigenous fauna. Although structurally simpler than the systems from which they were derived, they often harbour an appreciable diversity of native organisms, including some no longer present in 'natural' ecosystems. Dominant plant growth forms include tussock or stoloniferous grasses and forbs, with or without non-vascular plants, shrubs and scattered trees. These support microbial decomposers and diverse invertebrate groups that function as detritivores, herbivores and predators, as well as vertebrate herbivores and predators characteristic of open habitats. Energy sources are primarily autochthonous, with varying levels of indirect allochthonous subsidies (e.g. via surface water sheet flows), but few managed inputs (cf. T7.2). Productivity can be low-high, depending on climate and substrate, but is generally lower and more stable than more intensive anthropogenic systems (T7.1-T7.3). Trophic networks include all levels, but complexity and diversity depends on the species pool, legacies from antecedent ecosystems, successional stage, and management regimes. These novel ecosystems may persist in a steady self-maintaining state, or undergo passive transformation (e.g. oldfield succession) unless actively maintained in disequilibrium. For example, removal of domestic herbivores may initiate transition to tree-dominated ecosystems.

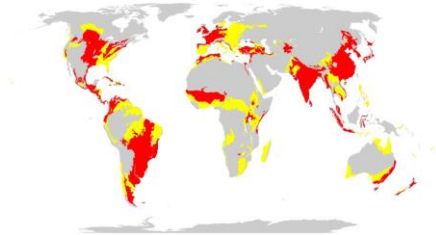
Semi-natural grassland, South Downs, England.
Source: David Keith (2018)

Key ecological drivers: Availability of water and nutrients varies depending on local climate, substrate and terrain (hence surface water movement and infiltration). The structure, function and composition of these ecosystems are shaped by legacy features of antecedent systems from which they were derived, as well as ongoing and past human activities. These activities may reflect production and/or conservation goals, or abandonment. They include active removal of woody vegetation, management of vertebrate herbivores, introductions of biota, control of 'pest' biota, manipulation of disturbance regimes, drainage and earthworks, etc. Fertilisers and pesticides are not commonly applied.



T7.5 Derived semi-natural pastures and old fields

Distribution: Mostly in temperate to tropical climatic zones across all land masses.



References:

Cramer VA, Hobbs RJ, Standish RJ (2008) What's new about old fields? Land abandonment and ecosystem assembly. *Trends in Ecology & Evolution* **23**, 104-112

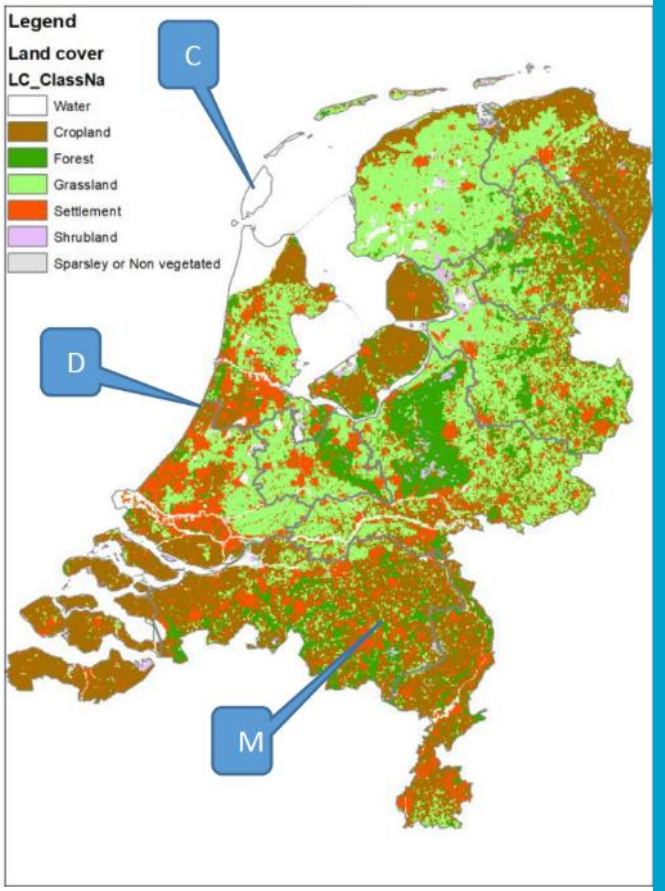
García-Feced, Weissteiner CJ, Baraldi A, Paracchini MA, Maes J, Zulian G, Kempen M, Elbersen B, Pérez-Sob M (2015) Semi-natural vegetation in agricultural land: European mapand links to ecosystem service supply. *Agronomy for Sustainable Development* **35**, 273–283

