

**PAR BEACH LOCAL NATURE RESERVE
SURVEY OF
HABITATS AND VEGETATION COMMUNITIES**

April 2014



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Par Beach Local Nature Reserve
Survey of habitats and vegetation communities
April 2014

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Date: 17/04/14

1. BACKGROUND

Spalding Associates (Environmental) Ltd was instructed to undertake mapping of the habitats and vegetation communities on Par Beach in the autumn of 2013.

Par Beach is a Local Nature Reserve; the site is managed through the Friends of Par Beach and the Par Beach Management Partnership, which has been advised to obtain basic data to contribute towards decisions regarding a programme of habitat restoration.

Par Beach Nature Reserve has an old management plan on which very little action has been taken, and a recent one that requires a more detailed programme to be developed. The first study in 1997 included a plan of National Vegetation Classification (NVC) communities which have since been subjected to invasion by non-native species. Detailed mapping is therefore needed to decide on a block plan for a mosaic of management zones. Previous survey reports are listed in Appendix 1.

The study area does not include the caravan park, the intertidal zone or the channel of the Par River to the west.

The main elements of the project have therefore been to:

- Digitally survey the extent of blocks of vegetation with similar broad characteristics.
- Map these using GIS and present them in relation to existing formal and informal paths through the dunes, related to aerial images for easy reference.
- Determine and label blocks with the same characteristics and relate these to the pre-existing NVC categories.
- Present the GIS captured information in visual paper format for use without a GIS system.
- Provide recommendations on future management regarding the invasive species.

2. METHODS

Field mapping was undertaken between January and March. A final visit was made on 4th March 2014 to finalise aspects of the mapping.

The stands of vegetation and other habitat types were identified at the broad scale using the types identified by the Phase 1 Habitat survey system produced by JNCC (JNCC, 2003). The vegetation types were further refined National Vegetation Classification communities (Rodwell, 1991 – 2000), based on the field surveyors' experience and as far as possible given the limitation of the survey season. Vascular plant species were identified according to Stace, 1997.

In order to map the vegetation stands accurately two methods were used. The boundaries of the seaward mobile dune communities were mapped in the field using a Trimble GEOXT GPS unit (accurate to 30cm). More landward communities were mapped by 'ground-truthing' aerial views of the site downloaded from Google Earth™ earth, using the most recent 2009 images. The two sets of data were combined to provide a 'wire diagram' from a MapInfo™ GIS base which can be overlaid on the Google aerial images. This information can be analysed to give coverage for various vegetation types mapped as polygons.

Point information was also included to record locations for scattered or individual specimens of non-native species which should be considered in the management plan, including the ornamental shrubs that are planted around the beach huts. Small units of *Rosa rugosa* were mapped at first as individual points and then enlarged as 50x50cm polygons and the total area calculated on this basis.

We have mapped the vegetation communities over the Ordnance Survey layer to provide a map copy for this report and also mapped over Google Earth. These maps can be inspected and printed out using the files provided.

Google Earth, although very good for visualising simplistic data, is not really appropriate for detecting small scale changes in vegetation fronts as it uses SRTM data that is only guaranteed accurate to 30 metres. The method Google Earth used to display adjacent imagery files does not allow for sub-metre accuracy and as such a differential GPS file created and post processed to give 20cm precision that displays correctly in the east of a site may not display correctly in the west. This problem is confounded by variations in geo-referencing of historical imagery for this site with the 2009 imagery located 1.4 metres to the north of the 2005 imagery. Google Earth does not take account of variations in height across a site. This has resulted in issues trying to display precise information on an imprecise platform.

Survey constraints

The survey work was undertaken during the winter months of December to February; this season is not ideal for identifying the contribution made by herbaceous species to vegetation. The surveyors are confident that the main vegetation types and their extent have been captured successfully. However there may be individual or very localised growths of

certain species which were not visible, or identifiable, at the time such as Three-cornered Garlic *Allium triquetrum*.

During January 2014 the heavy storms that affected the coast of Britain resulted in erosion of the seaward edge of the fixed habitat at either end of Par beach. The boundaries were mapped before these storms.

3. RESULTS

3.1. Habitat and vegetation community notes

Bare sand

Bare (unvegetated) sand extends seaward from the fore dune areas and extends inland on paths and tracks where regular trampling prevents the normal colonisation and fixing by native grasses, herbs and mosses.

