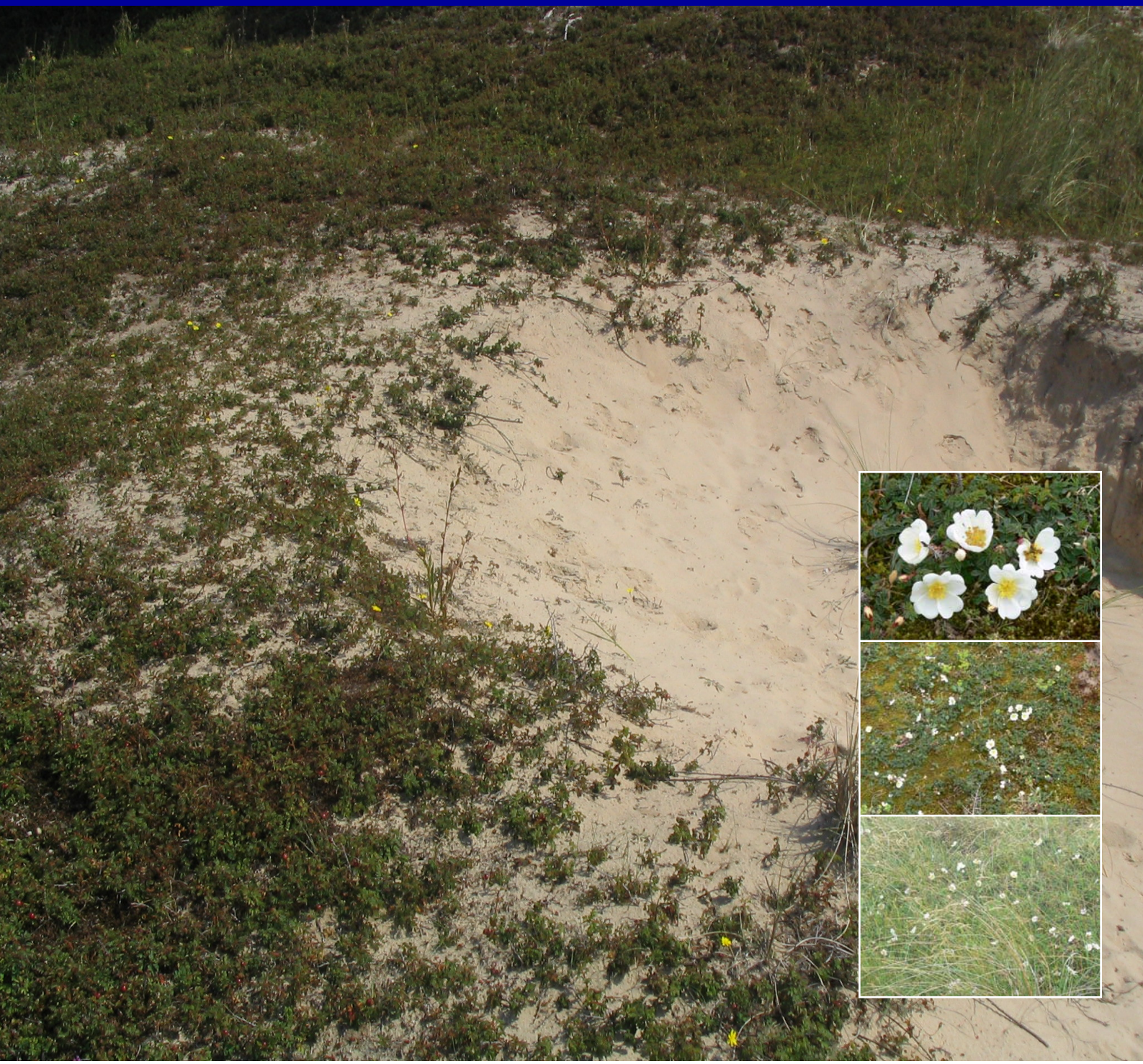
Department of the Environment—Jersey

Monitoring Burnet Rose on Les Blanches Banques

August 2013



Penny Anderson Associates Ltd
Consultant Ecologists

DEPARTMENT OF THE ENVIRONMENT - JERSEY

MONITORING BURNET ROSE ON LES BLANCHES BANQUES

AUGUST 2013

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This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed

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FIGURE

1 INTRODUCTION

1.1 Objectives

1.1.1 The aim of this project is to establish a monitoring programme for burnet rose (*Rosa pimpinellifolia* – now *R. spinosissima*) on Les Blanches Banques sand dunes. There is some concern that the rose is spreading on the dunes and some work is needed to establish the factors that are responsible for this and the outcome from the perspective of the dune's biodiversity. This has not been monitored scientifically and is currently derived from anecdote and mapping rather than quantitative measurements.

