



Sand Dune and Shingle Network

Thirteenth Newsletter, December 2011

Linking science and management

Introduction

Paul Rooney

Director – Sand Dune and Shingle Network



Welcome to the 13th newsletter of the Sand Dune and Shingle Network. In the last newsletter I outlined the challenging financial times that lay before us. Since then we have managed to secure some funding for the core network activities. This will sustain us

through this and part of next year, and we are waiting on the results of a numbers of bids and projects. Things are looking brighter. Thank you to those of you who have been supportive in the last few months.

This edition focuses on machair as a special dune habitat. There are a number of experts in the machair world, supported by the Machair Study Group housed within Aberdeen Institute for Coastal Science & Management (AICSM). We are pleased to highlight machair as an important part of our dune resource, and we welcome the opportunity to work more closely with those involved with this difficult to define but beautiful wind blasted feature.

This newsletter reports on an exciting 'Sand Dune Rejuvenation Workshop' organised by the Countryside Council for Wales held in Kenfig NNR. This event promoted a strategic approach to dune remobilization in Wales, and is reported here by Dr. Peter Rhind.

In September I was fortunate enough to visit the dune barrier islands of New Jersey, USA with Prof. Norbert Psuty of Rutgers University. Much of this low lying area is developed with housing and key pieces of infrastructure immediately on the shoreline. The visit reminded me just how important it is link science and management when dealing with the coastal dune environment.

Looking forward I want to remind you of our annual dune study tour to the Netherlands in May 2012, and our 'Dune Scrub and Woodland' conference which will be held in Liverpool on 12th and 13th September. Some details are available here <http://www.hope.ac.uk/coast/networkevents.html> but a dedicated website will be up and running soon with more information.

Finally, thank you to all the contributors in this newsletter. We are pleased with the diversity and quality of the contributions from those working in science and management.

Network News Charlotte Durkin



Over the last few months, John Houston has been involved in discussions to produce supplements to CIRIA's beach management manual which was published last year. Natural England, Environment Agency, National Trust, RNLI, Halcrow and others have come

together to share thoughts on what the scope of these supplements might be. In the latest webinar, the following topics were proposed.

- Beach safety
- Ecosystem services
- Dune management
- Competing and complimentary resources
- Understanding Marine Conservation Zones and other legislation

We are now submitting a bid to the Higher Education Innovation Fund to enable us to work on the dune management part of the project. There is sometimes a dissonance between agreed policy on how dunes should be managed and the schemes which are implemented to manage dunes in a sea defence context. We have just begun to interact with the coastal engineering sector and developing guidance in collaboration with the industry could potentially have the biggest impact in terms of delivering sustainable dunes. One of the organisations involved in the Beach Management Manual, writes about their experience of incorporating dune systems into Shoreline Management Plans on page 10.

The guidance publication would draw on case studies from the UK and worldwide and challenge some misconceptions about dune management.

For example, the idea that a stabilised dune is a more effective sea defence has influenced the design and engineering of coastal dunes all over the world. However, research over the last twenty years has shown that this may not be the case and it is important that we re-evaluate our most commonly held beliefs. Nowhere more than the Netherlands has embraced the original concept of stable frontal dunes, effectively managing their dunes as sand dykes. Now at selected sites the sea has been allowed to breach the frontal dunes and a more nuanced relationship between sea and sediment is being trialled.

The dune management supplement would be aimed at users with an engineering or spatial planning background, as well as non technical users. Little new practical guidance has been published since BTCV's Dune Management Manual over 30 years ago and with significant research developments in engineering and geomorphology in the interim, this guidance is long overdue.

The Newest Green Beach at Ainsdale on the Sefton Coast

By Philip H. Smith

The Ainsdale-Birkdale “Green Beach” on the Sefton Coast in northwest England began to form in 1986 when patches of Common Saltmarsh-grass (*Puccinellia maritima*) on the foreshore were not washed away during the winter and started to accrete silt and blown sand. The rapid subsequent development of embryo dune, salt-marsh and slack habitats is described by Smith (2007; 2010), who emphasises the extremely high biodiversity and nature conservation value of this feature. In late 2004, an area of the beach traditionally used for visitors’ car parking north of Ainsdale-on-Sea was reduced in size leading to rapid vegetation growth and the formation of a “New Green Beach”, which had been colonised by nearly 200 vascular plants by late 2011. In about 2008, another embryo dune ridge began to form on the shore south of the New Green Beach. This had become well established by 2011, its rate of growth increasing when the beach parking area was again reduced in late 2010. It was therefore decided to conduct a baseline survey of the new ridge and associated habitats (christened the “Newest Green Beach”) in August 2011.