Foredune

Foredune habitat, defined by the frequency of Sand Couch, is extensive but of two distinct types: the vigorous growth of Sand Couch is found, typically, on the seaward edge and there are indications of gradual extension of the dune system seawards by this colonisation with extensive but very open new growth midway along the strandline zone of the beach; just landward of this is the second type of foredune habitat which is a zone of very open Sand Couch *Elytrigia juncea ssp. boreoatlantica* and Marram *Ammophila arenaria* where the Sand Couch is less vigorous and there are scattered patches of ruderal weeds and Japanese Rose *Rosa rugosa*.

Semi - fixed dune

Semi-fixed dune habitat extends along the face of the dune ridge but is a narrow zone persisting between the extensive scrub and the heavily pressured mobile foredunes and beach; the more species diverse semi-fixed grasslands consist of short open communities of fine grasses, yellow composites, mosses and the characteristic Sand Sedge *Carex arenaria*, all species that can tolerate some low levels of sand movement.

Fixed dune grassland

Fixed dune grasslands are those where the Marram growth is accompanied by dense growth of Red Fescue *Festuca rubra* in particular; these grasslands may be very herb rich where they are short, particularly where Rabbits are grazing the sward, but may also be deeper swards where False-oat Grass *Arrhenatherum elatius* and other common grasses and herbs are frequent. These grasslands are very restricted on the Par Beach reserve and may have been replaced by scrub communities as the various woody species in the locality have expanded.

Swamp

Areas of reed bed, dominated by tall, dense Common Reed *Phragmites australis*, are present around the edges of the pool, scattered through the Willow & Alder *Alnus glutinosa* carr and forming an extensive habitat in the north eastern corner of the reserve. There is also a small stand on the brackish habitat adjacent to the Par river.

Woodland

There are significant areas of woodland on the landward areas of the reserve. A patch of woodland dominated by tall, mature Oaks is present on a slope along the eastern edge of the site adjacent to a dense bed of Common Reed. A narrow strip of mixed conifer and broadleaved woodland is present to the north of the pool across the northern edge of the site. This habitat is dominated by tall Sycamore *Acer pseudoplatanus* with tall conifers also present.

Woodland plantation

There are areas of mature plantation on the western and eastern ends of the site; Poplars and pines are the most conspicuous component but the ground flora has developed a semi-natural woodland ground flora character with frequent Bramble *Rubus fruticosus* agg. and ferns.

Scrub

Mature scrub dominated by European Gorse *Ulex europaeus* is widespread and common on the dune ridge where it is accompanied by Bramble and in places more woodland type associates such as Foxglove *Digitalis purpurea*. Elsewhere there are scattered stands or individual shrubs of gorse and there are patches of scrub with abundant European Gorse and Bramble along the edges of the Willow & Alder carr, consisting of dense medium height vegetation.

Small patches of low-level Bramble scrub are developing across the site adjacent to areas of neutral grassland, Willow and Alder carr and on the dune ridge.

Willow Carr (wet willow scrub)

Tall, mature Grey Willow *Salix cinerea* ssp. *oleifolia* trees with dense understorey dominated by Yellow Iris *Iris pseudocorus* cover large areas of surrounding the pool in the north east of the site.

Small areas of mixed Willow and Alder carr are present amongst the Willow carr surrounding the pool; these areas consist of tall, mature trees again with a ground flora dominated by Yellow Iris. There is a small area of Alder carr on the eastern edge of the pool amongst a larger area of mixed Willow & Alder carr, again with the ground flora dominated by Yellow Iris.

Neutral grasslands

Much of the grassland along the southern edge of the pool is short-cropped and well-worn down to bare earth as a result of trampling by waterfowl and visitors. This habitat is dominated by the amenity/ley grass species Perennial Ryegrass *Lolium perenne*. Areas of short neutral grassland are present across the site adjacent to the road, car parks and bare ground tracks; these swards are patchily dominated by Perennial Ryegrass with short herbs and grasses that are tolerant of moderate to heavy trampling.

Narrow patches of rough, tussocky grassland have developed on the less managed edges of the eastern car park and either side of the leat in the south east of the site. This habitat is dominated by Cock's-foot *Dactylis glomerata* with abundant Yorkshire-fog *Holcus lanatus*.

The grassland field in the north-west of the reserve corner supports a neutral grassland sward that grades between areas of high cover with ruderal weeds and a less weedy grassland on the southern end of the field that has supported orchid species in the past.

Running water

A shallow leat runs from the north of the site alongside the road and enters the pool along its eastern edge. The leat also passes southwards under the road and out towards Par Sands. There is abundant Hemlock Water-dropwort *Oenanthe crocata* present along the leat.

Standing water

A large pool of standing water is present in the north east of the site adjacent to the caravan park, known as Par Beach Pool.