1.1.2 The main concern is that burnet rose is becoming more dominant rather than mixed with a wide range of other species in a diverse community. This is in open dunes rather than the closed dune grassland where the rose forms part of a mixture with fewer species typical of more rank grassland, mostly on the dune plain (see PAA 2006).

1.1.3 The factors that need to be considered are varied and include the possibility that the rose can tolerate more sand blowing and accumulation than its associated species. This in turn could be the product of more trampling and sand movement as a result of disturbance. There is also the possibility of the opposite case whereby the dunes are becoming more stable and the rose is better able to grow in these conditions than its co-species. There could also be interrelationships between grazing (largely rabbits on the dunes here) or cutting or other herbivory such as the brown–tail moth which can cause widespread defoliation at times. Finally, changing climate patterns could be causing changes in the balance between species.

1.2 The Approach

1.2.1 The approach has been to review the ecological character of burnet rose in order to better understand how it may be reacting to different factors or pressures in relation to the species with which it grows. This has involved collating all that is known and relevant about the species, its patterns of growth and how it responds to various environmental factors in a sand dune situation. This has included the results from past experimental or monitoring work undertaken by Penny Anderson Associates Ltd (PAA). This information altogether has informed the recommended investigations and monitoring programme.

2 BURNET ROSE ECOLOGY

2.1 General Environmental Features

Plant and Community Features

2.1.1 The basic ecological character comes from the account in the Biological Flora of the British Isles by Mayland-Quellhorst *et al*. (2012). Burnet rose is a perennial plant that spreads mostly by root suckers and rhizomes, forming patches or thickets. It is a native plant of the British Isles, found in dunes, sandy areas near the coast, more-or-less base-rich heaths, open, dry habitats on chalk and limestone and base-rich outcrops inland. It is more frequent on the west and north coast of Wales, England and Scotland rather than the south and east where it is sparse. It is widely distributed in Europe and is tolerant of cold oceanic to temperate or even continental climates. It is stated as tolerating temperatures as low as minus 20^{o}C. It grows well on shallow, fine to coarse-textured material or loamy calcareous soils such as on dunes. The pH range is from 5.8 to 7.6 with an average soil organic content of 12.9 or a fraction of 35%. The plant seldom generates from seed (which requires winter chilling before germination) so most of the spread is from suckers (Grime 2001).

2.1.2 Rodwell (2000) considers the burnet rose to be a component of two sand dune vegetation communities; the SD8 Red fescue/lady's bedstraw fixed dune grassland and the SD9 false-oat grass/marram dune grassland. The communities where it appears in Jersey are variants on these since false-oat grass is not a sand dune species in the Island. The SD8 community is generally a closed sward 10cms or more tall, which may be grazed. Marram is infrequent in this, with red fescue being the predominant grass along with species like meadow grass, occasional cock's-foot and hairy oat grass. Only sand sedge and field woodrush are frequent. The commonest broad-leaved plants are lady's bedstraw, ribwort plantain, white clover, bird's-foot trefoil and common cat's ear. This has considerable affinities with the main rank dune grassland on Les Blanches Banques. The SD8 community is a fixed dune grassland with little sand accretion, thus the organic matter accumulation increases the moisture content, enhancing the trophic state. The limitation of moisture and nutrients prevents the vegetation thickening up and becoming more luxuriant, thus it gives space to a wide variety of herbs, including winter annuals which maintain the vegetation diversity.

2.1.3 The SD9 community is a rank, tussocky sward where red fescue is abundant along with constant marram and co-dominant false-oat grass. Meadow grass and cock's-foot are present but not abundant, along with other grasses, but smaller species are scarce in this community. Low bushes of burnet rose are scattered in this vegetation. This community does not seem to feature on the dunes in Jersey.

