



Trilateral Conference on  
**Dune Management in the  
Wadden Sea**



Wilhelmshaven  
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10:30 – 16:30

Organized by the National Park Administration Wadden Sea Lower Saxony  
and the Common Wadden Sea Secretariat (CWSS)

## ABSTRACTS

### 1. Introduction into Wadden Sea dunes

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Coastal dune complexes are of outstanding importance for nature conservation concepts in the Wadden Sea area between the Netherlands and Denmark, especially for the following reasons:

i) the human impact especially of an intensive agricultural land use and a resulting fertilizer immission is fairly low compared to the adjacent mainland systems. This results in animal and plant species refuges, which are nowadays missing in the mainland areas (e. g. communities of low productive, xeric grassland and heathland areas and moist to wet dune slacks); ii) at least partly primary and secondary successions are possible within the various dune complexes; iii) there are pronounced differences on and within the various island systems concerning the soil chemical and hydrological gradients as well as quite different successional seres.

On the other hand, i) a high impact by tourism results in partly strong disruptions by footpaths and other barriers in the dune areas; ii) the non sustainable use of freshwater results in a degradation of many of the dune slack areas; iii) stabilization measures in white and grey dunes hamper the primary succession processes in the dune movement, iv) afforestations with non native tree species (e. g. *Pinus mugo* agg.) develop species poor forest sites, while natural forest succession seres are an exception. Furthermore, the former traditional use of dune slacks (by mowing and sod cutting) and heathlands (grazing and sod cutting) leads to species poor late succession seres with a decreasing amount of cryptogams, especially lichens and hepatics. Isolated populations of boreal species (e. g. genus *Barbilophozia*) decrease in frequency, and grass species like *Avenella flexuosa* or *Molinia caerulea* increase (e. g. contribution K.E. Nielsen).

Proposals for future measures primarily may include i) a stabilization and restoration of dune slack systems, ii) concepts for a harmonization between tourism between nature conservation measures and iii) the development of concepts that concern the future management of the heathland and forest systems in order to develop a higher and more specific species diversity and composition.

## **2. An overview of dunes and dune slacks in the Wadden Sea region (QSR) with special focus on ecology, nature conservation and distribution of dune slack vegetation**

Jörg Petersen, nature-consult, Hildesheim

Basis of a short overview of the of dunes and dune slacks in the Wadden Sea region is the chapter "dunes" of the Wadden Sea Quality Status Report (s. PETERSEN & LAMMERTS 2005) with a main focus on the introduction of the new trilateral applied TMAP vegetation typology (TMAP = Trilateral Monitoring and Assessment Program).

Theme of the main part is the dune slack vegetation seen on an island tour from the West Frisian islands Texel and Vlieland to the East Frisian islands Borkum and Langeoog to the North Frisian island Sylt and finished on the Danish island Rømø, with respect to nature conservation actions. It starts with some introductory aspects of ecology and nature conservation from dune slack units of the classes: *Littorelletea uniflorae*, *Isoëto-Nanojuncetea*, *Saginetea maritimae*, *Scheuchzerio-Caricetea nigrae* and *Oxycocco-Sphagnetea*.

As well as plant communities that are present on nearly all islands, there are also communities that occur only in particular groups of islands, e.g. the West and East Frisian islands, as distinct from the North Frisian and Danish islands. Therefore several communities have quite distinctive distribution patterns in the Wadden Sea islands.

The number of occurrences of the various vegetation units is attributed to natural processes of succession, creation of new habitats as a result of increase in island size, as well as the effects of active nature-management practices. Sod-cutting, grazing and mowing are accepted methods of nature conservation today. They have a positive effect on many vegetation units of the hygrosera or may even be a pre-condition for their continuing occurrence. From the viewpoint of conservation and biodiversity, the abandonment of these historical forms of land use, in all but the West Frisian islands and in newer time also the East Frisian islands, is regrettable. In order to preserve the plant communities of moist dune slacks which are the most endangered of coastal vegetation, a combination of active and passive conservation measures is necessary and, additionally, it is important to introduce specific measures to facilitate natural dynamic succession.