Ornamental scrub

Ornamental plantings of woody non-native species are widespread across the reserve. A narrow band of tall ornamental shrubs dominated by Bamboo mixed with Willow scrub is present in the north eastern corner of the site alongside the Indian restaurant. Bands of ornamental shrubs are present in the east of the site alongside the road and car parks; these areas are dominated by tall conifers but with dense scrub like patches of ornamental and native shrubs forming an understorey and woodland edge type habitat. Dense patches of Japanese Rose are scattered through the foredune, scrub and ornamental shrubs on the dune ridge.

There are also plantings, some very recent, of ornamentals around the huts on the dune ridge, including Japanese Rose cultivars at one location.

Bare ground

Bare ground is mostly associated with tracks. A bare ground track is present along the northern edge of the pool, where there are patches of short grasses such as Cock's-foot, and there are bare ground tracks through the woodland in the western area of the reserve. The large car park in the east of the site consists of unvegetated bare earth, as do the west end car park and the access track and several informal car parking areas are on bare ground.

Built features

A tarmac road provides the access to the central car park and main entrance to the adjacent holiday park from the north-eastern corner of the reserve. There are also short lengths of tarmac footpath in the north eastern corner of the reserve and there is a small area of tarmac car park at the centre of the reserve next to the toilet block building.

A concrete feature with seating has been created on the side of the reclaimed ground on the western end of the reserve.

Small wooden huts are scattered through the grassland and scrub on the landward face of the dune ridge; one of these had been recently burnt to the ground at the time of survey.

There is a wooden ramp access over the dune to the beach, situated midway along the dune ridge and reached from the tarmac road via a concrete surfaced path.

There are also small items of car parking furniture, railings, gates and signposting scattered over the reserve.

3.2. Vegetation communities and classifications

Table 1. A list of the habitats and National Vegetation Classification communities (and probable sub-communities) that were identified during this survey, with a summarising comment about the variations across the site

NVC community Probable subcommunities are indicated in parentheses ()	Comments	Phase 1 habitat
MG10 <i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture	Herb-rich marshy grassland with rushes and Marsh Thistle on the western end of the site	Marshy grassland
MG1a <i>Arrhenathrum elatius</i> grassland	Lush grassland sward with locally frequent ruderal weeds including Nettle and occasional Bramble in field area at western end of site, locally dominated by coarse grasses including Cock'sfoot	Neutral grassland
MG7 <i>Lolium perenne</i> leys and related grasslands community	Short turf, moderately species rich grassland on the amenity areas adjacent to the car parking, maintained by mowing and Rabbit grazing, or where subject to heavy trampling at the pool edge or on the track verges	Neutral (semi-improved) grassland
OV21 <i>Poa annua</i> – <i>Plantago major</i> open vegetation community	Recolonising vegetation on small areas of disturbed ground with sandy soils, annual and ruderal vegetation	Cultivated/disturbed land – ephemeral short perennial
OV25 <i>Urtica dioica</i> – <i>Galium aparine</i> ruderal vegetation community	Dense growths of Nettle with other ruderal species including thistles at the western end of beach, with Balm leaved Figwort locally abundant	Tall ruderals
S4 <i>Phragmites australis</i> swamp and reed bed community	Swamp habitat dominated by Common Reed possibly grading to S26 where more open	Swamp
S4 (d) <i>Phragmites australis</i> swamp and reed bed community <i>Atriplex prostrata</i> sub-community	Transitional brackish/terrestrial habitat with locally abundant Common Reed and Sea Aster	Saltmarsh
SM13? <i>Puccinellia maritima</i> saltmarsh community	Eroding banks of saltmarsh grassland on banks of western boundary – possibly SM13 but requiring detail survey for confirmation	Saltmarsh
SD18 <i>Hippophae rhamnoides</i> dune scrub	Dense woody dune scrub where Sea Buckthorn dominates, some areas with patches of Japanese Rose and some with European Gorse.	Dune scrub
SD4 <i>Elymus farctus</i> ssp <i>boreoli-atlanticus</i> foredune community	This community varies between almost pure vigorous Sand Couch with scattered Marram on the seaward (leading) edge of the dune habitat to open, sparse vegetation cover on extensive areas to landward where trampling, senescence and ruderal weeds alter the community character	Open dune
SD6 (a) <i>Ammophila arenaria</i> mobile dune community; <i>Elymus farctus</i> sub-community	Semi-fixed tussocky Marram dune with characteristic thermophilic species Sea Bindweed, Sea Holly and Sand Spurge but also frequent ruderal weeds Ragwort, Prickly Sow Thistle and thistles	Open dune
SD6 (d) <i>Ammophila arenaria</i> mobile dune community; <i>Ammophila arenaria</i> sub-community	Tussocky semi-fixed dune with Marram abundant and dominant.	Open dune
SD7a <i>Ammophila arenaria</i> – <i>Festuca rubra</i> semi-fixed dune community; <i>Ammophila arenaria</i> sub community	Abundant Marram and finer-leaved Red Fescue with a moderate diversity of herbs and grasses; some areas with invading scrub, mainly European Gorse and Bramble but in places invasion by Japanese Rose, Traveller's Joy and Sea Buckthorn is evident	Dune grassland
SD7b <i>Ammophila arenaria</i> – <i>Festuca rubra</i> semi-fixed dune	Semi-fixed dune grassland of short turf of fine grasses with Sand Sedge, mosses, composites and scattered Marram with	Dune grassland