2.1.4 The plant is considered to be not very competitive by Mayland-Quellhorst *et al*. (2012) and this can lead to a diverse range of associated species. Lemauviel and Rozé (2003) for example, describe a fixed dune vegetation in France (Quiberon) where burnet rose had 85% relative frequency, but the vegetation was the most diverse of the three communities they studied. The authors described the community as having a dense carpet of mosses and lichens, a short grassland sward with the woody species (burnet rose and another species not found in the UK) forming a high cover on flat topography rather like the Jersey dune plain in form.

Environmental Tolerances

2.1.5 The plant can be outcompeted by other shrubs such as *Rosa rugosa* (a non-native invasive species in some dune areas in mainland Europe) and this is reflected in its need for high light levels given as 8+ out of 10 by Hill *et al*. as part of the Ellenberg's Values for British Plants (1999). Indeed, Hill *et al*. describe the plant as light–loving and rarely found in areas where summer illumination is less than 40%.

2.1.6 Hill *et al.* also describe burnet rose as an indicator of dry sites, more often found on dry than moist locations, and Mayland-Quellhorst *et al*. (2012) suggest it can tolerate Mediterranean drought. This makes it very versatile under conditions of a changing climate.

2.1.7 Hill *et al.* 1999 regard burnet rose as an indicator of infertile sites with an index of 3+ out of 10 for nitrogen requirements. This accounts for its position in the dune grassland vegetation which is generally nutrient-poor. It does not tolerate salt though, with an index of 0 out of 10 according to Hill *et al.* 1999.

2.1.8 Burnet rose appears on some dunes where the effects of recreational trampling pressure have been examined. The biological traits provided by the German vascular plant information system, BiolFlor, suggests that burnet rose is sensitive to trampling. Trampling studies by Trew (1973) support this, finding that the plant is only rarely present on Welsh dunes at Porteynon where passage of people/year were around 1000/year, but was common and widespread along paths where only 500 or less passed each year.

2.1.9 Lemauviel and Rozé (2003) tested a single experimental trampling event on different dune communities, including a burnet rose-dominated one, and found the relative frequency of the vegetation was halved from 250 passages upwards (the dose went from 250 to 1500 tramples on one June day, measured two to three weeks afterwards and one year later) but recovered to about 75% of the former cover within a year. The resistance of the vegetation was modelled at about 564-585 tramples before more than half of the relative frequency is affected. The authors considered that the woody species like burnet rose, once damaged through trampling, recover only slowly and that the diverse mixture is not adapted to regular disturbance which results in an unstable substrate. They quote other studies where trampling, combined with adverse weather conditions, can lead to the complete disappearance of populations of sensitive species.

2.1.10 A hint is given by Moore (1931), on burnet rose's ability to tolerate or thrive in dunes where sand accretion is taking place. On the Ayreland of Bride (Isle of Man), Moore describes burnet rose as an efficient sand-binder so long as the amount of blown sand is not too great. It is considered to be the first higher plant to appear in the succession from moss/lichen colonisation to dune heathland.

Herbivory

2.1.11 Burnet rose is not generally considered to be eaten by stock. Hoffman *et al.* (2001) noted that donkeys eat only the fruits, not the leaves. The rose was not favoured compared with a wide range of other broadleaved plants and grasses, even though the animals spent 19% of their time in the rose-dominated swards which only covered 3.8% of the area (on an 80ha site in Flanders). Mayland-Quellhorst *et al*. (2012) considered that only cattle would take burnet rose and that it then re-grows strongly from suckers and rhizomes. However, Lamoot *et al.* (2005) found consumption of burnet rose by cattle was minor (0.91% of bites) for Highland cattle, whilst graminoids were highly favoured (79% of bites) on dunes in the same area. There is no information in the literature on the effects of rabbit grazing on burnet rose. The dense and pronounced prickles that clothe the stems seem to deter most mammal grazers effectively.

2.1.12 BiolFlor suggests that burnet rose has little forage value and is moderately tolerant of grazing, but more sensitive to mowing.

2.1.13 Burnet rose is one of many food plants of the brown-tail moth whose larvae can strip the leaves in a plague year. Le Sueur (1976) recalls huge patches of the white of the larval webs visible 100s of yards away when numbers are high. It is not clear whether the numbers in an outbreak of brown-tail moths affect the population of their food plant in any significant way. Other species are also likely to feed on the rose.

