

Groundwater dependent terrestrial and aquatic ecosystems

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WaterAct
Joint actions for more efficient management
of common groundwater resources



Definition of groundwater dependent ecosystems (GDE)

- European Commission guidelines:
 - Groundwater dependent ecosystems are such that are “**directly dependent**” on groundwater.
 - Groundwater should provide the quantity (flow, level) or quality of water needed to sustain the ecosystems. **This critical dependence upon groundwater is most likely where groundwater supplies the GDE for a significant part or a significant time period of the year.**
 - Because of the dependence, the status or environmental objectives of a GDE could be affected by alterations of groundwater level or pollutant concentrations that are transmitted through groundwater.



Types of groundwater dependent **terrestrial ecosystems** (GDTEs)

- Springs, spring flushes, spring mires;
- Fens - minerotrophic peatlands;
- Mixed mires - fens and bogs with uncommon patterns in their hydrological or topographical characteristics containing features from more than one mire type;
- Swamp woods - forests of black alder, ash, downy birch and spruce on peat that are flooded by high groundwater level continuously or annually;
- Laggs at edges of raised bogs - wet margins around raised bogs, which are fed by mixed water from the groundwater and from bog runoff;
- Wet dune slacks – inter-dune mires.

How to identify GDTEs?

Joint methodology was developed for Estonia and Latvia during the Interreg project “Joint management of groundwater dependent ecosystems in transboundary Gauja-Koiva river basin (GroundEco)” (2018–2020).

The only common ecosystem/habitat classification is **the list of natural habitat types of community interest in Annex I of the EU Habitats Directive (92/43/EEC).**

Groundwater dependent terrestrial habitat types were selected both in LV and EE.

Five habitat types for sure (2190, 7160, 7220*, 7230, 9080*)

Several habitat types in **exceptional cases in both countries (6410, 7210*, 91D0*)** or in **exceptional cases only in Estonia (6430, 7110*, 7120, 7140)**. *Differences in habitat interpretation and pressures.*

GDTE habitat types I



GDTE habitat types II

Alkaline fens (7230)

de fens

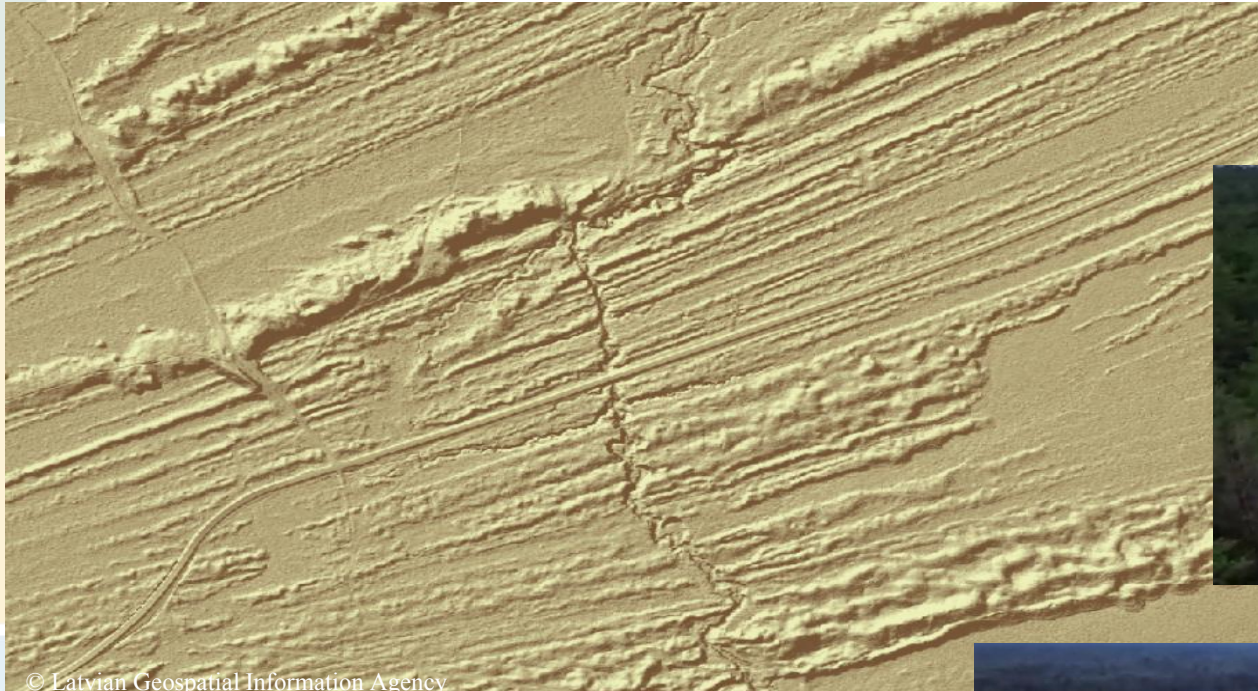
501.