Fig. 1. *Puccinellia* hummocks, Newest Green Beach, July 2011.

On 23rd August 2011, the length of the new ridge was determined by GPS at 270m. At its southern and northern limits this consists mainly of low mounds accreted around Common Saltmarsh-grass, the starting point for Green Beach formation. The central section of the ridge consists of more typical embryo dunes formed on top of the *Puccinellia* mounds (fig. 1). Up to about 1.5m high in the centre and 7 - 8m wide, these dunes are sparsely vegetated by Sand Couch (*Elytrigia juncea*) and Marram (*Ammophila arenaria*) with frequent patches of Sea Rocket (*Cakile maritima*) (fig. 2). The embryo dunes are quite heavily trampled at the southern end but, further north, they are much less disturbed by recreational activities.

A total of 21 vascular plants was recorded, with only those species already mentioned being at all frequent. Most plants were represented by only one or two individuals and were recorded as “rare”. Four nationally/regionally notable taxa were listed, including the Red Data Book “Vulnerable” Prickly Saltwort (*Salsola kali*). However, this species is fairly common as a strandline component on the Sefton Coast.



Fig. 2. Strandline and embryo dune mosaic



Fig. 3. Colonisation of shore by Common Saltmarsh-grass

East of the ridge, the beach (about 40m wide) now receives much less wear and tear from traffic and is just starting to vegetate, especially in the northern section where the level sand surface is beginning to show accumulations of silt (fig. 3). Here, Common Saltmarsh-grass was recorded as “frequent” and Sea Rocket “occasional”, the latter mainly on the sandier fringes. Also present were Sand Couch, Sea Aster (*Aster tripolium*), Sea Beet (*Beta vulgaris* ssp. *maritima*) and Curled Dock (*Rumex crispus*), all being “rare”. This vegetation is perhaps referable to an early stage in development of National Vegetation Classification SM13 (*Puccinellia maritima* salt-marsh) (Rodwell 2000). These communities are likely to evolve rapidly by succession, as occurred on the older sections of the Green Beach, and it will be interesting to follow their future development.

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Studland on the move – dune dynamics on the south coast of England

by **Angela Peters,**
Ranger Ecologist, National Trust

Studland beach, or South Haven peninsula, in Purbeck, Dorset, at 4km in length is a significant active sand dune system on the south coast of England. Backed by dune heath and a 30 ha oligotrophic lake in turn backed by lowland heath it forms part of the 757 ha Studland and Godlingston Heath SSSI and National Nature Reserve, also designated SAC, SPA and RAMSAR which signifies its importance nationally and internationally. National Trust was bequeathed the site in 1982 when the Bankes Estate passed the 8,500 acres (3,442 ha) to their ownership.

Old maps dating back to 1585 tell us that the dunes have been building up over the last 500 years. The acidic dunes gradually built up to cut off the inlet called the Little Sea, about 200 years ago making it a lake, which is now freshwater. Studland dunes have always been on the move and always will be, and this year we have initiated our own monitoring plan of the Studland beach coastline to show us and the various user groups such as beach hut users, naturalists, horse riders, sun bathers, café owners and others how the shape of the coastline is changing in the short term and the long term. There is at Studland, as at any coastal site subject to natural coastal change, conflicts of interest between allowing natural processes, and protecting infrastructure such as cafes, car parks, slipways and even protecting internationally protected habitats and species.



A high tide in October 2011, Studland beach © Annalea White.

We decided that the best way to capture data for our purposes was to use a hand held sub-metre accuracy Mobile Mapper GPS unit, and generate maps on GIS on an annual basis to show the shift in the dune toe and in the strandline. It literally is as simple as turning the machine on, hitting 'record' and 'stop' in the right places whilst someone walks up the strandline after the monthly high tide and back down the dune toe. It takes a few hours and is in the most part quite enjoyable (unless it's a sunny day, when there are too many sunbathers). This first year we planned to take monthly readings to gauge variation but this proved impossible due to the volume of beach users in sunny weather, so long term this will be done annually or quarterly and after storm events. There are many more ways of monitoring coastal change, but the Trust needed

something simple and affordable, and now that we have worked out how to download data and open it in MapInfo, it is proving simple and effective. Along with fixed point photos taken annually, quarterly and after storm events from 15 fixed points, we will have some excellent visual material to illustrate the dynamism of the beach. All this work can be undertaken by trained volunteers too and we hope to find willing volunteers to assist with this long term.

We have also teamed up with a local college, Kingston Maurward, to bring coastal studies students out to take quarterly beach profile measurements at select fixed points on a long term basis. This will show the seasonal changes in the shape of the beach and changes in volume of sediment, and in reference to the fixed points, long term changes to the location of the beach and dunes. This assists in their education and collects data that is useful for us on a long term basis.