community; <i>Hypnum cupressiforme</i> sub-community	sandy areas	
SD8 <i>Festuca rubra</i> – <i>Galium verum</i> fixed dune grassland community	Short dense grassland sward associated largely with the tracks over the fixed dune ridge, resulting from regular trampling and Rabbit grazing with trodden Marram, Buck's-horn Plantain, and Sand-dune Screw Moss with little open sand.	Dune grassland
W1 <i>Salix cinerea</i> – <i>Galium palustre</i> woodland	Wet ground with abundant Grey Willow growth	Scrub
W10 <i>Quercus robur</i> – <i>Pteridium aquilinum</i> – <i>Rubus fruticosus</i> woodland	Small stands of mixed species woodland, locally with abundant Sycamore, grading to scrub and wet woodland on the eastern areas of the reserve	Broadleaved woodland
W21 <i>Crataegus monogyna</i> – <i>Hedera helix</i> scrub	Thorn scrub with frequent Common Hawthorn	Scrub
W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	Scrub dominated by European Gorse with abundant Bramble including stands of mid-stage succession scrub where there is an open native scrub of Gorse/Bramble/Grey Willow (which is characteristic of recently colonised disturbed ground) and one area where the above ground growth of European Gorse has been recently felled to ground level. Associates vary with Marram being occasional on the dunes and Ivy dominating on one area on the east of the reserve	Scrub
W24 <i>Rubus fruticosus</i> – <i>Holcus lanatus</i> underscrub	Bramble scrub; an early stage of scrub succession. Associates include Marram on the dune ridges and on one area on the western part of the reserve Rosebay Willowherb is abundant amongst the Bramble.	Scrub
W5 (a) <i>Alnus glutinosa</i> – <i>Carex paniculata</i> woodland <i>Alnus glutinosa</i> – <i>Carex paniculata</i> woodland; <i>Phragmites australis</i> subcommunity	Wet woodland where there is frequent Alder and willow and the common associates are Common Reed and Yellow Iris	Broadleaved woodland
W6 (d) <i>Alnus glutinosa</i> – <i>Urtica dioica</i> woodland: <i>Sambucus nigra</i> subcommunity	Dry ground with tall willow scrub in the western wooded zone where Grey Willow has matured over a ground flora dominated by Bramble and dryopterid ferns with other native shrub associates including Common Hawthorn scattered throughout	Scrub

Note that *Elytrigia juncea* was formerly *Elymus farctus*; the plant name has changed but the name of the NVC has not.

3.3. Other vegetation stands, habitats and features

Discrete areas have been mapped where there was sufficient coverage of other types of vegetation which are not recognised within the National Vegetation Classification system. Some of these come within the Phase 1 habitat survey classification as indicated in the following table (Table 2).

Table 2. Phase one habitats not listed in the National Vegetation Classification system.

Area name	Area description	Phase 1 habitat classification where applicable
Japanese Rose	All vegetation where the density of growth varies between monospecific stands to common	Introduced shrub
Mixed plantation	Poplar and Pine dominant	Mixed woodland - plantation
Ornamental species scrub	Scrubby habitat formed by mature plantings of woody ornamentals surrounding the car park	Introduced shrub
Periwinkle <i>Vinca</i> sp.	Small but well established stand of the non-native	Introduced shrub

	Periwinkle	
Hard standing		
Disturbed soils		
Pine tree plantation		Coniferous woodland - plantation
Bare ground		
Ornamental shrubs		Introduced shrub
Hardstanding		
Running water		Running water
Standing water		Standing water
Bare sand track		
Burnt out hut		
Stand of Bamboo	There are two areas of bamboo, one near the entrance to the reserve and near the toilet block/car park at the centre of the reserve.	Introduced shrub
Mixed non-native/ornamental shrubs		Introduced shrub