In EE includes both rich and poor (slightly acidic) fens, in LV only rich fens. But any alkaline fen is a GDTE.



GDTE habitat types III

Humid dune slacks (2190) (inter-dune depressions with specific vegetation)



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GDTE habitat types IV

Deciduous swamp woods (9080*)



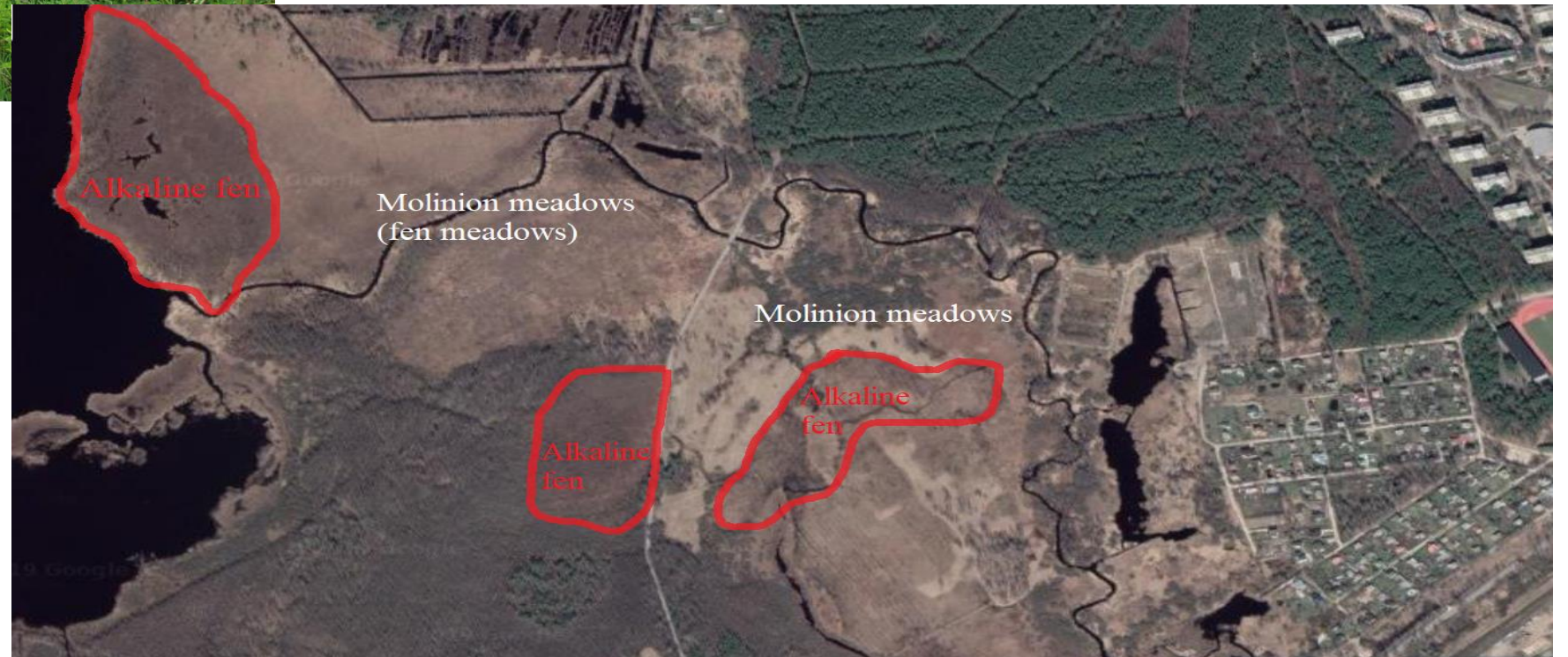
GDTE habitat types (exceptional cases in both countries) I