### 3. Biodiversity and conservation of coastal dune fauna

Axel Hochkirch, University of Trier, Biogeography Group

Although dunes belong to most fascinating ecosystems on earth, their presence has long been considered as a threat to humans. In Central Europe, dunes became widespread in the young post-Pleistocene landscapes and again after the massive deforestation by man during medieval times. Nowadays, dunes have become extremely rare habitat types on the mainland, whereas they still represent important landscape elements at the coast. As dunes are extreme habitat types in terms of dynamics, heterogeneity, microclimate, water supply and availability of nutrients, they maintain a highly specialized flora and fauna. Recent estimates show that old dunes maintain the highest diversity of all habitat types on the East Frisian Islands and this seems to be particularly true for the grey dunes and wet dune slacks. Due to their unusual climate, coastal dunes are also inhabited by many taxa which are predominantly southerly distributed or by species which exclusively occur at the coast.

So far, the conservation of dunes has mainly focused on coastal defence. Biodiversity conservation has received far too little attention. This might also be due to the fact that the number of flagship species that inhabit dunes is rather limited. No large dune mammals exist, but dunes represent important breeding sites for some highly endangered bird species, such as the hen harrier (*Circus cyaneus*) and the short-eared owl (*Asio flammeus*). The conservation of these bird species mainly focused on avoiding disturbance by humans (tourists), whereas the restoration of species-rich communities has not been considered. In terms of biodiversity, the insect fauna is the most important group that occurs in dune habitats (> 70% of all species). However, our knowledge concerning insects is merely based on species inventories. Due to massive mapping projects on the East Frisian Islands, we have a better knowledge of biodiversity in this region than in any other German National Park, but we know little on the threats to these species and on their habitat requirements.

Naturally, dunes are highly dynamic and heterogeneous types of habitats. The high priority of coastal defence measures has reduced the natural dynamics significantly. Open sand blow areas are covered by hay roles to avoid wind erosion and large sand erosions after storm tides are restored almost immediately. This loss of natural dynamics represents the most important threat to the coastal dune fauna as succession destroys habitats for pioneer species. The second major threat to biodiversity in coastal dunes is the abstraction of groundwater, which threatens hygrophilous dune species and favours succession by shrubs and trees. A dogmatic conservation strategy that avoids any management in the core areas of the National Park may lead to a loss of biodiversity and, more importantly, to a loss of the highly specialized dune slack species. Management may include mowing, sod cutting or grazing. Experience from the West Frisian Islands should be adopted also in other dune areas. Our knowledge on the effects of these measures mainly includes the response of the vegetation. Hence, research on the response of insect groups to management in moist dune slacks is urgently needed.

#### 4. Management challenges of Dunes in a European perspective

Dr J Patrick Doody, National Coastal Consultants, Brampton, UK

For centuries, humans have been preoccupied with 'protecting' sand dunes from erosion. As a result, acts of parliament and other measures designed to combat this trend became commonplace in Europe. Marram (*Ammophila arenaria*) planting and other forms of protection using physical barriers to control sand movement became commonplace. Historically, on many of the larger mobile sand dunes planting with exotic conifers to protect agricultural land and buildings from inundation with sand occurred. This had the desired effect and many mobile dunes became fixed vegetated sand dunes or dense forestry plantations. This latter activity caused the 'loss' of approximately 14% of the open sand dune landscapes in Great Britain (Doody 1989) and in Europe as a whole nearly 25% (Tekke & Salman 1995).

The desire to protect rare species and biologically diverse habitats resulted in the development of nature conservation management objectives, especially in areas designated as nature reserves. High rabbit numbers and wartime uses exacerbated sand dune erosion. In the early 1950s and subsequently, recreation also caused destabilisation. For many organisations concerned with 'protecting' nature conservation and recreational values of sand dunes, this meant a continuation of sand stabilisation techniques, such as fencing and marram planting. Myxomatosis in the rabbit population in the early 1950s and the cessation of wartime uses removed two of the more significant agents of erosion. For a few years, this resulted in an apparently enhanced appearance of the vegetation with prolific flowering of plants both common and rare. However, it slowly became clear that this change was adversely affecting nature conservation features of many important sand dune areas.

Today in the temperate zones of Europe, many sand dunes are over stable. The effect on the flora and fauna is to depress the species typical of open sand dune grassland or heath replacing it with overgrown scrub and secondary woodland. Whereas in the past the conservation manager saw erosion as a threat to wildlife, today it provides a new management tool. This contribution will describe some examples of management illustrating how the view changed from protectionism to one of dynamic conservation. Two simple 'state evaluation' models are described, which help decision-making on the key challenges for sand dune conservation, namely the:

1. physical state - referring to changes in erosion or accretion;
2. vegetative state - closely related to grazing management.