Climate Change

2.1.14 A recent consideration of climate change in Guernsey has relevance to Jersey and for this discussion it is assumed that the findings in the former are also being felt in the latter. Casebow (2007) has summarised the evidence and suggests that:

- the annual mean air temperature has increased by 1^{o}C between 1843 and 2006, with much of this experienced in the period 1981-2006. Each month is getting warmer, but this is greater in July/August (1.1^{o}C), and least in February (0.2^{o}C);
- average rainfall has declined by 4% since 1843, but this hides a reduction of 16% in summer/autumn and 10% increase in winter/spring. The overall decline is of about 35mm out of an annual average of 824mm (30 year average). Mid summer droughts have increased;
- sunshine hours have decreased but then increased by 5% over recent decades. There is generally less in March (down 10%) and March to June (down by 5%), but more at the other end of the year;
- in general, there are fewer gales now than there were in the 1975-1984 period;
- sea temperature has also increased.

2.1.15 The effects of these changes are considered to include increased winter soil temperatures and wetter soils in winter as well. Flowering periods are considered to be up to 13 days earlier than before 1985, although there is a wide range of responses.

2.1.16 The predictions under the medium-high climate change scenario for the Channel Islands are for average temperatures to continue to increase by up to 3^{o}C (3.8 summer, 2.4 winter) and for rain to be 4% less per year (45% reduction in summer and 24% increase in winter). The frequency of hot days is expected to increase four to five times by 2080 and frosts decline by 70-85%. The number of heavy rainfall days in winter could increase by 30-50% in winter and reduce by 40-50% in summer.

2.1.17 These changes, both current and predicted, are likely to affect the balance of communities as some species respond positively or negatively compared with others. It would appear that burnet rose could be able to respond positively to these changes as the plant is tolerant of drought and prefers dry conditions, but that establishment from seed would be less likely owing to its need for winter chilling. Being a widespread species, it will also tolerate increases in temperature. The key will be the way its companion species react to the same changes.

2.2 Jersey Context

Vegetation Investigations

2.2.1 The findings from the different investigations undertaken on Les Blanches Banques over the years show some significant effects of different factors on burnet rose that do not seem to be replicated in the wider literature (probably because the plant has not been the subject of many investigations). These are relevant to a consideration of any possible recent expansion as they show how the rose reacts to different factors on the dunes in Jersey rather than drawing inferences from other sites with different environmental pressures and plant communities.

2.2.2 In 1983, some linear mowing plots were established alongside several paths on the dune plain to investigate the effect of annual or biennial mowing of rank dune grassland with the aim of increasing plant diversity. Rabbit faeces were also counted to provide a measure of activity. The results showed little difference between annual and biennial mowing but a significant improvement in diversity, particularly of small annuals, after any mowing. The amount of burnet rose showed a decline from 25.5% cover prior to mowing in the treated plots on average to 14-18% cover after annual or biennial mowing, with generally a lower cover (13.8 to 15.8%) in the annually mown plots. The control plots had 21-37% cover from 1985 to 1989 (PAA 1989).

2.2.3 Four 5x5m plots were established in 1987 and half of each mown once in an attempt to attract rabbits to graze in order to test whether this was sufficient to increase plant diversity rather than undertaking large-scale regular mowing. The data can also be used to determine the behaviour of rose to cutting once and then subject to rabbit grazing. Most plots showed a decline in burnet rose after the single mowing event, although the level of change differed between them from about 22% less cover (from 80% to 58% Plot A) to only 5% (from 16 to 11% on Plot B and 45 to 40% on Plot D). Plot C had a low cover to start with (5.6%) which increased slightly but not significantly after mowing to 7.6%, (PAA 1990).These results tend to confirm the results from the mowing transects beside paths where a similar scale of reduction in cover was detected after mowing.

2.2.4 Subsequent rabbit grazing on the plots (much greater on Plots C and D that were near warrens than Plots A and B which were distant from warrens) did not seem to make any difference to the burnet rose cover. However, it declined on all plots, mown and controls, in 1987 compared with 1986 for no obvious reason. It was commented at the time that there had not been a brown-tailed moth outbreak. There are therefore natural unknown factors that result in considerable variation in burnet rose cover from year to year in the same places.

2.2.5 The mown plots A and B combined had an average cover of 48% burnet rose prior to mowing, which declined to 35% by the following year, and remained at around this level until the effect of the gale (see below) which was more dramatic than mowing had been. In the unmown plots A plus B, burnet rose cover on average was 57% in 1984, and this remained at between 46% and 63%, showing considerable variation across this period, until the 1990 gale (PAA 2002).

