

# Conservation and Management of coastal dunes in North Holland

Report of the study tour of The Netherlands 9-13 February 2009



John Houston and Sally Edmondson

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Organised by Liverpool Hope University and  
the University of Amsterdam

Report prepared by  
John Houston and Sally Edmondson



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## Foreword

This is the second publication in the Sand Dune and Shingle Network Occasional Paper series published through Liverpool Hope University Press. The aim of the Sand Dune and Shingle Network is to support the sustainable management of sand dune and shingle habitats by encouraging an exchange of information and experience and in developing links between different interests. The Network is based within the Department of Geography in the Faculty of Sciences and Social Sciences at Liverpool Hope University, and is supported by the Higher Education Innovation Fund and Natural England.

This report records a knowledge exchange exercise involving postgraduate students, academics and professionals working in dune conservation. Knowledge transfer is the process by which knowledge, expertise and skills are shared through linkage and exchange between different sectors. It is a key function of the Network and is achieved through the dissemination of good practice via a variety of publications and the organisation of events where key actors may meet and collaborate.

The report arises from a study tour to the Netherlands organised by the Department of Geography and the Network, in partnership with colleagues at the University of Amsterdam's Foundation for Integrated Dune Management. The exact sites visited vary from year to year, but it is an annual excursion to the Netherlands made available to Network members from the UK. Postgraduate students from the MSc in Environmental Management attend the study tour as part of their course, and on a bi-annual basis it also includes final year undergraduate students taking a coastal management module. This creates an unusual and productive vertical integration in the university curriculum. The study tour exposes students to professional practice and some of the latest advances in coastal dune management in Europe. For the UK professionals who participate in the study tour, and the Dutch professionals leading site visits, it is a refreshing experience to rub shoulders with early learners in coastal dune management as the deep and often specialist discussions held requires framing within the broad concept of dynamic dune management. It is a healthy exercise for all involved to return to this concept and not to be entirely immersed in the fine detail of conservation management.

An outcome from the study tour is the promotion of international exchange of information and understanding on dune management and ecology. This is an action listed in the UK Sand Dune Habitat Action Plan, and this annual study tour makes some contribution to its achievement. For the UK professionals an important benefit of the study tour is experiencing coastal dune management on an entirely different spatial scale than that which is possible on most of their sites. We hope that the experience helps UK participants to scale their own site management actions and to work at the landscape level whenever possible, to avoid unnecessary interventions and to realise the potential of natural processes.

We wish to thank all of our Dutch colleagues for their enthusiastic support in organising and delivering the study tours. Further information on the Sand Dune and Shingle network is available at [www.hope.ac.uk/coast](http://www.hope.ac.uk/coast).

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**Report prepared by John Houston and Sally Edmondson**

### **Acknowledgements**

The report is compiled by John Houston and Sally Edmondson based on discussions and field visits. The report authors are solely responsible for any errors in the interpretation of the information. The visit was organised in association with Fred van der Vegte and Cees de Vries of the University of Amsterdam and the Foundation for Integrated Coastal Dune Management. Additional hosts were Hidde Posthuma (Provincial Water Company of North Holland, PWN), Luc Geelen (WaterNet), Antje Ehrenburg (WaterNet), Eric van der Spek (Staatsbosbeheer) and Marieke Kuipers (PWN).

We would like to thank Dr Fred van der Vegte and Dr Cees de Vries for checking the text of the report.

**The aim of the study tour was to visit a number of sites in the Netherlands to discuss a range of management activities with a focus on recent large-scale dune restoration projects.**

The programme included five days in the field supported by presentations and discussions.

Participants: Andrew Brockbank (National Trust), Stacey Clarke (MSc student-Liverpool Hope University), Sally Edmondson (Liverpool Hope University), Anne Heslop (Lancashire Wildlife Trust), John Houston (Liverpool Hope University), Leigh Hulme (MSc student-Liverpool Hope University), Laurence Jones (Centre for Ecology and Hydrology), John Lamb (Lancashire Wildlife Trust), Peter McEvoy (Isle of Man Government), Erica Spencer (Manx Wildlife Trust) and Graham Williams (Countryside Council for Wales).

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Cover photographs from top left: Amsterdam Waterworks Dunes; dunes at De Hors, Texel; De Geul dunes, Texel; Duivelshoek dunes, North Holland; Bride of Haarlem dunes, Kennemerland National Park; the Slufter, Texel.

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## **Background: changing attitudes to nature conservation in the Netherlands**

### **Presentation by Fred van der Vegte, University of Amsterdam**

The dunes are the 'green backbone' of the Netherlands, averaging 4 to 5 km wide, and forming the major sea defence along much of the mainland coast protecting the low-lying hinterland from flooding. Along parts of the coast the dunes are engineered to form a single high sea defence structure and in other areas the depth of dunes forms the sea defence. The extensive areas of green stable dunes have only developed in the last 100 years, before which there were large areas of bare, white sand. Seaward of the dunes is a relatively narrow beach reflecting the tidal range of about 1.5m.

The 'young dunes' have formed over the last 1,000 years. Formal dune management in the Netherlands is first recorded from 1543 through legislation and for at least the last 100 years the Dutch dunes have been fixed through a rigorous approach to marram planting. In 1882, for example, a byelaw was established in North Holland to enforce the stabilisation of the dunes: it was rescinded as recently as 1993.

Several phases can be identified in the development of management strategies for dune landscapes over the last 100 years.

#### *First Phase: 1900-1950*

This was passive management – simply the acquisition of land on the assumption that ownership would ensure that no further loss would occur. The Dutch Government still maintains a list of all the potential land purchases for nature conservation purposes and provisionally allocates land to a preferred managing body. All land purchases are funded by Government, with 50% from central government and 50% by provincial government (unlike the situation in the UK where bodies such as National Trust usually have to buy land on the open market). However, the purchasing body in the Netherlands has to find the funds for management. The Dutch national 'map' is updated at intervals, but there is not much land left in the Netherlands now which has not been allocated for nature conservation purposes.

#### *Second phase: 1950s-now*

This was a period of developing the management of vegetation patterns with prescriptions, for example how to mow slacks, graze dunes etc. In the 1960s much of the science of habitat management was developed in this phase.

#### *Third phase: 1970s –now*

There was a focus on the need to manage external influences by working with the planning system, tackling pollution, water abstraction etc. This still remains important.