Doody, J.P., 1989. Management for nature conservation. In: *Coastal Sand Dunes*. C.H. Gimingham, W. Ritchie, B.B. Willetts & A.J. Willis, eds., Proceedings of the Royal Society of Edinburgh, **96B**, 247-265.

Tekke, R.M.H., & Salman, A.H.P.M., 1995. Coastal woodlands, forestry and conservation along the Atlantic and North Sea shores. In: *Coastal Management and Habitat Conservation*, A.H.P.M. Salman, H. Berends & M. Bonazountas, eds., Proceedings of the 4th EUCC Congress, Marathon, Greece, April, 1993. EUCC, Leiden, 395-409.

## 5. Concepts for management to increase dune dynamics in the Dutch Wadden Sea

Evert Jan Lammerts, Staatsbosbeheer (NL), Albert Oost, Deltares (NL), Ab Grootjans, Rijksuniversiteit Groningen (NL)  
(representing the "Expertteam Droge Wad" of the association "Het Tij Geleerd", comprising 8 NGOs and 15 research institutes in The Netherlands)

Since about a century ago, nature areas on the Dutch Wadden Sea Islands have shown gradual changes in dominating habitat types. In all vegetation series (halosere, hydrosere, hygrosere and xerosere), young successional stages are gradually replaced by older stages. Grass and bush encroachment cause decreases in the area of open, low vegetation stands and in the number and area of patches of bare sand or mud. As a consequence small scale biodiversity in dunes and salt marshes, not only of higher plants but also of mosses, lichens and insects, declines. Nowadays some of the most characteristic species, also some of the birds typical for open dunes, even have vanished completely from the islands.

Successional development on the site is a natural process as such. On the Dutch Wadden Sea Islands however, vegetation regression, periodical 'destruction' of vegetation-covered surfaces caused by dynamical processes such as water erosion or blowing sand, is an equally natural process. The equilibria between building and degrading forces on different spatial and temporal scales determine the patterns in vegetation and habitat types on the islands. The actual balance between old and young successional stages mirrors the large influence of stabilization measures by men during the last century.

The necessity to implement Natura2000, as well as the expected climatological changes, stress to reorientate coastal and nature management strategies for the Wadden Sea Islands. To meet this challenge the "Expertteam Droge Wad", a group of NGO-representatives and scientific researchers, was established in 2005. Its aim is to develop new ideas to bring ecological objectives in concordance with other objectives, especially long term safety but also maintenance of human resources, e.g. recreational and agricultural areas and the production of drinking water, all in the light of the expected sea level rise. As a first step the members identified the most important driving natural forces on different spatial and temporal scales. This resulted in the identification of characteristic and natural island units, each with its specific geomorphological and ecological pattern and developmental trajectory. Recently the results of this work have been published in ecological and geomorphological background reports. A summary has been presented in the book "Eilanden natuurlijk" (april 2008).

Now a start has been made with the identification of new management tools which, more than the current tools, restore natural processes or at least match them on their own specific spatial and temporal scale. The idea is that applying such tools can make the landscape adapt to sea level changes in such a way that safeguarding human interests can maximally be combined with periodical ecological rejuvenation. This may lead to a shift in nature management from methods which are applied periodically on a relatively small scale and which are mostly derived from former agricultural methods (e.g. sod-cutting, mowing, intensive seasonal grazing, burning) to methods which mainly concern the restoration of natural geomorphological and hydrological processes. Often this will imply the removal of restraints formerly imposed by men for local purposes, e.g. dikes and ditches to prevent erosion or sand blowing or to reclaim dune slacks into grasslands. Changed land use, new insights in the course of natural processes and the availability of new techniques (beach and shoreface sand nourishments) make new solutions possible.

## **6. Hydrology of dune slacks and its management: examples from Ditch and German Wadden Sea islands**

Ab Grootjans, Rijksuniversiteit Groningen and Radboud University Nijmegen (NL), Jörg Petersen, nature-consult (D), Evert Jan Lammerts, Staatsbosbeheer (NL)

Interdunal wetlands (dune slacks) of the Dutch and German Wadden Sea islands are highly valued because these ecosystems contain many Red List species that elsewhere on the European continent have become extremely rare due to drainage, eutrophication or general loss of habitat due to building of houses, roads and other urban activities.