Matthiola sinuata © Steve Trewella

As part of the monitoring we are also looking at some rare strandline and sand dune plants that depend on natural coastal processes. One lonely Sea Stock, *Matthiola sinuata* plant was recorded at Studland right at the edge of the dune two years ago by naturalist Steve Trewella. This nationally rare and UKBAP priority species is currently only found in North Devon, south Wales and the Channel Islands, so this was a pretty exciting find. National Trust Volunteer Annalea White has been monitoring the plant with Steve Trewella this year, as 40 seedlings were spotted in the vicinity of the original plant. A small fence was erected in front of the plant and its seedlings this summer to prevent people from trampling the seedlings. We also have a good population of the vulnerable and UKBAP priority prickly saltwort *Salsola kali* subsp. *kali*, at the northern end of the beach on the strandline, which this year volunteer Laurence Taylor mapped and measured – it was distributed intermittently along a length of 3.5 km and he counted hundred of plants.

Once the weather truly changes to autumn Studland beach becomes a wild and windswept place again, still popular with locals, walkers and dog walkers, and the occasional naturalist (yes, even in a normal chilly October!), but you get the sense of wilderness and mother nature taking back control. Thursday 28th October was 'beach measuring' morning. It was the wettest day we've had for months and erosion became evident as the very high tide coincided with the strong easterly winds: there was heaps of seaweed piled up, sand bars forming at the northern end of the beach, but the Sea stock was still hanging on and the Brent geese were just back for their winter holidays. Most invigorating!

Focus on Machair

It is a great privilege to be asked to introduce this issue of the Newsletter, for a range of reasons. The Sand Dune & Shingle Network has always given Scotland due prominence in its coverage, including some highly successful field meetings that are still generating benefits for the environment.

The Network has always been aware of the machair within its remit, though has been reluctant to appear to be stepping on the toes of the Machair Study Group, which I run with Professor William Ritchie through the Institute of Coastal and Marine Studies in the University of Aberdeen. We welcome the interest of the Network in machair, and also of course its willingness to work closely with the Machair Study Group.

In saying this, I am conscious that the Machair Study Group has not been very active of late, and I must take most of the responsibility for this. In late 2009, there was a major conference on machair in Glasgow, held by the

Glasgow Natural History Society, which did not involve the Machair Study Group. Nevertheless, the conference has probably led to something of a temporary hiatus in machair publications. In this context, it is immensely gratifying to see some interesting new material appearing in this issue.

The comparative lack of recent publications should not obscure the fact that much is happening. The RSPB's Machair LIFE+ scheme has just held a highly successful public meeting in Benbecula, and we look forward to seeing more details of their work as the project progresses. SNH has been working closely with CoastAdapt on a wide range of projects that will inform climate change adaptation in these low-lying islands facing the might of a rising Atlantic. Alas, nothing is quite ready for this issue!

Stewart Angus

Policy & Advice Manager
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Introduction

This issue, we bring you a focus on Machair, a habitat globally confined to the West of Ireland and Scotland. Its small range is due to the specific environmental conditions which result in this unique type of dune system. The word machair comes from the Gaelic term 'magh', meaning a large, low lying, fertile plain and this word features in many Scottish and Irish place names. Machair as a derivative, is a recognised scientific term for a specifically coastal plain, a (usually) calcareous dune pasture with a high shell content (up to 80 – 90%). The term often encompasses the entire system from the beach to the point where sand encroaches onto underlying peat. It develops in wet conditions where the prevailing wind is so strong it blasts the landscape and vegetation such that machair is more uniformly flat in topography compared to other dune habitats. This is why machair is confined to places where the wind is particularly strong such as the Westerly gales which come off the Atlantic.

Despite the harsh conditions which accompany the habitat, these landscapes are ancient cultural landscapes as farming has taken place here since prehistoric times. It is still heavily utilised for human activities as the fertility of the plain means it is used for marginal agriculture including livestock and some arable farming in which seaweed is important as a fertiliser. One of the differences between Irish and Scottish machair is that in Ireland, machair is very rarely used for cultivation, being preferred as a grazing ground (Gaynor, 2006), whereas both activities take place in Scotland. One of the biggest threats to the machair has been the subdivision of land during restructuring of the commonages. This has involved strip fencing, fracturing of the habitat and the intensification of farming on smaller areas.