2.2.6 This January gale brought salt-laden wind across the dunes which resulted in widespread death of the vegetation, including much of the gorse (bracken took over from this in many spots), the dune plain looked grey and dead in July 1990. It was noted that burnet rose declined, but then recovered, although to a shorter height by summer 1991, (PAA 1993). Cover on the previously mown A and B plots recovered to 23% and on the previous A and B control plots to 44.5% by 1991 (PAA 1993). This reflects the sensitivity of burnet rose to salt (Hill *et al.* 1999), but recovery was presumably due to re-growth from the underground rhizomes and suckers which were apparently not killed by the salt deposition.

2.2.7 Further monitoring of the effects of the storm and the redevelopment of the dune vegetation showed that burnet rose had reached a 39% frequency on the previously mown plots (A+B) by 1993, in the third growing season after the salt damage occurred. This continued to increase slowly until 2000 when cover reached 51%. The previously unmown plots had a higher cover prior to the gale and recovery from 1993 to 2002 showed consistently high levels between 43% and 56%. None of these small-scale changes in burnet rose cover are statistically significant from one year to the next, but show a consistently quite high level of cover. The work in Brittany (Lemauviel, S. and Rozé, F. 2003) shows, however, that even at this cover level, the sward can still be diverse. The A and B plots had, before the storm, been within the rank dune grassland community and they eventually returned to this vegetation type after about 10 years after passing through a more species-rich phase before the grasses became dominant because of inadequate grazing to maintain the richer swards.

2.2.8 In 2005, the vegetation of the dunes was re-mapped and compared with previous mapping exercises (PAA 2006). The same vegetation communities were identified and mapped as in previous occasions by some of the same surveyors, thus ensuring consistency of approach. The plant communities are not those recognised in any formal classification since they do not fit the NVC and are more detailed than this system as well, giving 14 different communities. Burnet rose occurs in a wide variety of these at various frequencies as follows:

- B - short, species-rich vegetation with moss and lichens where rabbit grazing is abundant. Burnet rose locally prominent, but not more than 50% cover;
- Bi - variable, short turf species-rich community with more dense cover of vegetation and less burnet rose (mostly frequent not dominating), and less moss and lichen cover;
- Bii - trampled, species-rich community along vegetated paths, often along the lightly trampled fringes, frequently occurring burnet rose;
- C - open tussocky marram grass – with much bare ground – burnet rose is a minor component, but present occasionally;
- D - closed marram in dense vigorous swards, often being invaded by rank grassland after marram has stabilised the sand. Burnet rose is abundant in this sward type;
- E - rank grassland indicating a stable soil with increased organic matter and nutrient content. Continuous vegetation. Burnet rose is occasional to frequent in this type.
- F - gorse scrub occurs in patches frequently associated with burnet rose and other species;
- G - mixed shrubs, burnet rose also occurs mixed with these, but only where there is enough light;
- I - bracken dominant communities also support frequent burnet rose;
- J - this is the burnet rose-dominated vegetation type, occurring in the vicinity of paths, especially on the low dunes below the golf course, in an open sward with fewer other species associated with it except lady's bedstraw and thyme and a more limited range of other species. Burnet rose comprises much more than 50% cover;

- L - heathland consists of heather or bell-heather mixed with burnet rose or grassy vegetation in very limited areas.

2.2.9 Any of these vegetation types can be mixed with one of the others and burnet rose frequently is co-mixed with the species-rich B communities.

2.2.10 Burnet rose is a key species on the dunes as a whole and a normal part of many vegetation types on the site. The repeat mapping has enabled a comparison of these vegetation types over time between 1994 and 2005 using GIS analysis. A hand-drawn vegetation map using the same plant communities was also produced in 1983, but could not be entered into the GIS owing to the lack of ortho-rectified aerial photographs at that time. The comparison (PAA 2006) showed that rose-dominated communities were not increasing, but rather they had declined by 6.23% to 7.86ha from 8.39ha (in a 100ha dune system). Similarly, mixtures of rose-dominated and other vegetation types had declined by 44.5% from 26ha in 651 patches in 1994 to 14.66ha in 431 patches in 2005. The GIS analysis showed that only 3.41ha of the rose-dominated communities were in the same location in 2005 as in 1994, showing significant changes in the vegetation patterning over this 11 years. Most of the stable communities were located on the east side of the dune plain and on the higher plateau close to the sport's ground.