In addition the location of stands/individual plants of the following invasive non-native species were mapped:

- Sea Buckthorn *Hippophae rhamnoides*
- Japanese Rose *Rosa rugosa*
- Periwinkle *Vinca* sp.
- Montbretia *xCrococsmia crocosmioides*
- Cotoneaster *Cotoneaster* sp./cv
- Pine *Pinus* sp.
- Buddleia *Buddleia davidii*

3.4. Habitat areas

Table 3 shows habitat areas for each of the polygon types used for the map. There were 2204m² of Japanese Rose alone and 7965m² in mixed vegetation habitats.

Table 3. Habitat areas

Habitat description	NVC Code	Phase 1 habitat	Area (m ²)
European Gorse scrub > 1 metre high with Bramble; associates vary with Marram being occasional on the dunes	W23 (c)	Scrub	23343
Fixed dense tussocky Marram grassland with abundant other grasses. The sward grades landward into fixed dune grassland (SD8) and possibly SD9 to landward but this would need confirmation by survey during the summer growing season	SD7 (a)	Dune grassland	13891
Japanese Rose. This includes all vegetation where the growth varies between monospecific stands to abundant over Marram grassland	-	Introduced shrubs	8672
Semi-fixed tussocky Marram dune with characteristic southern thermophilic associates Sea Bindweed, Sea Holly and Sand Spurge and frequent ruderal weeds Ragwort, Prickly Sowthistle and thistles.	SD6 (a)	Open dune	4331
Open sparse vegetation cover of Marram with Sand Couch and abundant ruderal weeds on extensive areas to landward of the leading edge of foredune	SD4	Open dune	717

Short fixed dune grassland sward with trodden Marram, Buck's-horn Plantain, and Sand-dune Screw Moss with sandy patches largely with the tracks over the fixed dune ridge, resulting from regular trampling and Rabbit grazing.	SD8	Dune grassland	6983
Bramble (early succession) scrub; associates include Marram on the dune ridges	W24	Scrub	1174
Tussocky semi-fixed dune with Marram abundant and dominant	SD6 (d)	Dune grassland	10922
Lush neutral grassland sward dominated by coarse grasses including Cock's-foot with locally frequent ruderal weeds and occasional Bramble in field area at western end of site	MG1(a)	Neutral grassland	7204
Open foredune; almost pure vigorous Sand Couch with scattered Marram	SD4	Open dune	3931
Short fixed dune grassland sward dominated by Red Fescue with Marram occasionally abundant	SD8	Dune grassland	630
Semi-fixed sands in open dune grassland with Sand Sedge, Red Fescue and mosses	SD7(b)	Dune grassland	697
Willow carr (dry); area of tall willow scrub in the western wooded zone where Grey Willow has matured over a ground flora dominated by Bramble and dryopterid ferns	W6 (d)	Scrub	8250
Mixed plantation	-	Mixed plantation	3035
Common Reed stand; swamp habitat possibly grading to S26 where more open	S4	Swamp	15918
Mid saltmarsh grassland including Elytrigia sp.; eroding banks of saltmarsh grassland on banks of western boundary possibly SM13	SM13	Saltmarsh	147
Ornamental species scrub; scrubby habitat formed by mature plantings of woody ornamentals surrounding the carp arking	-	Introduced shrubs	1441
Sea Buckthorn dominated stands of woody scrub	SD18	Dune scrub	1343
Short neutral grassland turf, moderately species rich, on the amenity areas adjacent to the car parking, maintained by mowing and Rabbit grazing	MG7	Neutral grassland	21763
Dense growths of Nettle with other ruderal species including thistles at western end of beach with Balm-leaved Figwort locally abundant	OV25	Tall ruderals	2855
Small but well established stand of the non-native Periwinkle	-	Introduced shrubs	18
Hard standing	-	Hard standing	797
Disturbed soils	-	-	368
Area recently cleared of European Gorse cover; above ground growth of European Gorse has been felled to ground level leaving stumps	W23	Scrub	588
Open mixed native scrub of Gorse/Bramble/willow; mid stage succession scrub will gradually develop to W21	W23	Scrub	2378
Stand of Bramble with Rosebay Willowherb abundant amongst the Bramble	W24 (a)	Scrub	1056
Herb-rich marshy grassland with rushes and Marsh Thistle on the western end of the site	MG10	Marsh grassland	2121
Pine tree plantation	-	Coniferous woodland	5513
Transitional Upper saltmarsh brackish/terrestrial habitat with locally abundant Common Reed and Sea Aster	S4 (d)	Saltmarsh	745
Bramble scrub	W24	Scrub	448
Oak woodland	W10	Semi-natural broadleaved woodland	2724
Scrub with abundant Gorse and Bramble	W23	Scrub	4270
Mixed woodland dominated by Sycamore	W10	Semi-natural broadleaved	876