Agriculture of this type is partly responsible for the 'unfavourable-bad' status accorded to Ireland's machair resource following the last round of Common Standards Monitoring (CSM) reporting in 2006 (Ryle et. al., 2007). The main problem was overgrazing which impacts on the 'typical species' and 'negative indicator species' targets. The latest round of monitoring is now taking place in Ireland and it will be interesting to see what effect the decoupling of subsidies and production in the 2005 Common Agricultural Policy has had. A lowering of stock numbers would reduce overgrazing on the machair but now that invasive species and agricultural grasses have had a chance to establish, the long term effect on the habitat is unknown. The 2007 report stated that despite the widespread intensification of agricultural practices on the machair, only one instance was deemed to represent irreparable damage. This provides some hope that the LIFE projects detailed below can remediate some of the impacts agriculture has had on this scarce resource.

For a general introduction to the machair please see the booklet published by Scottish Natural Heritage at <http://www.snh.org.uk/pdfs/publications/livinglandscapes/machair.pdf>

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Machair LIFE project

Bringing LIFE to the machair!



Machair Life is a four-year project running from 2011 to 2014, which aims to demonstrate that traditional crofting practices in western Scotland can secure a sustainable future for the machair.

It is supported by the EU LIFE+ programme, and is managed by RSPB in partnership with Scottish Natural Heritage, Comhairle nan Eilean Siar and the Scottish Crofting Federation.

The project aims are to secure and improve the conservation status of 70% of the world's machair habitat and its associated species by implementing and demonstrating sustainable management methods that optimise the conservation interest and are compatible with local crofting practices.

The project, based in the Outer Hebrides, will work on three SACs and ten SPAs covering 23,766 ha. It will bring 3,200 ha of machair habitat into favourable condition and improve the conservation status of the Birds Directive Annex 1 species Corncrake, Chough, Dunlin and Ringed Plover.

The project is focused on reinforcing good practice in the agricultural management of the culturally important machair. In turn this will continue to support the unique biodiversity of these regions. The projects actions include promoting late harvesting on arable machairs, introducing best practice techniques and demonstrating these to the

crofting community and increasing the capacity of these communities to help manage the interests of the Natura 2000 sites.

Information on the project can be found at <http://www.machairlife.org.uk/>

We hope to publish a full account of the work in a future newsletter.

A similar LIFE project ran in the Republic of Ireland between 2002 and 2005 which aimed to enhance habitat conditions for Annex 1 breeding and wintering birds at Termoncarragh Lake SPA and the surrounding area which includes machair. A specialized grazing regime has been introduced with the support of local farmers and land purchase allowed specific habitat requirements for Corncrakes to be implemented at different times of the year. The project engaged farmers within the SPA and set up active management agreements focused on the needs of species such as Red-necked Phalarope and over-wintering wildfowl like Brent Geese. Like the Scottish LIFE project, the project is habitat driven conservation focused on birds but evidence of improvements for wider biodiversity is cited by the project. Flowering plants and associated invertebrates have also benefitted from the improvements in coastal pasture habitat. During the next round of Common Standards Monitoring, the effect this project has had on machair in the area will become apparent.

<http://www.birdwatchireland.ie/Ourwork/Reserves/EULIFEprojects/Termoncarragh/tabid/225/Default.aspx>

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See also:

Machair Conservation: Successes and Challenges
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<http://www.glasgownaturalhistory.org.uk/machair.html>

Recent additions

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Tiree Machair

Photographs and text by Alison Spence

Of the 25,000ha of machair in Scotland, Tiree and Coll make up 4000ha (National Archives, 2010). Tiree is considered to have the most extensive and diverse areas of machair in the Outer Hebrides, covering 24% of the total land cover of the island (JNCC, 2011). Tiree machair and many of its associated species of flora and fauna are protected under International, European and UK legislation such as RAMSAR, SSSI, SAC and SPA.

Tiree Rural Development Ltd. (known as TRD) is a community company, charged with caring for the island's land-based interest on behalf of its residents and visitors. TRD works hard on many projects relating to the island's fragile biodiversity and crofting way of life. It is a livestock producing island and specific grazing regimes and agricultural systems are essential to maintain and preserve the unique habitats found (TRD Ltd., 2011).

One of TRD's many projects is the Access and Conservation project in partnership with the Tiree Community, Tiree Development Trust, Scottish Natural Heritage, RSPB and Argyll Estates. As part of this project the Tiree Access Forum was established, addressing issues relating to access to the land, in particular the effects of the increase in visitors accessing the beaches in motorised vehicles and its impact on the machair.

There has been a general increase in vehicles coming to Tiree but in 2009 there was a steep rise in the number of campervan/motor homes coming to the island. A 50% increase in October to May 2008/2009 compared to the same period 2007/2008 and a 154% increase in June and July 2009 compared with the same period 2008



© Caledonian MacBrayne 2010, Vehicular damage, Clockwise from top left: June '09, Oct. '09, Dec. '10, March '10.