#### *Fourth phase: 1980s-now*

This period saw a focus on working with landscape and ecological processes. There was interest and support from the Universities in this phase with a considerable amount of work aimed at reducing the problems of water abstraction and in re-establishing natural dune hydrology. The change in thinking in this phase is that we don't control the end of the process, unlike prescriptive grazing, and as yet there is not the knowledge to say what will happen. However, this is seen more as a philosophical question rather than a problem.

The management of natural processes does not focus on biodiversity (specific habitats and species) so this is a potential conflict with the rather prescriptive approach to Natura 2000. There is, however, a growing awareness that there has to be some flexibility within the 'favourable conservation status' approach of the Habitats Directive (for example the results of the UK Living with the Sea LIFE project which addressed the need for flexible site boundaries). The argument is to 'leave some

room for natural processes'. All Natura 2000 sites in the Netherlands will have management plans prepared by central government and there is some concern that this approach might be less flexible than locally-prepared plans.

*Fifth phase: 1995-now*

This is the programme of restoration management to recreate natural dune systems, to remove the build up of nutrients etc. The public is generally opposed to such large scale works although there is more support for actions to restore wetland habitats (as the loss of these habitats can be clearly demonstrated). There is less support, for example, for actions to restore dry slacks. People remain concerned about de-stabilisation and have deep-seated fears that the floods of 1953 could happen again. The concern generally centres on the insecurity of uncertainty - if natural processes are allowed to proceed, who knows where it will end. This also does pose a problem for EU Habitats Directive targets; whether to adopt an approach which uses natural processes or to follow a precise prescription towards targets.

The phases of management as seen for the North Holland Dune Reserve are indicated in the table below:

<b>Phase</b>	<b>Issues and actions</b>
up to the 1950s <b>Exploitation function</b>	Sea Defence Rabbit farming Agriculture Allotments Forestry Water abstraction Horticulture Camping (from 1920) Recreation (from 1903)
1950s – present <b>Management of public function</b>	Nature a 'moral value' that needs to be combined with drinking water supply function Dunes to be managed for sea defence, recreation, nature conservation and water abstraction No room for hunting, agriculture and more camping sites From 1965 the plans for the area were discussed in public Recognition that research is required
1970s - 1990 <b>Scientific basis for management</b>	New training for rangers New paradigm arising from landscape ecology approach
1990s <b>Scientific management for management plus stakeholder involvement</b>	Political: people want to be taken seriously Practical: we need to know what the benefits are of management Social: personal ideals Personal: sense of belonging. People want a point of reference in their lives

The current consensus is that it is vital to work with natural **and** cultural processes. Both require a very sound knowledge base and clear aims and objectives. The training of staff is seen as a fundamentally important basis for the success of these strategies, including the organisation of a professional ranger service and cooperation with a network of professionals, including exchange visits.

The experience of communicating with stakeholders shows that people are more convinced than ever about issues and managers are undertaking more communication work than ever before. People's attitudes change. For example people in Bergen were opposed to the planting of trees in the 1950s. The tree planting damaged their sense of belonging but now people are opposed to tree removal.

The relationship with people is moving away from enforcement to agreement. Enforcement is the traditional approach to wardening and Dutch wardens have police powers to enforce zoning or hand out fines. The modern approach is more about negotiating, e.g. to discuss new zoning plans with stakeholders and to seek consensus solutions. A successful agreement is convincing people of the best course of action, and turning a negative into a positive. The experience of the Dutch National Parks is that it took about 10 years for people to learn to work together. In all these relationships, personalities, and the ability to respect compromise solutions, are important.

### *The Future*

There is increasing recognition of the importance of working with the land-sea interface. This is a new area of work for the Europarc Federation Atlantic Isles group led by Fred van der Vegte, Ed Holdaway and Phil Dyke (National Trust). Seascape assessments were pioneered by the Countryside Council for Wales in 2001 but the main findings have not been widely distributed.

One concern is about giving room for wildlife on the coast. After a section of the Dutch foreshore was closed due to pollution it was noticed that wildlife came back (e.g. seals hauling out on what had been busy beaches). This has given rise to ideas of creating a natural beach on the Dutch coast with no access but viewing points at each end.

An example of good practice which has been cited is the Dutch Integrated Management Plan for the Noordzee 2015. Europarc and the Coastal and Marine Union (EUCC) have met with the Dutch Ministry to discuss their ideas. There is increasing interest in spatial planning for the land-sea region. The Water Framework Directive should also be applied in the marine zone with 'good ecological status' a target for 2015.

The Dutch have developed national policies for sea defence and how to respond to the challenges of rising sea levels over the next century and beyond. Under the Dutch sea defence policy some villages in the Netherlands lie to the west of the sea defence line. The Dutch government provides guaranteed insurance for these properties. Compensation is provided by central government and local authorities have the power to buy-out properties and lease them back to previous owners.

## Background: The vegetation of the Dutch coast

### Presentation by Cees de Vries, University of Amsterdam

Climate, sandblasting and soil are key factors affecting the vegetation; also important are relief, moisture and former use.

Changes recorded along the Dutch coast are;

- A slight decrease in wind speed between 1950 and 2005
- An increase in rainfall across the Netherlands (from an average of 700mm to 800mm) since 1900
- An increase in average temperature has also resulted in a longer growing season

These three factors contribute to the undesirable trends on the dunes.

Salt deposition is a controlling influence with deposition of  $70\text{g}\cdot\text{m}^{-2}\cdot\text{yr}^{-1}$  ( $700\text{ kg}\cdot\text{ha}^{-1}\cdot\text{yr}^{-1}$ ) near the beach falling to  $10\text{ g}\cdot\text{m}^{-2}\cdot\text{yr}^{-1}$  2 km from the sea.

The chemistry of the dunes is also a key factor. There is a change of sand pH in The Netherlands that results in very different plant communities and succession between the northern and southern dunes.

Area	pH	CaCO <sub>3</sub>
Southern dunes (from Belgian border to Bergen)	6 - 8	3 – 10%
Northern dunes (north of Bergen)	4	mostly < 0.2%

Water is crucial. Even small dunes, if they are 1 metre high (including those on the beach), can hold a raised dome of water forming a 'mini aquifer'. This freshwater is essential for the colonisation of Marram Grass.

The Dutch dune landscape has been influenced by 1,000 years of rabbit grazing and along much of the coast the rabbit would be the optimal grazing animal.