Krauss J, Bommarco R, Guardiola M, Heikkinen RK, Helm A, Kuussaari M, Lindborg R, Öckinger E, Pärtel M, Pino J, Pöyry J, Raatikainen KM, Sang A, Stefanescu C, Teder T, Zobel M, Steffan-Dewenter I (2010) Habitat fragmentation causes immediate and time delayed biodiversity loss at different trophic levels. *Ecology Letters* **13**, 597–605

NLD LCEU (2013)

USGS WTE

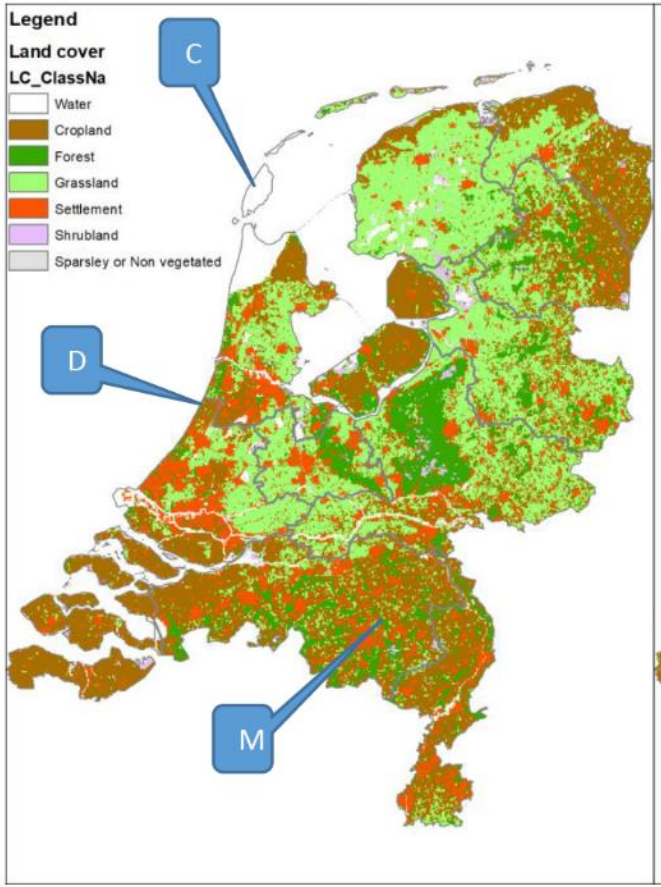
NLD LCEU types (2013)	
Agriculture	1 Annuals
	2 Perennials
	3 Greenhouses
	4 Pastures
	5 Field borders, hedgerows etc
	6 Farmyards and barns
Coastal	11 Coastal dunes (vegetated)
	12 Coastal dunes (open)
	13 Beaches
(Semi-)natural	21 Deciduous forest
	22 Needleleaf forest
	23 Mixed forest
	24 Heathland
	25 Driftsand
	26 Wetlands
	27 Semi-natural grasslands
	28 Public green space
	29 Other unpaved
Inundated	31 Floodplains
	32 Salt Marsh
Built-up	41 Residential
	42-48 Offices and businesses
	45 Infrastructural / paved

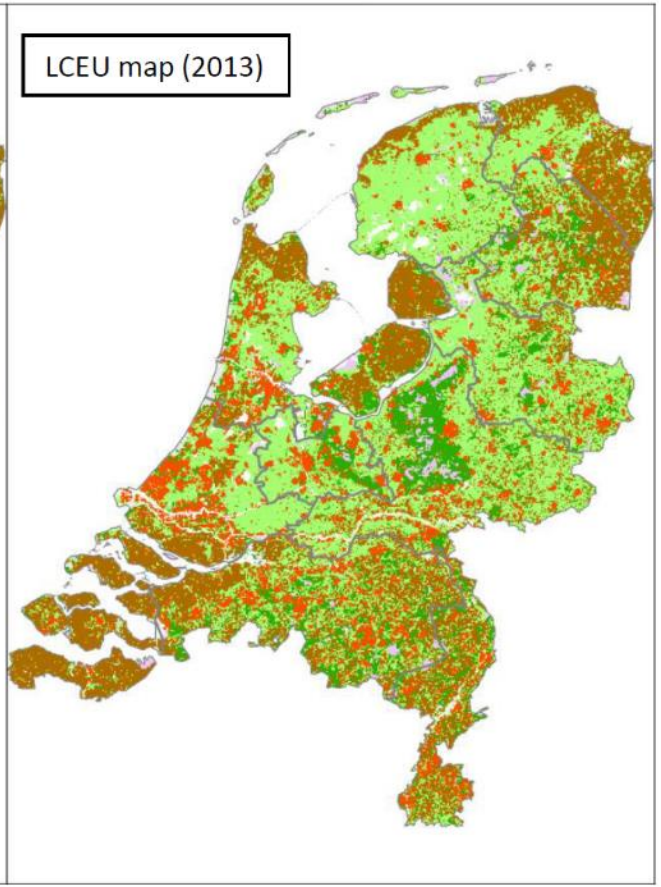


USGS WTE

NLD LCEU (clustered)