Erosion of machair due to vehicular access is widely published and recognized as a serious problem. It is most common in areas where vehicles have access to the wider machair such as on Tiree. Many park along the seaward edge of the machair to enjoy the view and this activity results in erosion through compaction of the vegetation along tracks and on the dunes. This allows strong winds to erode the topsoil, exposing the sand beneath (Angus &

Elliott, 1992).

Working with TRD Ltd, we attempted to alleviate these problems by initiating an overnight campervan parking scheme allowing crofters to have up to three campervans per night on a designated area of their croft. In exchange for this, visitors pay a nightly charge with 90% going to the crofter and 10% going to TRD Ltd who organise the booking and payment collection. This has resulted in a decrease in the number of vehicles parking illegally on the machair overnight and reduced some of the pressure. It has also allowed visitors the chance to talk with crofters and find out more about Island life and its fragile habitats.

To maintain these areas and to raise funds for future projects, a voluntary parking permit was introduced in 2010. This scheme allows people to make a donation, of £10 or more to TRD Ltd, and in return receive a yearly designed car sticker which states that they are helping to preserve the natural heritage of Tiree. Information on the habitats are also given out at this time and updates are sent via email to all those wishing for more information.

It has always been the aim of TRD Ltd to establish a sustainable management plan for island wide access and earlier this year I was employed to carry out an access consultation. From the results of this consultation it was possible to put together a programme of works, which would help with the continued conservation of the Machair habitat but also improve the visitor experience at the same time.

New parking areas would be introduced around the island with access tracks made from local quarried stone. Parking areas would be delineated with sleepers or stob and rope where appropriate. A Geo-grid product would be used to reinforce the ground within these parking areas where necessary. This product is widely available, is made from recycled plastic and varies in installation procedures. The one suggested by Scottish Natural Heritage for use on the machair, requires no removal of the surface and is laid on top, with uneven areas being filled with either sand or local gravel. To protect the dune systems, dedicated access points would be provided in sensitive areas. Disabled access onto the beach will be provided at two points where the dunes are low enough to accommodate wooden ramps. In other areas of high use it is proposed to install a filled tyre system which is both cheap to make, easy to maintain and helps to recycle the tyres on the island. This idea was put forward by some of the windsurfers who have seen it work well in countries such as New Zealand.

Education plays a large part in conserving the machair. It is not a common habitat and is often seen as just grass. It is therefore important that at every opportunity through, production of leaflets, websites, interpretive panels and via the access officer to promote the fragility and importance of this habitat. This along with the provision of sustainable, usable access to the beaches; provision of foul water disposal ; and keeping communication open between all stakeholders should ensure the continued preservation of the Tiree Machair.

For more information and cited references please see <http://www.tireerd.org.uk>

Thirty years of change on the Machair

by Robin Pakeman and Rob Lewis, James Hutton Institute www.hutton.ac.uk



©Richard Hewison

Between 1975 and 1977, the Nature Conservancy Council funded the then Institute of Terrestrial Ecology to carry out a large-scale quadrat-based survey of all the major sand dune and Machair sites around Scotland: 56 sites and 1548

quadrats from Islay up to Shetland, including the North Coast. The original data sheets have survived, as have 1:10,000 maps showing the quadrat locations. Funding from the Esmée Fairbairn Foundation and the Scottish Government provided the means to put a team in the field during 2010 to attempt a resurvey of the Machair sites. In addition to the field survey team, one team member carried out interviews with crofters, farmers and township clerks to find out how land use had changed in the period between the surveys and how it may have influenced the vegetation.

Land use changes



©Julia Fisher

Even by the 1970s cultivation of the Machair was mainly a feature of only North and South Uist; though the practice was present still in most of the surveyed areas. However, by 2010 the practice had all but ceased outside of the Uists. On the Uists a small number

of townships had ceased cultivation, but rotation cereal growing is still widespread. Examination of the Agricultural Census data indicates that whilst cultivation may be still widespread, it and the associated fallows have reduced in area on the Uists. Other changes have included a widespread shift from cattle dominance to sheep, a general replacement of seaweed by inorganic fertilisers, increases in apportionment and the rationalisation of cultivated strips, and increases in plough depth.

Some of the changes have been driven by technology, but much has been driven by a reduction in the number of active crofters. It appeared that this figure had halved over the period between the surveys. Some crofters have responded by increasing their activity by taking on the land of inactive crofters, but in general the crofting areas on the Machair have seen a reduction in their intensity of use. Changes have occurred elsewhere within townships: there has been a general reduction in the use of moorland areas

for summer grazing, a switch in use of inbye land from hay and cereal production to silage and summer grazing. However, these changes may well have helped to maintain the winter grazing of the Machair that is necessary to prevent competitive dominance and a loss in species richness.