The main vegetation types are:

#### *Lyme Grass/Marram Grass (Elymo-Ammophiletum)*

This is characterised by only a few species. Marram Grass and Sea Lyme Grass require high sand transport rates and deposition. Marram Grass develops new roots as it is buried by sand. The older roots become attacked by nematodes and once deposition stops the nematodes will eat the growing roots and reduce the vigour of the plant.

#### *Sand Cat's Tail/ Star Moss (Phleo-Tortuletum)*

This community follows the Lyme Grass/ Marram Grass community. It is characterised by 30, 40 or 50% bare sand and winter annuals. The community is long-lasting if the sand supply is maintained. The mosses and grasses form a mat protecting the sand surface from sand movement. The sand can become very hot in summer – up to  $60^{\circ}\text{C}$  is possible. There is no water at the surface and with the drying of the moss in summer the whole surface can become 'unwetable' and thus generates water running over the surface in heavy rain.

#### *Dune grassland: Dune Dandelion / Lady's Bedstraw community (Taraxaco-Galietum)*

This is the most important grassland community and is very species-rich. It can survive for decades if grazed. Decalcification of the soil and a build up of organic matter however will lead to scrub development. Whilst high calcium levels are maintained this helps the breakdown of organic matter

but low calcium leads to the build-up of organic matter and the development of woody shrubs, often starting with Burnet Rose. However, this process is slow due to the overall low nutrient status of the soil.

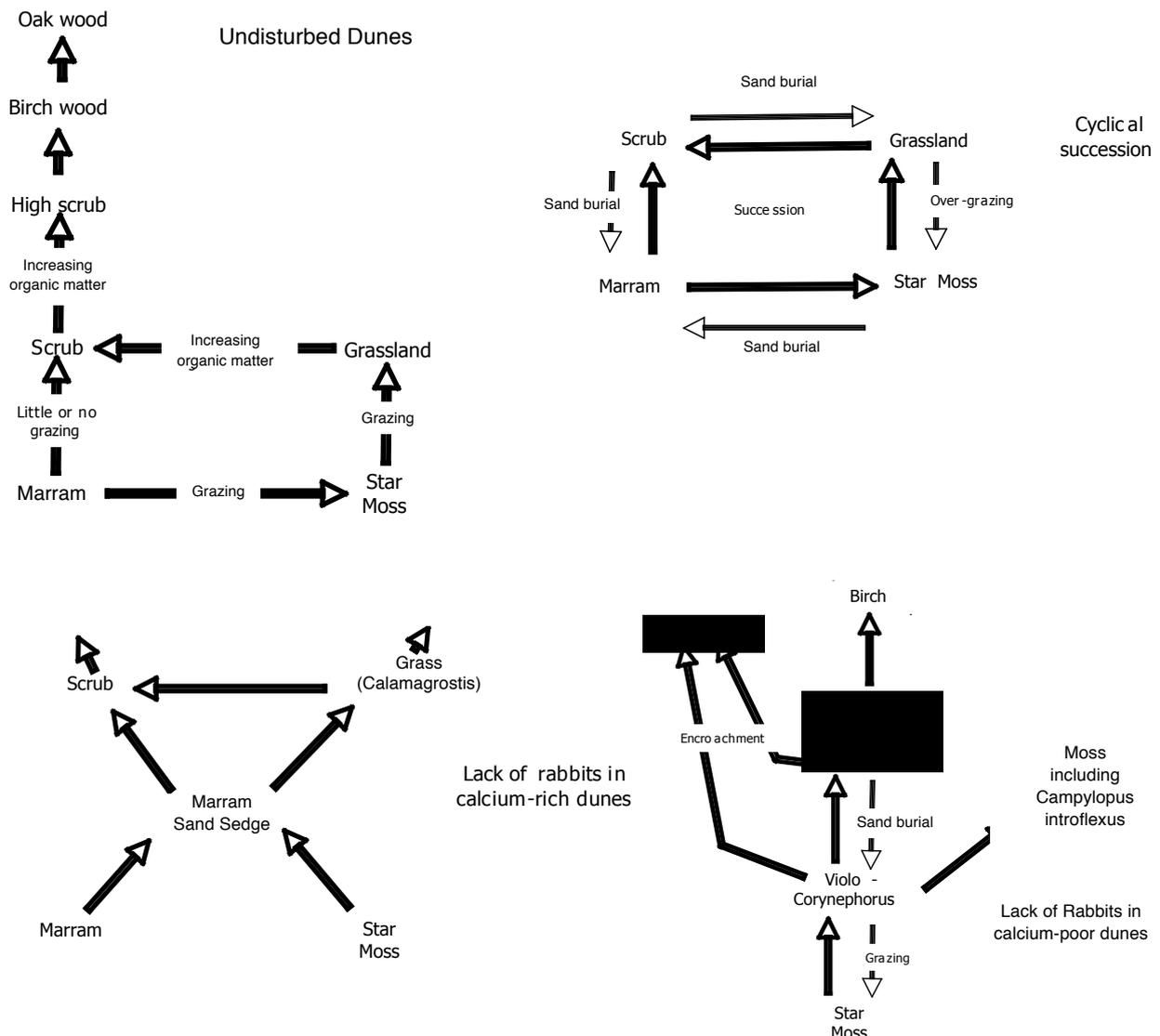
*Sea Buckthorn/ Privet (Hippophae-Ligustrum)*

This community can directly follow the Marram Grass community in the absence of grazing or it can develop via the dune-grassland (through decalcification, the accumulation of organic matter and the absence of rabbits).

*Higher scrub (Rhamno-Crataegetum)*

A mixed scrub will develop with species such as Dog Rose, Hawthorn, Spindle and Buckthorn. Trees such as Birch and Oak will only develop on the sheltered side of scrub patches or at some distance from the sea.

Models of succession include cyclic succession where sand burial and over-grazing return the state to an earlier level. A major concern is the fluctuating numbers of rabbits. Long term monitoring shows that rabbit counts have fallen from c. 25 rabbits/ km of a transect to fewer than 5 rabbits /km. Rabbit numbers fell sharply around 1990 due to a viral disease. After 20 years the population is starting to recover. Without this grazing pressure diversity is reduced and species such as *Calamagrostis epigejos* increase. This leads to changes away from undisturbed and cyclic succession.



## Visit to the North Holland Dune Reserve

### Led by Hidde Posthuma, Provincial Water Company of North Holland (PWN)

The area visited lies to west of Heemskerk at the end of a cycle path midway between Castricum aan Zee and Wijk aan Zee. Here the formation of breaches in the frontal dune ridge has been allowed by the Rijkswaterstaat (The Ministry of Public Works with overall responsibility for coastal defence). In the largest of these breaches a tongue of sand is moving inland towards the second line of dunes. Also, further back, about 500m from the shore a stable parabolic dune has been stripped of vegetation to encourage re-mobilisation.



