

Summary

The edges of the Wadden Sea consist of salt marshes: foreland of sand and silt deposits with naturally established vegetation that withstands flooding by salt water at high tides. Naturally formed mainland salt marshes have almost entirely disappeared because embankments in the past far exceeded the rate of natural accretion. The existing salt marshes along the mainland coasts of Friesland and Groningen are the result of artificially stimulating sedimentation. Before 1935, this was done by the owners of shoreline property. Since that time, by the government by means of land reclamation projects. The technical management of these salt marsh development areas consists of sedimentation fields surrounded by low, permeable brushwood groins and drainage systems comprised of trenches. This management technique guides the most important factors in the formation of salt marshes: a reduction in water current and waves and an increase in drainage. Ultimately, the result is a perennial salt marsh vegetation that can withstand rises in sea level and subsidence due to natural silt accretion.

Salt marshes are one of the few Dutch landscapes of exceptionally great international importance. If the surface area of the mainland salt marshes in the Wadden Sea is compared to that of the clayey and brackish salt marshes in the Netherlands, it turns out that about half of the halophyte communities are located within the salt marsh development areas. Without them, the vegetation types typical of clayey salt marshes would almost have disappeared in the Wadden Sea area. More than 10% of the Ringed Plovers, Common Redshanks, Black-headed Gulls, Common Terns and Arctic Terns breed in the salt marsh areas. For the Avocet, this is even 50%.

Extending the surface area of salt marshes by stimulating the development of salt marshes and by the outbankment of summer polders is permitted under the Dutch government's Key Planning Decision for the Wadden Sea area. The management of the salt marsh development areas is now focused on a more natural salt marsh structure. There is also more room for local erosion and accretion (salt marsh dynamics), under the condition that the total surface area covered by salt marshes is preserved. The effects of management changes and changes due to natural factors are being followed in a unique system involving

approximately 30 monitoring sections that have existed for more than 40 years now. It has been discovered that erosion problems during the 1975-1985 period had been the result of more wind and higher high-water levels in combination with a not optimal groin system. This long-term monitoring has also shown that there is no significant correlation between accretion and the volume of earthwork done for drainage. Both of these discoveries have had a major impact on the management of the salt marsh development areas.

The accretion balance and the establishment of vegetation in the pioneer zone are largely determined by the brushwood groins. A reduction in the total surface area of the salt marshes is not allowed. This is complied with by a better system of groins in the pioneer zone: making the individual sedimentation fields smaller by building more groins where this was needed. At the same time, the majority of the groins on the water's edge have been abandoned. The new system of groins is more durable, requires less maintenance and takes up approximately 2000 ha less area on the mudflats. It also appears that the abandoning of the groins closest to the sea has been beneficial for accretion in the pioneer zone. Making the sedimentation fields smaller in the pioneer zone in the central Frisian and eastern Groningen sub-areas has completely halted the previous erosion there. Accretion and vegetation in the pioneer zone along the western and central coastline of Groningen, however, is not progressing quite as well. As there has been no reduction in the size of the sedimentation fields there, these areas show a greater variation from year to year. For the entire salt marsh area, there has been a small but steady growth of 1% per year, which is for the greater part accounted for by the western sub-area in Friesland.

The quality of the natural salt marsh vegetation is largely determined by the degree of drainage and by grazing. The volume of earthwork for trenches and ditches was reduced during the 1980-2000 period from 560,000 m³ per year to 7000 m³ per year. A gradual reduction and making the trenches narrower was necessary in order to maintain a certain amount of drainage. Besides being a result of a policy decision, the reduction in drainage is a logical result of the increase in the elevation of the salt marshes due to accretion. With reduced

flooding, the trenches are less quickly filled with sediment while the silt is increasingly being retained by the vegetation. The increase in the elevation of the salt marsh, however, will also lead to a succession to a less diverse vegetation, a process known as maturation. The increasing massive occurrence of sea couch is a result of this development. Maturation can be counteracted or slowed by means of grazing in combination with even less drainage. If drainage is completely halted, however, perennial vegetation can die back, thus resulting in ponds and barren spots in the salt marsh. On the exposed northern coastline, this leads to the erosion of the salt marsh. This is why a maximum size has been proposed for such ponds and barren spots. If the maximum is exceeded, local maintenance will be carried out to prevent the stagnation of water drainage. Currently, an experiment is being conducted under practical conditions to get the capacity of the trench system to agree with a natural creek system. The evaluation will take place in 2002.

After 20 years of changes in the salt marsh development area, the following general conclusions can be drawn:

- The groin system has been strongly improved as to quality and has been reduced in size.
- The drainage is scarcely maintained anymore. It is still possible to conduct local maintenance to prevent erosion.
- These changes were based on existing monitoring for many years in combination with experiments done on a practical scale.
- The surface area of the salt marshes is now increasing slightly and the pioneer zone is showing a natural variation from year to year.
- Maturation in salt marshes as the result of the ongoing accretion demands devoting attention to achieve the best possible combination of grazing and drainage.

The management of salt marsh development areas has undergone drastic changes and fits into the government's policy: stimulating the development of natural salt marshes.