Ecological Changes



©Robin Pakeman

Overall, species richness was shown to significantly increase within the Machair grassland between surveys: in 1976 22.4 ± 0.27 species were found per 5 m x 5 m quadrat, whilst in 2010 the figure was 24.49 ± 0.24 .

However this pattern was shown to diverge between different areas and islands, increasing in Barra, Coll, Colonsay, Islay, South Uist and Tiree, while Harris, Lewis, Monachs and Shetland revealed a declining trend. A marked increase in the percentage cover of bryophytes were recorded between years ($+8.35\% \pm 0.01$), while a further 9 plant species showed large changes between surveys. Species *Juncus gerardii* and *Centaurea scabiosa* were found to show the greatest marked change in percentage cover where they occurred, the former increased by $9.8\% \pm 2.37$ and the latter, a valuable species for bumble bee conservation, decreased by $21\% \pm 1.41$. Others to reveal a substantial decline (i.e. $> 5\%$) were *Phragmites australis*, *Equisetum palustre*, *Iris pseudacorus* and *Eleocharis uniglumis* all exclusively wetland species, suggesting the machair grassland were substantially wetter in the 1970's than they are today. With the exception of Coll, Colonsay and Tiree, analysis of Ellenberg's indicator values (IV) for water revealed a decline in wetness to be universal across the majority of machair areas, the North Coast, North Uist, Sanday, Shetland and Lewis revealing significant falls in IV for water scores between surveys.

Significant changes in grazing intensity and cultivation activity were found between survey years for several areas. A decline in grazing intensity and cultivation activity was apparent for Barra, Harris, Monach Isles, Lewis (just grazing), North Uist and the North Coast (just grazing), whilst Sanday and Tiree revealed an increase. These results correspond well to recorded significant increases in Ellenberg nitrogen indicator values (N) for Sanday, Tiree, South Uist and Islay. There was a significant fall in N for Lewis.

Three decades have seen certain changes in the Machair resource. However, changes have been specific to certain islands and have been influenced by the balance between farming and crofting; there were certain indicators of intensified management for islands such as Sanday and Tiree whilst there appeared to be a drop in management intensity for others such as Harris and North Uist. The ecological part of this study was extended to the remaining sand dune sites round the east coast of Scotland during summer 2011.

Sand Dune Desperation in Wales

By Mike Howe and Peter Rhind

In the latter part of the 20th century sand dunes in Wales changed beyond all recognition with mobile dunes declining from about 75% in the 1950s to just 6% today (Rhind *et al.* 2001, Rhind & Jones 2009). Bare sand now accounts for just 1.7% (135ha) of the Welsh sand dune resource. No other habitat has undergone such a massive transformation. Factors such as depletion of sand supply, nutrient enrichment, enhanced CO₂ levels, soil development, artificial stabilization, and possibly natural climatic variation have been implicated (Rhind *et al.* 2008).



Left: Fen Orchid © Countryside Council for Wales

Council for Wales

This lack of mobility is now becoming critical since many of our obligate dune species are totally dependent on the open sandy areas of early successional habitats. These include the now critically endangered fen orchid (*Liparis loeselii*), which is designated as a SAC feature

on two Welsh dune systems. This plant has now been lost from all of its former locations in Wales (7 sites) apart from Kenfig Burrows, and here plants have declined from about 10,000 in 1970s and early 1980s to less than 160 today. Many pioneer dune invertebrate species have also undergone massive declines and now face the threat of local extinction (Howe *et al.*, 2010). Two species of beetle (*Paederus rubrothoracicus* and *Panagaeus cruxmajor*), two bugs (*Geotomus punctulatus* and *Prostemma guttula*) and one species of solitary wasp (*Mellinus crabroneus*) are now extinct in Wales, with *Panagaeus cruxmajor* lost from Tywyn Burrows as recently as 1998. The belted beauty moth *Lycia zonaria* was not recorded at Morfa Conwy, at its only Welsh locality, in 2011 and may also be extinct.

Traditional grazing practices have had little impact in terms of reversing stabilization and although mob grazing can be effective (Erlandson *et al.* 2005) this has been rejected on animal welfare grounds. A range of other options have been implemented including scrub control, topsoil stripping and deep ploughing. The latter causes topsoil inversion, burying any surface nutrient layers and unwanted seeds and exposing low fertility subsoil. However, these have met with mixed results and it now seems clear that more radical intervention is urgently required if we are to reinstate an element of dynamism to our dune systems and restore dune habitats and species to favourable condition. One option is to reactivate stabilized blowouts but for these to remain active the area of reactivation needs to be in excess of 500 m² (e.g. Boxel *et al.* 1997). Reactivations smaller than this tend to rapidly re-stabilize.