*Duivelshoek. View from frontal (seaward) dune ridge inland to parabolic dune stripped of vegetation*

### *Breaches in foredunes*

PWN is allowed to let natural processes reduce the height of the foredune ridge to 5m above beach level, but not below this level as it would then be considered a risk to coastal defence. The shape of the breach has a significant effect on sand transport. A 'V' notch shape allows the wind to strengthen, scouring the breach and allowing fresh sand to migrate landwards. It is possible that the new area of mobility will connect with the dunes of the next ridge to create conditions for new parabolic dune development over a long time period.

### *Turf stripping and remobilisation of parabolic dune at Duivelshoek*

Several projects have been carried out in the Netherlands in recent years to strip turf from fixed dunes and slacks to reactivate sand drift and create conditions for the rejuvenation of dune habitats. The project at Duivelshoek was the most recent, being only completed in January/February 2009. Across most of the site 60cm of soil had been removed from the windward faces of a formerly active parabolic blowout and turf was stripped in the wet slack down to the watertable to reactivate the development of wind-formed embryo slacks. In the slack floor the soil stripping was also specified to be deep enough to remove the roots of *Salix repens*. Some *Salix repens* roots had remained but the site managers were confident that this would not regenerate. In total some 9,000m<sup>3</sup> of sand was removed over 1.3 ha. The work took 12 days using two excavators and four dumper trucks. The excavators were machines with 360 degree hydraulic arms and 1 cubic metre (1m<sup>3</sup>) buckets.

Some of the stripped vegetation was buried with 1m of clean sand on top (this seems to be a standard specification for this type of work) and some of the material was removed for use in the

adjacent water extraction areas to raise levels. The work carried out in the water extraction area was not the driver for the project. The project was designed and implemented to rejuvenate dune habitats and create conditions for natural processes to re-work the landscape.



*Windward face of parabolic dune stripped of vegetation*

*The impact of an accidental fire: August 2004.*

In August 2004 some 40 ha of the dune grassland was burned by an un-managed fire. Following the fire managers noted the rapid re-colonisation by *Calamagrostis epigejos* grass over the site. Locally this is referred to as 'poison green'.

The management solution has been to control the spread of coarse grasses by livestock grazing whilst also encouraging rabbit grazing. The site is grazed with Highland Cattle which helps keep areas open for rabbits. The long-term management aim would be to see a return to rabbit grazing as the ideal means of maintaining low vegetation with rosette plants. It is important to understand the behaviour of rabbits. They generally only venture 100m from warren sites although about 2.5% of the population will go further. Maybe this behaviour allows the population to seek out new areas whilst also maintaining well-established warrens. The Dutch experience of trans-locating rabbits shows that this is difficult. Rabbits can only be trans-located in family groups and not as individuals. In one experiment in the PWN area 90 rabbits were translocated and released but all died.

Goats are also being used in the area to control scrub growth, including *Prunus serotina*. The managers accept that livestock grazing will lead to a change in the area but such changes are accepted.

## Visit to Amsterdam Water Supply Dunes

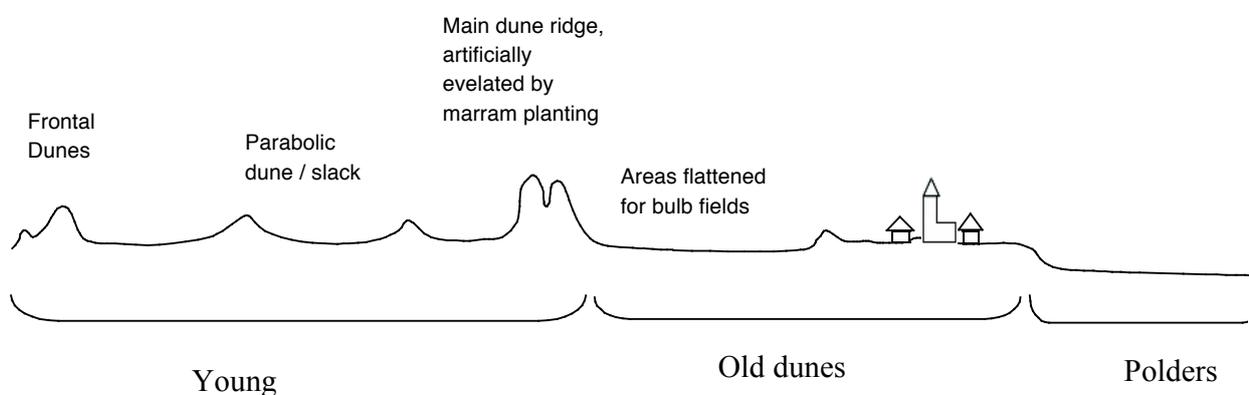
Led by Luc Geelen and Antje Ehrenburg, WaterNet

The Amsterdam Water Supply dunes (AWD), are part of WaterNet, a company owned by the Municipality of Amsterdam and the Amstel, Gooi and Vecht Regional Water Management Board. The area includes 4,200 ha of nature land, of which 3,400 ha are dunes. The dunes reach a height of 35m.

### Natura 2000

AWD forms part of the large Kennemerland-Zuid Natura 2000 site which covers 8,000 ha of dune area along with land owned by Natuurmonumenten, Staatsbosbeheer, Provincial Nature Agencies, the Provinces of North Holland and South Holland and four Municipalities.

The northern part of the AWD site is adjacent to urbanised areas whilst the southern part is adjacent to agricultural land, especially bulb-growing areas. Much of the former inner dune landscape was levelled for bulb growing and housing developments and there are still pressures in the northern area (around the National Park Zuid-Kennemerland) for housing developments.



*Diagrammatic cross section of the Amsterdam Dune Waterworks Dunes: land uses/functions include coast defence, water supply, recreation, nature reserve, urban and bulb growing.*

The AWD is the main water supply for Amsterdam. Freshwater is found to a depth of 60m. In the early 1900s deep pumping was introduced to abstract this water but by the 1950s there were problems with water quality and salt water rising in the aquifer. The abstraction was not sustainable and infiltration with river water was introduced as an alternative.