		woodland	
Willow carr - wet	W1	Scrub	17742
Mixed Willow and Alder carr - wet	W5 (a)	Semi-natural broadleaved woodland	7606
Bare ground	-	Bare ground	6385
Ornamental shrubs in landscape planting	-	Introduced shrubs	1009
Running water	-	Running water	1332
Standing water in the pool	-	Standing water in the pool	19194
Alder carr - wet	W5 (a)	Scrub	811
Dense Ivy	W23 (c)	-	50
Bare sand track	-	-	299
Re-growing grassland on eroded area	OV21	Ephemeral/short perennial	118
Marram with native invading scrub, mainly European Gorse and Bramble	SD7	Dune grassland	1202
Semi-fixed open Marram with mosses, composites and Sand Sedge	SD7a	Dune grassland	898
Small area of disturbed ground; recolonising vegetation on disturbed ground with sandy soils, annual and ruderal vegetation	OV21	Ephemeral/short perennial	17
Sea Buckthorn and Japanese Rose	SD18	Dune scrub	1355
Stand of Bamboo	-	Introduced shrubs	59
Open Marram with Sea Buckthorn invading	SD7	Dune grassland	1628
Japanese Rose invading Marram	SD7	Dune grassland	174
Traveller's Joy invading Marram	SD7	Dune grassland	69
Sea Buckthorn and Gorse dominant	SD18	Dune scrub	4648
Very sparse Sand Couch and Marram on open sand area	SD4	Dune grassland	11610
Mixed native woodland	W10	Semi-natural broadleaved woodland	2760
Building	-	Building	62

4. DISCUSSION

4.1. Comparison with 1997 survey

The management plan produced in 1997 provides a map of habitats and NVC communities; it does not provide any information about when the survey to produce the map was undertaken so would not strictly be comparable with the present data set. Table 4 lists the habitats and NVC communities that were identified as existing on the reserve at that time together with the area each occupied; the ‘built-up’ area appears to have included the now vegetated ‘rubbish tip’ on the west of the reserve.

Table 4. Comparison of habitat areas in 1997 and 2014

Phase 1 habitat	Composite habitats and NVC communities (1997)	Area (ha) 1997	Area 2013
Broad leaved woodland	W1 <i>Salix cinerea</i> – <i>Galium palustre</i> woodland	1.4	1.77
	Woodland fringe	0.11	-
	Woodland on island in lagoon	0.13	0.20
Scrub	W23 <i>Ulex europaeus</i> – <i>Rubus fruticosus</i> scrub	0.62	3.06
Swamp	S4 <i>Phragmites australis</i> swamp	2.96	1.66
Unimproved grassland	MG5 <i>Centaurea nigra</i> – <i>Cynosurus cristatus</i> grassland	0.42	0
	MG1 <i>Arrhenathrum elatius</i> grassland	0.09	0.72
Sand dune	SD 4 <i>Elymus farctus</i> foredune	2.15	1.63
	SD6a <i>Ammophila arenaria</i> dune	0.25	0.43
	SD7/7a <i>Ammophila arenaria</i> – <i>Festuca rubra</i> semi-fixed dune	3.96	1.79
	SD8b <i>Festuca rubra</i> – <i>Galium verum</i> fixed dune	0.6	-
	Restored sand dune	0.74	-
Open water		1.73	1.92
Running water		-	-
Cultivated/disturbed land and built up areas		9.6	-
Beach		6.5	-

4.2. Invasive and non-native species

A number of ornamental species (Table 5) have either been planted in formal and informal landscaping works and reclamation works, dumped in soil waste or have seeded into the habitats of the reserve. The dune habitats have been extensively colonised by Japanese Rose and Sea Buckthorn; both species have made large stands where they are the dominant species (both together and separately) and both species are invading the more open semi-natural dune vegetation communities dominated by Marram. This is resulting in a gradual loss of the native Marram dominated dune grasslands with their associated plant and animal communities and changing the landscape character of the dune area. Some of the plants are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended); it is an offence under the Wildlife and Countryside Act 1981 (as amended) to “plant or otherwise cause to grow in the wild” any plant species listed in Schedule 9 of the Act.