In order to keep these wetlands in a good condition management is applied, consisting of mowing and/or sod cutting. This is done to prevent a rapid succession towards tall herbs and grasses or even woodland.

Dune slacks require a regular supply of groundwater. Without groundwater the wetlands fall dry, which is not the main problem, but a lack of groundwater discharge stimulates acidification of the soil and it accelerates the natural succession. Drainage of wet areas and abstraction of groundwater, therefore, reduces the life span of pioneer stages of dune slacks and makes the management costly.

On the Dutch Wadden Sea islands some water companies have stopped the abstraction of groundwater in nature areas and they now obtain drinking water from the mainland. On Schiermonnikoog and Vlieland and also on some German islands (Norderney and Langeoog) technical solutions have been developed in order to continue the production of drinking water on the island, but to decrease the impact on existing nature areas. We will discuss some of these initiatives and focus on the possibilities to preserve these ecosystems for future generations.

## 7. Eutrophication causes a native grass to be invasive in new ecosystems

Knud Erik Nielsen, University of Aarhus – National Environmental Research Institute, Silkeborg, DK

Long-term nitrogen deposition has a strong potential to reduce plant species richness<sup>1</sup>. Fast-growing species like grasses outcompete slow-growing species usually small herbs and lichens. Generally N-sensitive vegetation has declined in seminatural ecosystems in Europe<sup>2-4</sup> as an example heath, grasslands and fens.

Northwest-European dune ecosystems have in the last century experienced dramatic changes<sup>5,6</sup> due to changes in nutrient deposition, planting of conifers and grazing pressure. Intensive survey of fixed dune habitats in 2004 to 2006 has revealed a dramatic increase in the abundance of *Deschampsia flexuosa* in the coastal dune ecosystems in Denmark. The species is now a dominant species in parts of the Danish fixed dune habitats. These findings are in striking contrast to historical records of Danish dunes, some dating 100 years back<sup>7-9</sup>, where *D. flexuosa* was not found in the coastal dune vegetation.

The recent invasion of *D. flexuosa* in coastal dune ecosystems parallels the increasing abundance of *Molinia caerulea* and *D. flexuosa* on the European inland heaths<sup>10</sup> as documented in the Netherlands 25 years ago<sup>11</sup>. But so far the increasing competitive ability of *D. flexuosa* has been considered to be restricted to inland heaths, inland-dunes and forests where the occurrence usually coincide with an increase in nutrient supply. The relationships between the carbon-nitrogen ratio in the soil and the analysis of the cover of the vegetation suggests that the invasion of *Deschampsia flexuosa* in the coastal dune ecosystems most likely is caused by eutrophication due to nitrogen deposition, but other causes such as climate change and decreased grazing can not be ruled out. The discovery that a typical inland grass *Deschampsia flexuosa* suddenly occurs in the coastal ecosystems, occasionally even as a dominant, is a strong signal that eutrophication can cause a native species to be invasive in new ecosystems.

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## **8. Coastal defense & dune management: Perspectives, challenges, threats**

Bas Arens, Bureau for Beach and Dune Research, Amsterdam, The Netherlands

Policy making for both sea defence and nature management needs fine-tuning. In the Netherlands experiments are performed with dynamic preservation of the coast. By means of sand nourishments to beach or shoreface, erosional processes along the beach are suppressed. As a result, there is no longer a need for strict management of foredunes. At a number of sites, natural processes can do their work, leading to important changes in geomorphology. Restoration of the interaction between shoreface, beach, foredunes and inner dunes offers possibilities for rejuvenation in dunes and consequently improvement for pioneer stages and threatened plant communities, which is highly desirable with regard to the preservation of Natura2000 values.

New insights suggest that coastal defense and nature management can benefit from each other. Where safety is provided by means of nourishments, natural processes might transfer sand from the beach inland, and consequently will result in growing dunes and rising surfaces, not only in the foredunes, but also inland. Therefore, nature can serve safety. Awareness is growing that policies for sea defences and for nature management could aim for the same goals. This is quite contradictory to the past, as sea defense practices were a menace for nature, while nature management was considered to undermine coastal safety.

In this presentation an overview is given of current developments on the western Frisian Islands. The effects of natural processes are illustrated, but also the perception of the local people to this fundamental change in policy.