***Molinia* meadows (6410)**



In many cases, *Molinia* meadows originate from slightly drained fens that have been extensively used for a long time.

If the fen-meadow complex is large enough, it is justified to consider it all as a GDTE.



GDTE habitat types (exceptional cases in both countries) II

Cladium mariscus stands (7210*)

YES



YES, because *Cladium mariscus* stands are part of spring mire with alkaline fen vegetation and spring discharges

NO



NO, because it is not terrestrial (lake), although the plant community is the same

GDTE habitat types (exceptional cases in both countries) III

Bog woodlands (91D0*)



YES, because the coniferous woodland has formed on spring mire (fen) deposits (*in Latvia there is currently no possibility to make the distinction; in Estonia a specific vegetation site type according to a national classification*)



NO, because the woodland has formed on bog peat deposits (sphagnum peat, sphagnum-dominated vegetation), fed by precipitation

GDTE habitat types (exceptional cases in Estonia) I

Hydrophilous tall herb fringe communities (6430)

Includes poor fens and poor paludified grasslands in Estonia, but not in Latvia.



YES, fen or paludified grassland vegetation site type, which are fed by groundwater



NO, floodplain grassland vegetation site type, which hydrological regime is mostly controlled by the surface water from the water body

GDTE habitat types (exceptional cases in Estonia) II

Active raised bogs (7110)
bog woodlands (91D0*)

Not dependent on ground water table
measure in NE Estonia by
the transition mire or bog

No such problems in Latvia

Active raised bog (7110)



NE Estonia, oil shale mining region with many raised bogs

Types of groundwater dependent **aquatic ecosystems** (GDAEs)

- Standing and flowing waterbodies may all be receiving groundwater input to some extent.
- Critical dependence is considered in situations where groundwater provides most of the water in the water body or groundwater input is critical for its chemical composition.
- General types of GDAEs may be classified as follows:
 - Karst lakes and other temporary groundwater-fed lakes
 - Spring-fed permanent lakes
 - Closed-basin clear-water lakes
 - Groundwater-dependent rivers

How to identify GDAEs?

- Habitats Directive does not help much (only habitat types 3180* and 3190*).
- Neither does classification based on water type according to the EU Water Framework Directive (WFD) (2000/60/EC).
- **Lakes** belonging to habitat type 3160 (Natural dystrophic lakes and ponds) and/or to WFD water type groups with dark water (IV – in Estonia; IV and VIII – in Latvia) are likely not critically groundwater dependent.
- **Rivers**, in Estonia, are classified according to the WFD, based on catchment size and organic matter content (water color). Dark watered rivers (types V1B, V2B and V3B) are likely not critically groundwater dependent.
- Knowledge on the share of groundwater (is it more than 50% or not) should be known or estimated.
- Therefore no joint methodology for Estonia and Latvia (yet) – identification depends on the availability of relevant data.