Having made some headway towards identifying the most effective ways of rejuvenating a suite of our larger

dune systems (Houston & Dargie, 2010), we are now fine tuning this process through a series of site-based geomorphological studies (e.g. Pye & Blott, 2011a). At Kenfig Burrows, for example, there is potential for creating areas of mobile dune close to the shore in the northern half of the site where a relatively large 'reservoir' of sand occurs within the frontal dunes. Existing blowouts in this area could be artificially enlarged with the aim of creating long sand transport corridors which link up with existing stable, or largely stable, parabolic dunes further inland. A similar assessment is in progress for Merthyr Mawr (Pye & Blott, 2011b).

In September CCW hosted a Sand Dune Workshop to discuss the conservation implications of dune stabilization. The workshop proved to be extremely useful, providing a basis for developing an agreed strategy aimed at helping to restore increased levels of mobility on selected sites. There was tacit agreement that Welsh dunes should support in excess of 30% early-successional habitats including 10% bare sand.

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Sand Dunes within Shoreline Management Plans

Management by functionality

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Shoreline Management Plans (SMPs), provide the policy and strategy for risk management, as well as drawing together research at the interface of land and sea. At Royal Haskoning, the recent development of ten Round Two SMPs has formed the basis of this observational note on how sand dunes are managed within SMPs.

Sand dune systems are often subject to a plethora of anthropogenic pressures and can serve a number of functions, for example: (1) recreational resource; (2) ecology (habitat); (3) flood defence asset to the hinterland; and/or (4) coastal erosion protection. Every system is different because of its location (prevailing processes), function and differing levels of anthropogenic pressure. It would therefore be logical that each should be managed in a different way.....but how are they managed within or between SMPs?

In the SMP process the approach to sand dunes is often a product of, and dependent on, function. In order to apply rational management policy, you must first understand why the sand dune is important and what function it plays. For example, on dune systems where the primary function is ecological habitat and the aim is conservation a 'no active intervention' or 'do-nothing' approach may be applied, letting natural processes prevail. Where recreation is a primary function of the dune system, public access is often a key issue. Here a soft touch may be applied such as restricted access, board walks and 'people nests'.



An example of public access management at Holme Next The Sea, Norfolk © Royal Haskoning

Where the dune system provides a coastal erosion or flood protection function, the management measures may be more deliberate. Where possible these are soft engineering, such as sediment entrapment,

nourishment etc., but in some cases are hard engineering such as groynes to promote sediment supply and/or reduce removal and ultimately fix the dune in place.

In a general and over simplified sense, management can be seen on a continuum from small scale short term, such as restricted access, to long term strategies, such as land use-change or hard defence. In many cases, management has a greater eye on long term strategy with regards to climate change and land-use management. This is often an ultimate aim of SMP policy focus, 'to sustain the dune system'. Public perception also plays an important role within SMPs regarding dune management. As is often

the case with other coastal landforms, a challenge of the SMP is to change public perception from that of a static landform to the acceptance of an active system susceptible to change over time.

Project Examples

In Newhaven (South Shields) the sand dune system served a dual function of recreational resource and erosion protection to hinterland transport infrastructure. Here the dune system is under extreme pressure. The consequences of these pressures are important because the dunes have a key shore protection and sea defence function in addition to their inherent ecological and recreational values by naturally protecting the coastline against erosion and sea flooding. Sand trap fencing and beach nourishment (with clean dredged material) as well as: (a) sea wall; (b) fishtail groyne; or (c) offshore reef structure, were all recommended to sustain the dune in its present position. Land-use change was also considered. At Studland, near Poole Harbour the relatively natural dune system is managed with a light touch. Here the function is a recreation and conservational resource. Heavy management intervention would see a loss in the primary function. Conversely, across the Poole Harbour entrance at Sandbanks, the thin sand spit is backed by high end property and transport infrastructure, and is intensely managed.

The sand dunes of Camber Sands (SSSI), East Sussex serve a dual function of conservation and recreation. A gift shop and access road backs the dunes. Management is not necessarily locking the dune in place through hard engineering, but reducing the anthropogenic pressures such as limiting the public access, allowing the dunes to strengthen through natural processes. This is a good example of management of an active system.

North of Seahouses within the Northumberland SMP the wide dune system fronts an area of low-lying hinterland. This dune system is the subject of the Environment Agency's Foreshores Project, aiming to improve interconnectivity between the sea and the leeward land. The proposed managed realignment (opening a tidal route into the hinterland) would improve the dune system and allow natural processes to remain dominant.