The Natura 2000 approach is considered to be a bit too conservative in not recognising the desirability of change in the dune areas, and in its demands for designated types of dune. The two main habitats are fixed dunes (EU Habitat type 2130) with 1,200 ha and dunes with *Hippophae rhamnoides* (Sea Buckthorn) (EU Habitat type 2160) with 800 ha. The site also includes Atlantic Dune Woodland (EU Habitat type 2180). Only 60% of the total area within the Natura 2000 site is covered by EU habitat types.

### *Prunus serotina*

A major problem at the AWD is the rapid increase of *Prunus serotina* scrub. From 2004 to 2006, for example, the spread has been from 323 ha to 483 ha, a 25% increase equivalent to 14% of the total area. *Prunus serotina* is mainly a problem in the Sea Buckthorn areas where it may constitute 80% of the habitat. It was introduced in the early 20th century as a soil improver and was planted in pine woods and around buildings.

*Prunus serotina* became invasive in the 1980s in the pine woodlands. It was first considered to be a problem only in the forestry (pine) areas, but in the 1990s it began to spread throughout the dune site. It has exploded from a situation where it was rare on the dunes in the 1980s to one today where it is everywhere.

The reasons might be a combination of external factors (increased rainfall, warm winters, fewer rabbits and grassy vegetation) and specific factors (high germination rates, easily distributed by birds and fast growing). There is probably also a link between nitrogen deposition, leading to an increase in grass which favours the establishment of *Prunus serotina*.

*Prunus serotina* takes hold within dying Sea Buckthorn stands, but it is now also a threat to fixed dunes, the seeds germinating very easily in grassy places. It produces large numbers of seeds that are dispersed by birds. The seeds germinate readily and within 10 – 15 years a *Prunus serotina* scrub woodland has developed.

As it is a Natura 2000 site, accepting this plant is not an option for WaterNet. Actions started in 2004 with cutting and clearing. Grazing is used as a follow-up as herbicides cannot be used in the water supply dunes. It is proving to be more than a 5-year project and the control of the species will be a long-term activity. In a few places the *Prunus serotina* will be left, to assess how it develops in a woodland situation. The conclusions on the work to date are that control will require sustained effort, that treatment can be effective in local areas where clearance is followed by grazing and on-going management, there is a need to remain vigilant and also a need to be realistic with what can be achieved, accepting compromises in some situations.

### *Large scale restoration projects*

A major project at AWD has been the restoration of the dunes at the Van Limburg Stirum canal. The canal was formerly one of the main extraction canals on the site. The work has been completed in two phases with the aim to restore the natural water levels and the annual fluctuations of the water table. The water table fluctuates by about 60cm from the wettest period in early spring to the driest in late autumn and there can also be a total fluctuation from 'wet' years to 'dry' years of about 1.5 m. In terms of restoring wet slacks rising calcareous groundwater has a beneficial effect on slack vegetation whereas infiltrating rainwater leaches the soil.

In 1995 the first restoration project was started and this has been reported in the literature. However by 1997 there were complaints from bulb growers that the rising water levels had damaged their crops, although weather conditions are thought to be the cause. This reported damage was from sites up to 10km away from the restoration project and 10 years on there are still legal battles with bulb growers.



*First phase of restoration of the Van Limburg Stirum canal completed in 1995*

The results of monitoring show that although the restoration of the canal leads initially to increased mobility only a small area remains mobile after 10 years. It is too early to conclude whether the remaining areas of sand blow will form long-lasting parabolic dune features. It was noticed in the work that the sod-cutting areas attracted grazing cattle.

Lessons have been learned from this first project. A second project known as De Zilk, named after the village on the border of the dune area, paid more attention to the potential conflicting interests in the area.

These are;

- Nature- where there is a desire to raise water levels
- Water- where there is a legal obligation to provide drinking water
- Recreation- visitors want 'dry feet'
- Bulb growers –want a lowering of the water table
- Residential areas –want 'dry cellars'

The challenge was to devise a project which could satisfy all these interests. The project De Zilk attracted 1 million Euro of EU funding, of a total project cost of 2.2 million Euro, through the EU Interreg programme as part of the 'New Delta' project. The link to this EU funding helped to raise political awareness of the project and its aims.

The Environmental Impact Assessment considered six short-term and three long-term scenarios. Ecological and hydrological models were developed for each to predict the effects of the restoration work. A final scenario was developed which would raise water levels in the dunes and lower water levels in the polders (a win-win situation). The line of no change (hinge point) in levels was the Oosterkanaal running south-north close to the eastern boundary of the dune system. Despite some public opposition the project was approved. The support of local politicians was important in getting approvals. The team also considered transparency, sound research in the EIA, independent quality control, stakeholder participation and clear communication to be vital.

The De Zilk project included 30 ha of sod-cutting in the humid dune slacks and the restoration of the final kilometre of the Van Limburg Stirum canal by filling it with sand. The project took three months and involved moving 220,000 m<sup>3</sup> of sand. The restoration of the canal used the sand originally excavated to fill in the canal and restore dune contours. During the work some evidence of agricultural activity from the 9th century was discovered.



*Second phase of the restoration of the Van Limburg Stirum canal completed in 2008*

## **The North Holland Dune Reserve: Excursion between Egmond aan Zee and Bergen aan Zee**

**Led by Fred van der Vegte and Cees de Vries, University of Amsterdam**

The walk along this section of the Dutch coast covers the distinct change between the calcareous dunes of the south and the acid dunes of the north. The distinct difference over a short length of coast is due to the meeting of sand sources derived from two rivers.

The input of airborne salt is a significant limiting factor on vegetation growth along the Dutch coast. Near the coast the dunes receive 700kg/ha/yr of salt. By the high inland ridge (2 km inland) this is reduced to 200kg/ha/yr and further inland salt will still be precipitated in storms. Salt damage stunts trees, is a factor in developing the wind/salt pruned shapes and a key factor in maintaining a treeless landscape on much of the dune area closest to the sea.

The specific area visited was in private ownership during the phase when employment schemes were responsible for planting large areas of forestry on publicly owned dunes and therefore they retained a much higher area of open dunes than the afforested dunes to the north around Schoorl.

There are two large areas of 'summer cottages' in these dunes, a tradition in the Dutch dunes that does cause some conservation problems. The owners and occupiers are legally not permitted toilets, electricity or water but clearly many of them have these facilities. The long tradition of these cottages in the dunes has led to the development of a vegetation type characteristic of the affected areas.