2.2.11 The changes from rose-dominated vegetation occurred across the spectrum of vegetation types. The changes are interesting since they show a move of 7.04ha altogether to richer grassland communities, including mixtures with the rose. These changes show merely a reduction in dominance since rose is a major feature of these communities in any case. These areas are concentrated on the dune plain and the higher dunes close to the sport's ground. 1.88ha has moved from rose-dominated or co-dominated to rank grassland. A little was colonised by marram suggesting unstable sand conditions, emphasised by the loss of rose to bare sand in 0.2ha.

2.2.12 Changes in other vegetation types to rose mixtures were also evident. 0.57ha of B diverse vegetation had changed to burnet rose dominated swards, but many of the rose mixtures had changed to rank grassland of some kind (where rose would have been equally abundant). Some open marram (0.39ha) had also moved to rose-dominated vegetation. Small areas of gorse scrub had changed to rose-dominated vegetation.

2.2.13 Overall the analysis emphasises the considerable dynamic nature of the dune vegetation with changes across the board in many of the vegetation types and their locations. Those most likely to remain static are the longer lived ones such as scrub and woodland. The key findings are the switches between grassland, rose and marram communities.

The Implications

2.2.14 The research and past monitoring shows a number of key features:

- burnet rose is abundant across a wide range of communities, but these are dynamic and change frequently in response to various factors;
- it is tolerant of dry, sandy soils, drought, low nutrient levels and low temperatures but not low light or salty conditions;
- the largest reductions found were due to salt spray damage, but cutting and trampling have similar, but lesser effects. It seems to be resistant to most grazing;
- burnet rose could be resistant to most elements of climate change owing to its tolerances, but how the changes affect other species could be more critical in determining the nature of plant communities on the dunes in the future.

2.2.15 Against this background, it is important to consider where any issues of change in burnet rose are or might occur. The obvious areas of change which could affect biodiversity more are where mixed burnet rose communities change to those dominated by the rose. There is no evidence that burnet rose is taking over the rank grassland or other more rank communities where it is a constituent part. It is the more diverse communities therefore where movement towards a rose-dominated vegetation and loss of annuals and the other associates of a diverse community where more concern might be felt – although it would appear that other areas are taking over this role as they change as well.

2.2.16 This synopsis suggests that some of the possible factors controlling burnet rose identified in the project remit can be discarded. Rabbit populations are probably not affecting the amount of burnet rose through grazing, although they can be very important in determining whether the burnet rose forms part of a species-rich vegetation or a rank grassland. Climate factors cannot be ruled out, but are more likely to be affecting the companion species than the rose, possibly giving it a competitive advantage – but this does not seem to be the case now or yet since the plant is not consistently increasing across the dunes at the expense of more diverse communities. Trampling does not seem to be reducing the rose as it does not occur on the most highly used paths and the dense prickles prevent easy access to walk across it. Cutting can reduce its growth, but there has not been recent large scale cutting across the dunes and increasing rose is the issue identified, not reduced rose.

2.2.17 Burnet rose does not grow close to the coast since it is not tolerant of high salt levels, so it is more a feature of the fixed dunes further inland. It is not found within the more mobile land-ward dunes where bare sand and marram communities predominate. This means that it is associated with species tolerant of more stable sand than mobile ones. The research shows that many of these species are not tolerant of inundation but sand, whereas the rose can survive under moderate instability. This gives a pointer to the key to changes in the dune vegetation. Where there are factors (mostly trampling, but locally possibly rabbit burrows and scrapings) nearby, sand mobility is increased, sand blow covers the mixed rose/diverse communities, but only the rose can tolerate this (or not if it is too high as can be seen by the increase in bare sand at the expense of rose in limited areas).

2.2.18 These considerations lead to some ideas for monitoring burnet rose. The first premise is that it is not the rank grassland communities that are of concern and that effort should be focused on areas where burnet rose is possibly taking over from more diverse B vegetation. The problem is that it will be difficult to identify areas where change might occur. Some ideas are presented in the next section.

3 THE MONITORING SUGGESTIONS

3.1 Approach

3.1.1 It is recommended first that some investigations are undertaken to explore how the rose might be able to gain dominance over other species. Then there are some ideas given for monitoring the situation in areas where rose is dominant, where it is co-dominant near to and away from areas of sand movement (through trampling).