At Tenby South Beach, South Wales the relatively immobile dune system is backed by a golf course and serves a recreational function. Roll-over has compromised the leeward land use and the resultant management is through localised hard and soft engineering.

Sand dunes are individual and differ from one location to the next in terms of surroundings, function and the scale of external pressures. Within SMPs, sand dune systems are not managed generically, but managed primarily according to function, rather than scale, location or condition. The differing management from one function to the next is not to say that different functions are more or less important from one function to the next....but managed differently.

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This study shows the results of a program that monitored the process of natural colonization of plant species in a restored dune over a period of seven years, 2002-2008. The main conclusions of this study were that coastal dune restoration plans should have a regional approach, incorporating landscape-scale processes, including: (1) the recovery of lost or altered dune systems, primarily selecting those that are close to existing dunes, and (2) the restoration of a sufficient number of dune systems, to reduce fragmentation and facilitate the exchange of species, and to minimize the risk of disappearance due to the effects of natural and anthropogenic disturbances. **FREE** Please also see the author's personal publication list which contains links to some PDFs <http://personal.us.es/galfer/Publicaciones.htm>

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Other events

New Zealand conference 2012

Mark Dean one of our contacts in the New Zealand Dunes Trust has been in touch with an update on their most recent conference in February 2011. The Trust recently completed the final workshop in their project 'Empowering Coastal Communities to Adapt to Climate Change' and have received funding to take forward a research project on back dunes. You can find more about their most recent activities here <http://www.dunestrust.org.nz/news.html>

The next conference in this part of the Dunes Trust will be in during and the Trust are keen to attract people from the Northern Hemisphere to share ideas and knowledge. Please contact Kirsten Crawford on info@dunestrust.org.nz. The proceedings of the last conference can be found here <http://www.dunestrust.org.nz/DunesTrustConferencePresentations2011RFS.pdf>

Netherlands Study Tour 2012

Don't forget about our trip to the Hague and surrounding region in May 2012. Now is the time to start enquiring about funding within your organisation if you'd like to join us. Details are on the website <http://www.hope.ac.uk/coast/networkevents.html>



European Dune Network

Sharing experience across borders

The March 2012 newsletter will include an update on the development of the European Dune Network, news from throughout Europe and other international matters. On 21st May 2012 the European Union will also be inviting conservation bodies and land managers to celebrate the 20th anniversary of the Habitats Directive. This is an important milestone for conservation. The Natura 2000 network is now the largest conservation network in the world and the foundation stone of nature conservation in Europe. We will reflect on its impact for dune and shingle habitats.

With the Coastal Union-EUCC and other partners we are awaiting a decision from the Interreg IVC secretariat on a submission made earlier this year for a project aimed at developing a permanent European Dune Network. Whatever the outcome we will continue to work with old and new colleagues in developing links across sites and countries united by the common desire to conserve this special habitat.

Please continue to send us news and information, reports and contacts for dune management work across the EU and wider Europe

Plantlife campaign

Plantlife launches campaign to save threatened dune flora

Plantlife, which champions the conservation of our native flora, has launched a funding appeal to help conservation efforts aimed at the conservation of some of our rarest dune species. Plantlife is very aware of the problems that dune specialist plants are facing from over-stabilisation.

They call this the dunes 'shutting down' as natural movement is stifled by stabilisation schemes, conifer plantations, sea defences and the loss of traditional grazing. Species such as the rare and protected bryophyte Petalwort, need the damp, bare open ground created by

natural blowouts. Others such as the dune form of the fen orchid have declined from as many as 100,000 plants at seven sites in the 1980s down to just a single site with about 400 plants in 2011.

The main actions in the appeal include launching a project for Fen Orchid, delivering work at targeted sites, preparing advisory material and raising awareness of the plight of dune flora with policy and decision makers.

Please help Plantlife raise £30,000 with this appeal. They are over half way there so let's see if the sand dune and shingle network can make a difference. To support this worthwhile appeal please go to <http://www.justgiving.com/dunesappeal> and do your bit.

NERC PhD Studentship Opportunity - Modelling water based ecological services in dune systems

The Centre for Ecology and Hydrology, British Geological Survey and the University of Southampton have been successful in securing funding for a research project on sand dune eco-hydrology. The PhD will include field-based measurement campaigns and office-based model

development. If you are or know someone who would be interested in applying for this then please email Charlie Stratford (cstr@ceh.ac.uk) for more details. The closing date for applications is the 27th January 2012.

<http://www.findaphd.com/search/ProjectDetails.aspx?PJID=35846>

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Cover Photo: A view of the Harris hills from Berneray © Richard Hewison

The Sand Dune and Shingle Network is based at Liverpool Hope University