*The dune landscape to the south of Egmond aan Zee*



*Summer cottage landscape north of Egmond aan Zee*

Rabbits have had a major influence on dune vegetation over the centuries. The rabbit is still an important grazer in the North Holland Dunes where numbers have recovered better than in the Amsterdam area following myxomatosis. By the 1980s the numbers were about 100 rabbits/ha. It had taken 25 years for rabbit numbers to recover following myxomatosis in 1955 and in 1990 a second crash occurred due to Rabbit Haemorrhagic Viral Disease (RHVD) and from a situation of 100 rabbits/ha only very few were left. The population is now starting to recover in places, aided by the stock grazing. Extensive grazing has been established with 1 animal/ 15 ha (a low density) using a combination of Exmoor ponies, Konik horses and Highland cattle.



*Highland Cattle grazing dunes south of Bergen aan Zee*

Rabbit grazing around privet, hawthorn and creeping willow leaves a distinct pattern resulting from the digging for roots in winter and the eating of shoots in summer at the edge of patches. This leaves a ring of bare sand around a circular patch of scrub, an indicator of rabbit activity that can clearly be detected on aerial photographs.

The North Holland Dune Reserve is a large site with many habitat types. The site has some 920 recorded vascular plant species (with a low proportion of non-native species) plus some 250 recorded lichen species. The dunes have strongly contrasting microclimates –on a summer’s day the south slopes can be 60° C and dehydrated down to 20 cm whereas the northern slopes will have surface temperature of about 20° C.

There is also a distinctly different shape to the dunes between the lime-rich zone and the lime-poor zone. In the lime-rich dunes parabolic dunes develop resulting in a concave shape on the windward side and a steep lee slope. In lime-poor dunes parabolic dunes do not develop as the vegetation cannot keep up with the sand burial, especially on the trailing dune ridges, thus the moving high dunes are often longer and more dome-shaped with a shallow gradient and a less-steep lee slope.

Some areas of pinewood have been removed. In one example 2 ha of 50 year-old pine wood (*Pinus nigra*) was removed in 2002. The roots were removed but not all branches were cleared. *Corynephorus canescens* is the first colonist, followed by *Carex arenaria*.

The North Holland Dune Reserve is one of the busiest sites for recreation in the Netherlands when compared to other sites in the Netherlands.

*Annual visitor figures expressed as visitors/ha/year*

<b>North Holland Dune Reserve</b>	<b>750</b>
National Park Zuid-Kennemerland	590
Dune Water Company of South Holland	430
Terschelling (medium Wadden Sea Island)	300
Amsterdam Water Supply Dunes	211
Hoge Veluwe (Inland heath)	120
Schiermonnikoog (small Wadden Sea Island)	60

Total number of visitors /year

<b>North Holland Dune Reserve (PWN)</b>	<b>6,000,000</b>
Texel (largest Wadden Sea island)	5,000,000
Spaarwoude (Inland recreation site, one of four in NH)	2,000,000
Dune Water Company of South Holland	1,000,000
Amsterdam Water Supply Dunes	700,000

For comparison the Grand Canyon attracts 5,000,000 visitors/year and Yosemite gets 3,600,000 visitors/year.

## The Island of Texel

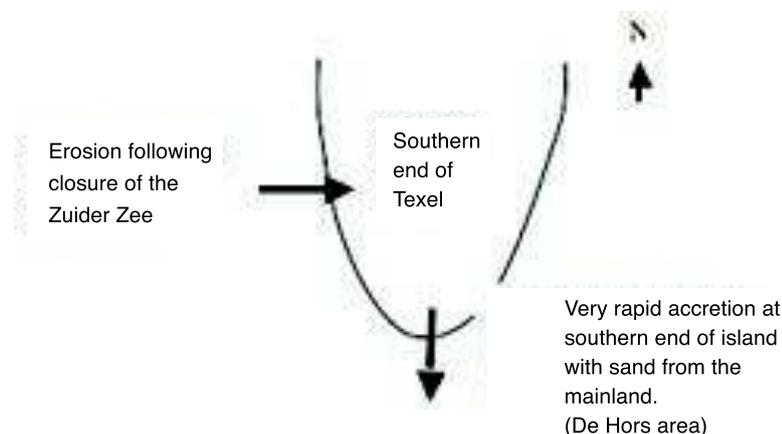
### Led by Erik van der Spek, Staatsbosbeheer (State Forestry Service)

Texel is the most popular of the Wadden Sea islands and is connected to the mainland with a regular ferry service. The island receives about 5 million visitors /year, of which at least 50% are heading for the beach. Some 13,000 people live on the island and there are 38,000 bed spaces so most visitors are staying on the island.

Recreation patterns have changed. A traditional two-week holiday is no longer the case and people come for one week, or short breaks. This makes it more difficult to 'educate' the visitors and influence behaviour. About 250,000 leaflets are distributed every year. Also there is now only a short 'quiet season' in January-February.

### *Dunes of the south west*

The south west coast of Texel is an area of rapid coastal change. When the main Zuider Zee barrier was constructed this led to rapid erosion of this part of the island with 1.5 km of erosion recorded between 1930 and 1990; the island was growing southward but retreating eastward as shown below.



The erosion is now officially stopped under the 1990 coastal policy, which is a 'hold the line' policy, and sand nourishment is taking place. However as the situation was not natural in the first place there are on-going discussions about letting some areas of the coast erode back from the 1990 line to be matched by accretion elsewhere. This case study might show that the 1990 policy is not inflexible and a more dynamic situation could be allowed where justified.

The open dune landscape is a cultural creation and in its natural form would normally be tree-covered. In mid 19th century the dune areas were considered to be wasteland and the slacks were converted to meadowland. Now the process is being reversed to restore the wet slacks.

Soil has been stripped over a 35 ha area and the material is buried in the frontal dune ridge, with a cover of 1 m of sand, where the flow of groundwater will take any nutrients seawards and not back into the slack system. The hydrology of the area is controlled by sluices. Partly as a result of the use of the area for water supply the watertable was too high (infiltration) and new sluices have been constructed to allow drainage to the south. Passes have been installed to allow sticklebacks access into the restored wetlands and these provide a food source for species such as spoonbill.

Following the hydrological restoration, and since 1995, an area of 500 ha is grazed by Exmoor Ponies and Highland Cattle. The grazing is 70 animals in the summer and 60 animals in the winter. Rabbit numbers remain low. Staatsbosbeheer has contracts with local farmers for grazing and these include conditions such as a ban on anti-parasite medicines and supplementary feeding. Monitoring has shown that good populations of dune slack species have now returned.

