WATENV – Water, Soil and Vegetation

Lecture 5

5.10. Haline streams

- They can naturally occur at coastal estuaries as well as in the inland
- Today, they are mostly of anthropogenic origin and owe their existence to salt enrichments in the groundwater and surface water
- Inland haline streams can be classified as salt-influenced special types of various streams from the montane to the planar level

5.10.1. Brackish and tidal waters

- The lowland streams freely flowing into the North Sea and the baltic Sea have brackish areas reaching into the inland depending on the strength of the tide
- An anomaly is the small river Godel on the island Föhr. It is the only German marsh river which flows un-dammed into the North Sea, passing unique salt meadow lagoons.
- **Tidal stream** of the **Ems** in autumn, with extensive brackish reed belts which are traversed by tidal streams. In the foreground, with a stronger influence of freshwater, the extensive softwood alluvial forest with its typical vegetational complexes (*Salicetum triandro-viminalis*, *Salicetum albae*).

5.10.2. Salt-containing inland streams

- Underground salt structures in Lower Saxony. Natural salt waters are strongly correlated to surface-near occurrences of salty sediment layers respectively structures, like **salt domes**
- **Salt domes** are salt deposits breaking through sediment layers above them. The driving force of this upward movement is the lesser density of the salt deposits
- The salt deposits in Lower Saxony have their origin in the geological epoch of the Permian, some 250 million years ago. At this time, what is nothern Germany today was a lot closer to the equator. The global climate was hotter and drier than it is today
- Northern Germany was covered by the Zechstein Sea. It was subjected to strong fluctuations of water levels
- When parts of the sea got disconnected from the main sea, they dried up fast, leaving behind salt deposits (evaporites)
- Those conditions lasted for several million years. Salt deposits with a thickness of 500 to 1000 meters were left behind by the Permian sea. In the following 250 million years, the salt deposits were buried by about 5000 meter thick terrestrial sediments

- Salt dome Gorleben. The salt deposits are mined in underground mines and regarded as possible dumping sites for the waste of nuclear plants
- *Callitriche obtusangula* (**salt creek** at Bad Rothenfelde).
- Non-natural salt contents of streams are caused by industrial and agriculrural salty wastewater

5.8.4. Streams of hill lands

- This stream type occurs at the transition zones between the Central German Uplands and the lowlands, and on the gently sloped plateaus in the Central German Uplands (e.g. northern Rhoen, Eifel, Ardennes, Weser Hills) as well as in intramontane basins (e.g. Thuringian Basin)
- Several creeks of more strongly textured Pleistocene landscape of the northern lowlands as well as the Alpine foothills also belong to this category
- A river in the Central German Uplands in the summer. Caved-in shores are overgrown by *Phalaridetum arundinaceae.* In the middle of the stream, gravel is deposited.

6. Stream vegetation – living with currents

- The vegetation of streams is mostly depending on the deceeding respectively exceeding of critical current velocities and the availability of light
- Furthermore, population density and species specters are controlled by the water chemistry, (especially the water hardness), respectively by the concentrations of several nutrients

6.1 Consequences of anthropogenic stream changes on stream vegetation

- In Central Europe, stream structures are often artificially created by water engineering
- The straighening of the **Rhine** by the engineer Johann Gottfried **Tulla** between 1817 and 1876.
- Due to the straightening of the watercourse, the Rhine was shortened by more than 100 km. The river's original width of about 4000 m in the 18th century was reduced to about 250 m.
- Cartographic display of a built out and a natural meandering part of the small lowland river **Bever**
- Consequences of abrupt flow velocity changes in streams caused by weirs: above, slow streaming with *Nuphar lutea*, *Sparganium emersum* or *Sagittaria sagittifolia*; beneath current-tolerating species like *Potamogeton pectinatus* or *Ranunculus fluitans*
- Riparian forests – forests growing in the wet areas adjacent to the streams – disappeared

6.2. Riparian vegetation of streams

- In the riparian zones of streams, the natural vegetation are small or tall growing reeds interspersed with woody plants
- *Phalaridetum arundinaceae* stream reed at the Weser. The *Phalaris* reeds close to the water are followed by *Phragmites*-reeds closer to the land
- Typical creek reeds (*Sparganio-Glycerietum fluitantis*) in bays and point bars of a lowland creek
- The stream reeds are consisting of numerous current-tolerating plants, which are adapted to changing water levels and relating current conditions
- Due to the dynamics of their places of growth, fragments or initial stages of shore vegetation are common
- The dynamics of flowing water in natural creeks and rivers cause a permanent change and thus renewal of the stream structures by dislocations of stream beds and shores, especially during flood events
- **Softwood alluvial forest** along a river (*Salicetum triandro-viminalis*).
- Biotope complex of oxbow lake-"**Flutrasen"**, reeds and softwood meadows at the Danube at Hainburg