3.2 Investigations

3.2.1 The first step will be to investigate some areas where rose has become dominant over other species, changing from a co-dominant vegetation with the species-rich B communities. Suitable patches to sample can be taken from Figure 1 which shows the extent of rose and rose/co-dominant vegetation in 2005 and the changes since 1994. The aim is find out through observation and deduction, the processes that have taken place over time under the rose.

3.2.2 The proposal is to dig soil profiles in say five patches where rose is dominant and which was co-dominant with the B communities (see 2.2.8 above) and five areas where the rose is co-dominant with a diverse community and to measure and identify the layers exposed. Soil profiles should be exposed when the ground is damp so that the layers of sand accretion can be identified and do not collapse. The sand accretion should be mostly pale cream coloured, whilst layers showing vegetation establishment should be browner owing to the addition of organic matter, with snail shells and remains of plant roots still visible. Measurements should be taken of the depth and variation in depth (e.g. over five samples along the profile) of each layer.

3.2.3 The horizontal distance to any bare sand area should be measured as well – but Figure 1 or old aerial photographs need to be checked since such bare sand may now be re-vegetated. The bare sand could be in any direction, but as the prevailing winds are south-westerly, sand originating from this direction would be more relevant.

3.2.4 By comparing different profiles against the different vegetation types, some conclusions might be drawn on how well the rose can cope with sand accretion, how much sand addition it can tolerate and whether there is any clear tolerance level above which other species associated with the rose cannot tolerate. It should be born in mind that lady's bedstraw, red fescue (*Festuca rubra ssp arenaria*) (Lemauviel *et al*. 2003) and grey-hair grass (*Corynephorus canescens*, Ranwell 1972) can also respond well to a sand cover, so it is the wide range of dune annuals that would be the best comparator.

3.3 Monitoring

3.3.1 Assuming that some monitoring is still required despite the account of changes of the burnet rose given above and the lack of evidence for any absolute increase, the following scheme is suggested. The objective would be to follow the vegetation in a number of burnet rose plots where changes have occurred on the basis that more change will occur. The monitoring would therefore follow developments in the vegetation as well as noting any environmental changes so that how rose populations change can be followed and broader conclusions reached.

3.3.2 It is recommend that some permanently marked plots are established, where plant identification can be conducted annually or biennially, and where some environmental features can also be noted. Some of the plots should be close to paths or other areas where loose sand is developing

or reducing – i.e. where dune dynamics is visible. Most information can be gathered if all the different vegetation types where rose is a feature as shown on Figure 1 are used. This would exclude the rose within the rank grassland for the most part. Further rose vegetation community mapping can be provided, but should be available on the GIS layers for the dune vegetation re-mapping carried out in 2005.

3.3.3 The recommended approach will require some botanical skills, particularly of small dune annuals. Some species such as the small vetches, some grasses, chickweeds, etc could be amalgamated, but there would be a reduction of information if this approach were taken. The route to take will depend on the skills available. Some training in botanical identification for this project might be available from members of the Société Jersiase or PAA staff could provide this or undertake the work if required. It is important to retain the same identification approach every time the data are collected (i.e. if some species are grouped, this grouping should remain the same for all recording dates).

3.3.4 The recommended approach is as follows. Two sample areas should be selected of each of the six burnet rose communities shown on Figure 1 (or fewer if it is decided that some vegetation types can be omitted). Permanent transects 5m long (one in each plot) need to be established across each with a clear label. The posts need to be set firmly, so that they do not move, and marked at the top with a clear line in order to measure the soil surface. By using a small rigid tape measure, a measure of sand movement over the period between measurements should be made at each post (although this will be a balance between sand loss and gains).

3.3.5 To record the plants and ground surface, tape measures should be stretched between the marker posts, preferably in June when the dune annuals are easiest to identify (and then repeated at the same time within weeks depending on the weather conditions in each subsequent year). Monitoring should be annual or biennial, depending on the budgets and personnel available. At each 0.5m along the tape (excluding the first and last points to avoid tramping round the marker posts and altering the sand levels), a six pin frame (which PAA used regularly in Jersey and which the States owns) should be set at right angles and all species/groups of species touching each pin recorded. Whether the pin hits bare sand or litter should also be recorded. A 0.5x0.5m quadrat (the States also owns a metal one) should be placed alongside the pin frame's location after it has been removed and all species present recorded (but only as present or absent, not with a % cover as this is more repeatable and less vulnerable to recorded differences). However, an estimate of the % cover of litter and bare sand visible from above should be made. If the sand comes from rabbit scrapes or burrows, this should be noted. Notes should also be made on the average height of the rose and of the other associated vegetation, on any appearance of sand blow and inundation of the plants, of any obvious signs of grazing or any other environmental features that are apparent.