Grazing can have an impact on species such as Hen Harrier and Short-eared Owl. Where breeding sites are affected grazing by cattle and horses is not allowed in the breeding season. Sheep grazing, however, does not appear to have an impact on these species.



*De Geul dunes and Grotevlak wetland on Texel*



*The Slufter viewed from the inland flood defence barrier looking to the outer dunes*

### *Wetlands of De Muy*

The De Muy area is an area of coastal wetland lying between the main sea defence ridge and the outer dunes. It has been reclaimed for agriculture and the intention now is to restore it to a semi-natural habitat.

As part of a large national EU Life-Nature restoration project run by Staatsbosbeheer 65 ha of sod-cutting has been completed to restore dune slack communities from an area of meadow land as well as some areas of trees and scrub.

The area lies outside the sea defence (the dyke is landward of the area) and was formerly linked to the 'slufter'. The slufter is a special feature on Texel, where the sea broke through an outer sea defence creating a large intertidal basin, which lies within the dune system. The slufter has to be managed to maintain its function. The important feature is the length of the main creek and this should be about 3.2 km. If longer it will lead to sand deposition and gradual filling of the basin. The width of the sea outlet cannot exceed 500m and the edges are reinforced with sand trapping fencing and Marram planting.

In the project the link could have been re-established with the sluffer to create a brackish water marsh but the decision was taken to keep the restored land as freshwater. The choice for freshwater conditions was influenced by the rich orchid rich wet grasslands which were already present. This is an interesting example of a restoration project which could have followed two distinct routes.

The extensive consultation involved communication with the local Council, the community, bird-watchers and farmers. The consultation included a workshop, a draft plan and a second workshop. Some of the issues and compromises were;

- Some meadowland was to be retained to show the cultural associations in the area (some land is from the 14th century).
- People were asked whether visitors and livestock should be segregated as some people are afraid of animals.
- There was also a careful evaluation of the benefits to nature, looking at the various options and opportunities.
- An important aspect of project design was that the quality of the recreation should not be reduced and existing paths should remain as they are.
- During the works temporary paths were provided if the public had to be excluded from the working areas.
- Because of coast defence concerns no sand could be removed from the area. Excess sand was used to construct the works access roads and then it was moved again and buried in the main sea defence ridge and planted with Marram Grass.
- The work period was scheduled for August-October 2008 (to avoid the breeding season for birds and also before the winter storms).

The actual works to turf-strip 65 ha of wet meadowland and slack used seven hydraulic excavators to move 100,000 m<sup>3</sup> of soil. About 12 cm of soil was removed over the area. Fortunately the levels of phosphate were already quite low as there had been no farming in the area for 15-20 years. The work was completed by large contractors but these also employed local people.



*Turf –stripping in operation (from interpretation board)*



*The finished landscape after turf-stripping. The excess sand is added to the flood defence dunes (in rear), re-profiled and planted with Marram Grass*

No problems are expected with, e.g. Sea Buckthorn or Common Reed. All year grazing will be introduced in 2009 with Galloway Cattle on the wet area and sheep on the dunes. 30 Galloway Cattle will graze 250 ha all year round. The first plants to return from the seed bank should be *Anagallis tenella* (Bog Pimpernel) and *Samolus valerandi* (Brookweed). *Parnassia palustris* (Grass of Parnassus) should return later.

## National Park Zuid-Kennemerland

### Led by Marieke Kuipers, Provincial Water Company of North Holland (PWN)

Kennemerduinen was one of the early National Parks in the Netherlands and now lies within a suite of newly designated National Parks from 1991. The total area is now 4,000 ha and there is a management structure which involves the main stakeholders and a focus on integrated projects.

The main partners are the Provincial Water Company of North Holland (PWN), Natuurmonumenten (equivalent to National Trust in the UK), Staatsbosbeheer (the State Forestry Service) and three municipalities who each own land.

There is continual pressure from the park edges for development and this must be resisted. Affluent housing is immediately adjacent to the dune area, and the residents all want gates for direct access to the dunes and also want to fell trees to provide an open view to the dune landscape. The National Park want to keep the trees here as a zone for containment of the impacts of the adjacent residents. Whilst in some parts of the dunes there is a move to remove woodland here it forms a protective barrier between development and the open dunes. The forest zone is protected and fines of 1,500 Euro are imposed per tree if private landowners cut down trees to improve their view.

The management of the National Park is led by the larger conservation bodies with the Province of North Holland providing the secretariat. The aims of the National Park are to provide for recreation, nature conservation, education/communication and research.

There is a single visitor centre based in one of the old water works buildings. This is a good centre which attracts 50,000 visitors a year but the future plans are to develop a series of smaller buildings around the park boundary.

Part of the site (the Kraansvlak) remains closed to the public. This is the area where European Bison have been reintroduced. There is a good display on the project in the visitor centre and it clearly attracts a lot of interest. Seven bison were introduced to 300 ha in 2007. The bison graze almost entirely on woody material and supplement the grazing of Konik ponies. With the development of the National Park (and amalgamation of several land owner/ships) there was natural pressure to extend the access infrastructure. This has been resisted to allow natural areas to be zoned. For example there is not a south-north cyclepath running along the seaward dune area and this will help to allow dune mobility in the future. In the 1950s site management planned for intensive recreation (including the provision of dune pools for swimming) and an large network of footpaths. The original park area from the 1950s was, however, only 1,200 ha of the site core so opportunities have increased over the years. The park management has now managed to rationalise the footpath network and has reduced the overall length of paths. A large scale recreation research project has been completed in 2008 and the findings will be used, as necessary, to adjust the recreation management policies.

The main part of the publicly accessible site is grazed by Konik horses and Highland Cattle within a single 2,000 ha large grazing enclosure (although this can be managed as two enclosures of 1,200 ha and 800 ha). The low intensity grazing pressure is c. one animal to 15 ha (a total of 140 animals) and not all parts of the site are grazed. For example, a 9 ha 'play area' is outside the grazing zone. Another part of the site is grazed by a roving sheep flock of 90-300 sheep guided by a shepherd on an area of 100ha. Barbed wire fencing is not used for any of the grazing activity and this must help to make it more acceptable to visitors.

The landscape includes dunes, slacks and planted pine woods. The woodlands were planted in the 1930s on the high dunes rather than the valleys. They remain as strong landscape elements. Nearly all slacks were, in the past, used for agriculture, with dune potatoes being a specialist crop in the area. The dunes are all 'green' and stable with no open sand. Although Marram planting has now been stopped on the frontal sea dyke there is still no blowing sand.