Table 5. The species/cultivars which occur on the reserve and which are of most nature conservation concern because of their invasive potential.

Common name	Scientific name	Notes	Nature conservation status
Japanese Rose	<i>Rosa rugosa</i>	Widespread on dune habitat and increasing	Schedule 9
Sea Buckthorn	<i>Hippophae rhamnoides</i>	Widespread on dune habitat and increasing	Not locally native
Cotoneaster	<i>Cotoneaster sp/cv</i>	Single plant noted in woodland; requires critical examination whilst in flower/fruit during summer. Potentially invasive and some of the species are listed in Schedule 9 of the Wildlife and Countryside Act.	? Schedule 9
Montbretia	<i>Crocsmia xcrocosmioides</i>	Widely scattered across reserve in small clumps	Schedule 9
Buddleia	<i>Buddleia davidii</i>	At least three mature shrubs, probably self-seeded, are growing on the dune grasslands	Non-native
New Zealand Flax	<i>Phormium cultivar</i>	Scattered across the landward dune ridge grasslands, presumably planted in the past; this large subshrub has become naturalised in Cornwall and may become problematic at the reserve.	Non-native
Karo	<i>Pittosporum crassifolium</i>	Planted in landscaping, eastern part of reserve; this shrub seeds and naturalises so has the potential to be become invasive in the reserve.	Non-native
Periwinkle	<i>Vinca sp</i>	Two areas of this potentially invasive subshrub occur in the western section of the dune ridge grasslands	Non-native

There are other non-native species that have been planted around the various huts on the dune ridge but which, because of the low abundance (such as Dracaena Palm *Cordyline australis*) or absence of invasive tendencies (such as Rosemary *Rosmarinus officinalis*) are not of current concern.

5. RECOMMENDATIONS FOR MANAGEMENT OF SCRUB AND NON-NATIVES

5.1. Scrub invasion management – general remarks

In order to retain as much dune habitat diversity as possible the management priority should be to remove the invading scrub (particularly Japanese Rose, Sea Buckthorn and European Gorse) from the semi-fixed and mobile areas of habitat, particularly on the eastern end where the prevailing wind, natural sand movement patterns and native dune ecology has created a robust and dynamic dune grassland with vigorous Marram growth. Following that, a programme should be developed for gradual control and elimination of Japanese Rose from the mobile dune at the centre and west end of the beach, combined with a rotational programme of scrub control (including the European Gorse) on the more fixed areas of the dune ridge with the aim of creating sheltered pockets of semi-natural grasslands amongst the scrub stands where Rabbit grazing can assist in controlling scrub.

The other non-native species listed in Table 5 should be monitored and any opportunity to remove them from the dune habitats should be taken before either growth expands or naturalisation begins or increases, particularly in the case of the Buddleia which can quickly establish in more open habitat.

5.2. Rabbits

As with many dune systems in the UK the grazing activity of Rabbits is an essential tool in controlling scrub. An awareness of where the warrens are on the dune ridge and the potential to harness the grazing activity is a useful tool in planning where sustainable management following scrub removal is possible, but it is important to retain scrub cover near warrens to provide refuge for Rabbits, particularly since the reserve is very heavily used by people, and to ensure that grazing areas are in close proximity (probably 50 metres in this landscape) to scrub edges for retreat to shelter when disturbed.

5.3. Japanese Rose

Japanese Rose is not native to Britain and, although it has been used extensively in landscape plantings, it is posing a threat to local wildlife and biodiversity value where it has become naturalised. The species is creating dense thickets which effectively eliminate light penetration to the ground resulting in bare ground below the canopy and a loss of native plant cover. The loss of diverse Marram grasslands also results in the loss of its associated animal species such as butterflies and grasshoppers, and may result in the invasion of other non-native species.

As a consequence the species has recently (2010) been placed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) whereby it is now illegal to cause the species to grow in the wild.

However the plant is valued for its strong rose scent and the hips are widely used for culinary and herbal purposes. In addition Japanese Rose has been reported as having some benefit to bumble bees which feed on the pollen.

Full scale removal of the species is unlikely to be practical in terms of the resources it would require to achieve this. The recommendation for nature conservation purposes is for both immediate and long term control with the aim of elimination from targeted higher value areas of dune habitat and control elsewhere to avoid the gradual invasion of the entire dune system.

Therefore management should be aimed at:

- preventing the invasion of more dune grassland/foredune
- control of existing stands, with the aim of gradual elimination from the dune grassland/foredune to allow natural dune processes to progress, prioritising the small stands on the seaward edges
- identifying a tolerance zone around the more urbanised areas of the dune (i.e. near the central car parks and beach huts) where Japanese Rose would be allowed to persist.