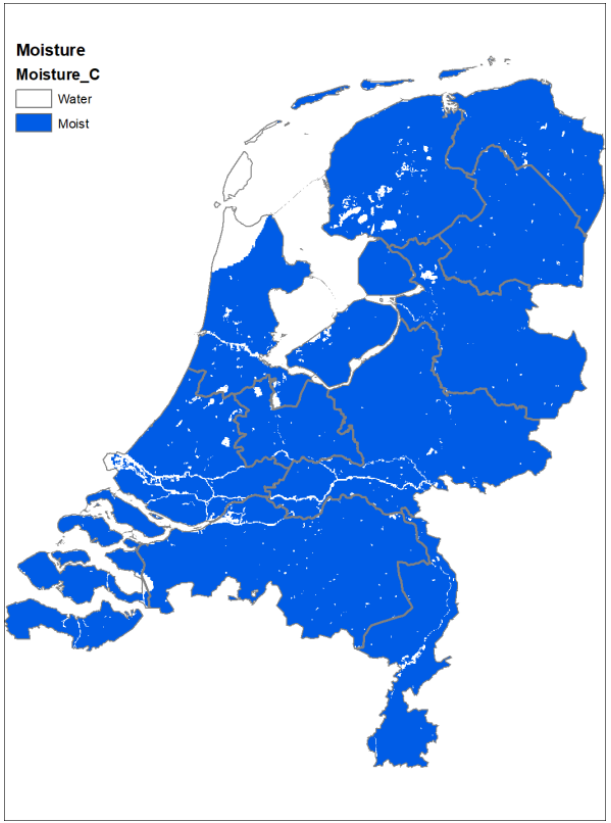
NLD LCEU types (2013)		USGS/ESRI WE
Agriculture	1 Annuals	Croplands
	2 Perennials	Croplands
	3 Greenhouses	Settlements
	4 Pastures	Grassland
	5 Field borders, hedgerows etc	Grassland
	6 Farmyards and barns	Settlements
Coastal	11 Coastal dunes (vegetated)	
	12 Coastal dunes (open)	
	13 Beaches	
(Semi-)natural	21 Deciduous forest	Forest
	22 Needleleaf forest	Forest
	23 Mixed forest	Forest
	24 Heathland	Shrubland
	25 Driftsand	Sparsly or non
	26 Wetlands	Shrubland
	27 Semi-natural grasslands	Grassland
	28 Public green space	Forest
	29 Other unpaved	Grassland
Inundated	31 Floodplains	
	32 Salt Marsh	
Built-up	41 Residential	Settlements
	42-48 Offices and businesses	Settlements
	45 Infrastructural / paved	Settlements



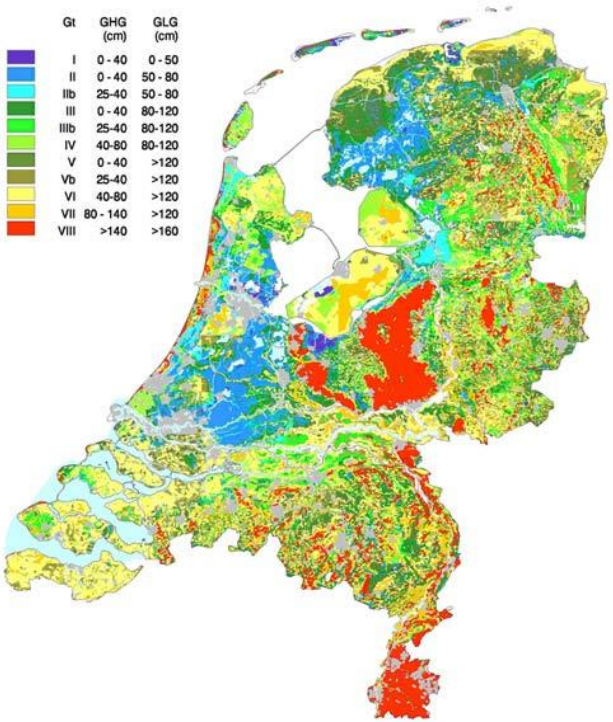


Atmospheric vs ecological moisture availability

WTE moisture



Groundwater regime



Conclusions 2: USGS/Esri WE

- Broad landcover types well recognized
  - Lacks ecological detail (wetlands; coastal dunes)
  - Large-scale mosaics difficult to map
- Water availability: atmosphere <> soil

SEEA forum questions

1. What are the main bottlenecks encountered – *or expected to occur in your country/case*?
2. How could these be solved?
3. What number of ET classes is needed for ecosystem accounting? – *Or: how much detail is required?*
4. What (additional) guidance is needed - *by you*?