The National Park is also important for its legacy of military history. A large number of WWII bunkers in the dunes have been removed but some have remained inside the dunes and now have an interest in their own right. This military interest is linked to the sites within the Belvedere Memorandum on cultural history. Artefacts from this Second World War period are significant and have to be taken into consideration by managers. Unexploded ordnance (found to several metres deep) is also a hazard and sites have to be cleared prior to any activities involving excavation or use of heavy machinery.

### *Restoration projects*

The National Park managers have undertaken a series of large scale restoration projects using a special government fund for a programme of works. This provides about 50-75% of the total costs. It is an area-based budget which has to be spent by a fixed date. The funding has to be committed by 2013 hence the urgency for the large-scale works. However, there is growing public concern about such a high level of activity and generally across the Netherlands there will be a period of reflection over the next decade on the benefits of such projects.

The focus of new work is now along the sea defence ridge. With changing attitudes in relation to flood risk and sea defence requirements at the local level it is possible to consider dune restoration projects which make a link between the beach and the fixed dunes.

Ideas for re-mobilisation are based on the existing geomorphology. For example two relatively small blowouts immediately inland of the frontal ridge are targeted for re-mobilisation where several breaks in the frontal ridge (only down to 7-5m above beach height) would feed sand into these blowouts and trigger new dune mobility. In time the migrating dunes would develop into a new parabolic dune.

In addition to creating new dynamics in the most seaward part of the site the re-mobilisation of existing, fossilised, parabolic dunes is being proposed. Some former parabolic dunes have an interesting geomorphology, such as hairpin dunes and the gagenwale (or counter-wall) types and these may be conserved as they are. But others could be considered for re-activation. The parabolic dunes were probably last active in the 1850s and a single parabolic dune may cover an area of about 50 ha.

The overall approach is at the landscape scale with dynamics restored from beach to at least the secondary line of dunes about 1 km inland. The frontal dune is the 'kern' zone –the core of the sea defence but in reality the sea defence is the whole system and none of the plans would remove sand from the system.

Already-completed restoration work has targeted the rejuvenation of wet slacks through turf-stripping and turf-stripping and destabilisation of parabolic dunes. One of the largest of these is in the Bride of Haarlem dune area. A large area was turf stripped and resulted in massive sand movement for a few years. Now, however, the open character of the site is has to be maintained by removing Marram Grass.



*The windward face of the parabolic dune at the Bride of Haarlem*



*The newly created young wet slack habitat forms part of the restoration work*

The restoration of wet dune valleys and damp grassland has also been a target in recent projects. The use of the dunes for water abstraction (by the Haarlem Water Company) had reduced groundwater levels by about 2m. This was not sustainable and saltwater had risen by up to 50m in an aquifer of only 100m depth. The area of humid slacks had been reduced to less than 1% of the area (30 ha). After actions to re-wet the site and rejuvenate slacks the current total area is now 300 ha. The project Groot Olmen involved the removal of a depth of 60 cm of humic soil (this equates to three spade depths in the cultivated dune valleys) over 7 ha. The work was carried out in 1989-1990 and was followed by two very wet winters which left the site much wetter than intended. This led to some local concerns about the principle of rewetting the dunes linked to problems of flooding in the cellars of adjacent residential areas. However, the solution was to improve drainage near residential areas rather than maintain a low water level in the dunes.



*Restoration of dune slack habitat at Groot Olmen*

A management plan for the wet slacks was prepared in 2004. Although there have been no major works since then there may be ideas for further work by 2010 to draw down more government funding.

Communication on this project targeted nature groups to convince them of the desirability of the action. There was a particular concern over the potential impact on sand lizard. To respond to these concerns the work was preceded by mowing to prevent lizards hibernating in the area and it was also carried out in September before hibernation. The conclusion was that the end result would be better for sand lizard.

There was not a communication plan for the general public although information was given on signboards. However one member of the public objected and raised a petition of 80 names, leading

to additional work and interest from journalists. After more extensive local communication the result is that most people are happy with the work, although the one person remains against. The communication load is at a level which the rangers can deal with.

The lesson is that communication is vital. The current approach for the dune re-mobilisation in the frontal dunes will be to hold a broad consultation to outline the plans but to focus thereafter on one-to-one communication with 'VIP' stakeholders. This approach has proved to be more successful than using big meetings, being more efficient and effective, and curbing any escalation of communication activity. The aim would be to have a project on the ground by 2011. It is also important in this communication that site managers and rangers are well-informed and are loyal to the project idea, otherwise mixed messages can be given.

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[http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/2130\\_Fixed\\_coastal\\_dunes.pdf](http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/2130_Fixed_coastal_dunes.pdf)

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### **3. Other information and links to organisations**

Rijkswaterstaat 2007. Because the Dutch love their coast. Information leaflet explaining Dutch coastal policy.  
[http://www.rijkswaterstaat.nl/images/Engelstalige%20brochure%20Because%20the%20Dutch%20love%20their%20coast\\_tcm174-187935.pdf](http://www.rijkswaterstaat.nl/images/Engelstalige%20brochure%20Because%20the%20Dutch%20love%20their%20coast_tcm174-187935.pdf)

ICZM report as part of EU ICZM initiative  
[http://ec.europa.eu/environment/iczm/evaluation/iczmdownloads/nl\\_2005.pdf](http://ec.europa.eu/environment/iczm/evaluation/iczmdownloads/nl_2005.pdf)

Maps of North Holland dunes  
<https://www.pwn.nl/SiteCollectionDocuments/Natuur/kaartmateriaal/NRKaart%20PWN-gebieden.pdf>  
<https://www.pwn.nl/SiteCollectionDocuments/Natuur/kaartmateriaal/NRKaart%20NPZK.pdf>

<https://www.pwn.nl/SiteCollectionDocuments/Natuur/kaartmateriaal/NRKaart%20NHDnoord.pdf>  
<https://www.pwn.nl/SiteCollectionDocuments/Natuur/kaartmateriaal/NRKaart%20NHDzuid.pdf>

Stichting Duinbehoud (Dutch Foundation for Dune Conservation)

<http://www.duinbehoud.nl/index.php?id=1078&PHPSESSID=610c3107b3a406aca50e503a2ae0c636>

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LIFE project

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## Sand Dune and Shingle Network Occasional Paper Series

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