It is important to plan the control and ensure that the longer term management is achievable in terms of manpower and funding since unless control is repeated reinvasion can be very rapid.

The recommended management for the species relies on a combination of mechanical and hand physical removal combined with some chemical control. The roots and rhizomes (by which it produces suckering growth and increases) must be removed as well as the top growth to prevent recolonisation. All parts of the plant, particularly the rhizomes, must be contained and removed since small fragments have potential for regrowth. Weedkiller such as glyphosate can be effective if applied directly to the roots and rhizomes or as a stump treatment, although higher concentrations are usually necessary and necessitate measures to be taken for public health and safety.

Mechanical or hand tool grubbing out followed by applications of weedkiller on regrowth is therefore recommended for targeted dense thickets. This should be combined with late summer applications of weedkiller as a foliar treatment, such as glyphosate (hand applied using paintbrush or hand carried equipment), on areas where Marram dune is being invaded. Although grazing with goats or sheep would provide some control it is unlikely to be a practical option at this site and is not particularly effective. Mowing and burning are ineffective control methods for this species.

5.4. Sea Buckthorn

This thorny shrub is only native to the east of England, but has been planted widely elsewhere to stabilise dunes, but its growth shades out other native species resulting in a loss of local dune character. In addition the plant is able to fix nitrogen from the atmosphere, resulting in an increase in soil nutrient levels and vegetation character. Therefore to retain dune habitat it is necessary to control its growth and prevent it invading the whole dune system. It is therefore important that resources are used carefully to gain control of the species at Par Beach.

The prolific berries are not believed to account for as much of the invasive growth as the expansion of suckering rhizome growth from established plants. Physical removal of the

shrub, including as much of the root system as possible, is the only effective measure for regaining dune habitat from an area where Sea Buckthorn has become dominant.

Simple hand cutting of top growth provides very temporary control since the stumps quickly regrow. However if stumps are treated with herbicide this will delay regrowth (although it will not reverse the increase in soil nutrients). The landward areas of Sea Buckthorn growth could therefore be treated by stump cutting with herbicide treatment with the aim of restoring native scrub cover to those areas where the soil will now be at least moderately enriched. However on the semi-fixed and mobile dune habitat on the seaward side of the dune ridge the management aim should be to eliminate Sea Buckthorn in the long term wherever possible and reduce its extent immediately to ensure a sustainable dune ecology for the future.

In order to provide effective control of the Sea Buckthorn growth on the seaward edges the following methods should be employed:

- Cut well-developed top growth to stumps and treat the stumps with Triclopyr herbicide; this may have to be followed up with a foliar spray in the following growth season.
- Dig out/uproot as deeply as possible the recently suckering growth on the seaward side and where feasible treat the stumps.
- Scrub cutting and stump treatment should be undertaken in the late autumn/winter period.

If resources allow, mechanical removal of at least a proportion of the densest growth on the dune ridge away from the central car park could be undertaken with the aim of restoring dune habitat; this should be undertaken near vigorous Marram growth and the worked area may benefit from a top dressing of sand from the intertidal zone to deter ruderal growth before native dune vegetation recolonizes.

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Appendix 1. Previous reports

Report title	Production details	Scope
Ecological assessment of coastal zone management issues at Par, Cornwall 2005	Spalding Associates (Environmental) Ltd Report for Cornwall County Council Digital format	Phase 1 level habitat and marine biotope mapping to GIS of terrestrial and intertidal habitats at Par Beach, nature conservation assessment and review of management
Par Beach Management Plan July 1997	Environmental Consultants (CTNC) Ltd	Terrestrial habitats mapped at Phase 1 level and vegetation communities mapped to NVC community level
Managing the Countryside Estate Par Sands Local Nature Reserve 2011	Unknown File name: ManagementPlanDraftSept2011.pdf	Detailed management plan including public access and visitor management

Title: Map 1. Habitat overview

Project: Par Beach Management, Cornwall



Spalding Associates
(Environmental) Ltd.

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CDH

Date:
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Legend

- Other habitat type
- Woodlands and scrub
- Saltmarsh
- Swamps and tall herb fens
- Mesotrophic grassland
- Vegetation of open habitat
- Shingle, strandline and sand-dune communities
- Hard standing
- Rosa rugosa with mixed vegetation
- Rosa rugosa
- Building
- Standing water
- Broadleaved tree
- Conifer tree
- Montbretia
- Bin
- Introduced shrubs
- Target note
- Buddleia