GDAE types I

Karst lakes and other temporary groundwater-fed lakes



origin,

should be

e also

GDAE types II

Spring-fed permanent lakes

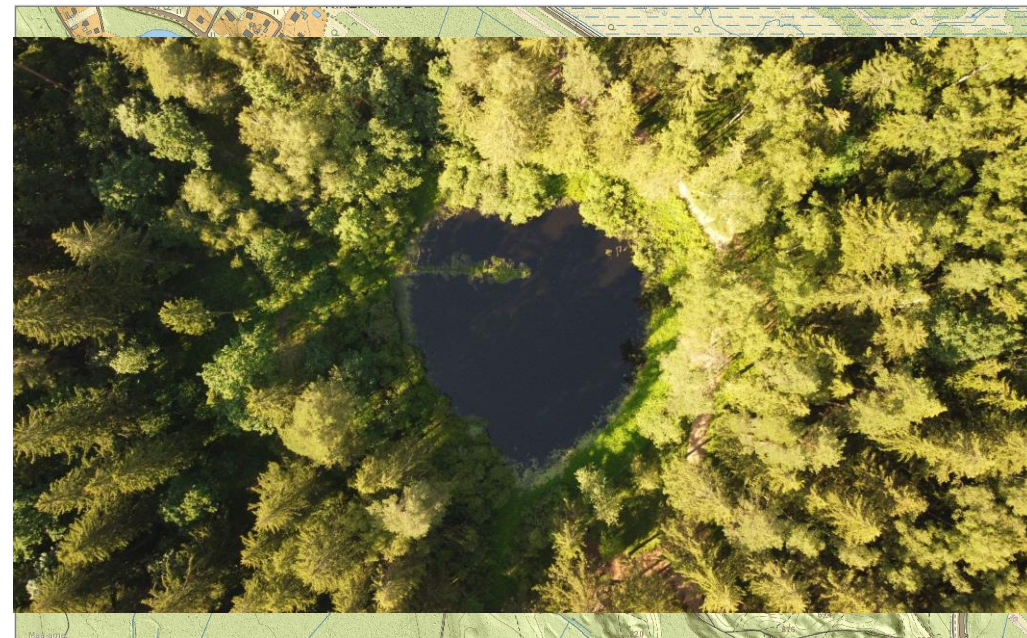
- Lakes formed to the locations of limnocrene springs (either naturally or by damming).
- The border between a solitary limnocrene spring and a spring lake is vague.
- No or small surface water inflow, but surface water outflow is annually considerably larger than the inflow – rate of outflow to inflow is the best proxy for estimating the share of groundwater.
- Dystrophic brown- and soft-watered lakes are excluded.



GDAE types III

Closed-basin clear-water lakes

- No surface-water outflow and usually also no channelized surface water inflow.
- Most common in areas with thick Quaternary sediments (sand, gravel, also till). In Latvia also in Devonian gypsum deposits.
- Water-level is controlled by the groundwater level in the surrounding aquifer.
- Basically reservoirs of groundwater that happen to be above ground, because the lake depression extends below the groundwater table.
- Generally no visible springs.
- Often habitat type 3110 (Oligotrophic waters containing very few minerals of sandy plains *Littorelletalia uniflorae*). WFD lake types with soft and clear water.
- In Latvia also habitat type 3190* lakes of gypsum karst (habitat).



GDAE types IV

Groundwater-dependent rivers

- Groundwater is the only or dominant (>50% of discharge) source of water in it.
- Start from springs, spring lakes or spring fens and may also receive additional diffuse groundwater inflow in their course.
- Cold or cool water during warm seasons, clear water.
- Further downstream temperature, oxygen content and color may start to resemble surface-water-fed rivers, though groundwater contribution is still >50%.
- May be critically groundwater-dependent in the headwaters section, but become less dependent downstream. Defining the exact border is close to impossible.
- For practical considerations it is reasonable to delineate by water bodies that are used for reporting under the Water Framework Directive.
- Require measurement of GW contribution or expert decision based on the known spring locations.

GDAE types V

Groundwater-dependent rivers



- Thank you for the attention!



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Estonia-Latvia
European Regional Development Fund



EUROPEAN UNION

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