3.3.6 Before moving the quadrat, all rabbit faeces in it should be collected and counted, then discarded outside the plot. The pin frame and quadrat should then be moved to the next 0.5m point. The quadrats would thus be contiguous from 0.5m to 4.5m, giving nine pin frame and quadrat sets of recording per transect. The data should be set out clearly on a recording sheet that can be used each year, dated and with the recorders names clearly shown.

3.3.7 This methodology is very similar to that used for the path transects and larger mowing plots A to D, so can therefore be analysed in the same way for changes over time and compared with the earlier results. The results can be expressed by:

- the number of pin hits converted into mean percentage frequency for the different species/species groups;

- the mean number of species/species groups per quadrat (this figure would be more meaningful if species are individually identified each year of recording);
- the mean number of rabbit faeces per quadrat; and
- the mean surface level for each transect at each recording occasion.

3.3.8 T-tests, chi-squared and Shannon-Weaver Diversity indices can be calculated from the data as appropriate.

3.3.9 The recording should be carried out for at least five to six years and preferably about 10 years (perhaps in alternate years), so that time is allowed for changes to occur and be seen in the data. Such recording will assist in interpreting the apparent changes in the distribution of rose-dominated vegetation on the dunes. This would be supplemented with an analysis of the changes found if the dune vegetation is remapped in the next few years after the last mapping exercise in 2005.

3.3.10 It should be noted that some change in the vegetation is essential in a sand dune system and that the losses and gains of burnet rose-dominated vegetation is part of the dynamic nature of the system owing to the continuous generation of new sand blowing areas. The essential requirement is for the amount of sand accretion and loss not to be too small or large for the scale of the system, but to allow for movement of the species around the dunes. This is particularly important in Jersey owing to the very high proportion of dune annuals present.

4 REFERENCES

Casebow, A., 2007. *Planet Guernsey. Towards a Sustainable Future*. Guernsey Climate Change Partnership.

Grime, J.P., 2001. *Plant Strategies, vegetation processes and ecosystem properties*. *2nd Edition*. J Wiley and Sons.

Hill, M.O., Mountford, J.O., Roy, D.B. and Bunce, R.G.H., 1999. *Ellenberg's Indicator Values for British Plants.* ITE DETR.

Hoffmann, M,, Cosyns, E., Deconink, M., Lamoot, I. and Zwaenepoel, A., 2001. Donkey diet in a Flemish coastal dune area in the first year of .grazing. In: *Coastal Dune Management – Shared experience of European Conservation Practice*. Eds. Houston, J.A., Edmondson, S.E. and Rooney, P.J.. Liverpool University Press.

Lamoot, I., Meert, C. and Hoffmann, M., 2005. Habitat use of ponies and cattle foraging together in a coastal dune area. *Biological Conservation 122*, p523-536.

Lemauviel, S. and Rozé, F., 2003. Response of Three Plant Communities to Trampling in a Sand Dune System in Brittany (France). *Environmental Management 31, 2*, p227-235.

Lemauviel, S., Gallet, S. and Rozé, F., 2003 Sustainable management of fixed dunes: example of a pilot site in Brittany (France). *C. R. Biologies 326*, S183-191.

Le Sueur, F., 1976. *The Natural History of Jersey.* Société Jersiase.

Mayland-Quellhorst, Foller, J. and Wissemann, V., 2012. Biological Flora of British Isles: Rosa spinosissima, no 265. *J Ecology*, *100*, p561-576.

Penny Anderson Associates Ltd (PAA), 1989. *Management Studies on Les Blanches Banques: Mown Path Transects and Enlarged Mowing Plots.* Island Development Committee.

Penny Anderson Associates Ltd (PAA), 1993. *The Effects of the 1990 Storm on the Dune Plain Grassland*. Jersey Island Development Committee.

Penny Anderson Associates Ltd (PAA), 2002. *Jersey Sand Dune Monitoring A-B plots 2003*. States of Jersey Environmental Services Department.

Penny Anderson Associates Ltd (PAA), 2006. *Vegetation Mapping Les Blanches Banques, 2005*. The States of Jersey, Planning and Environment Department.

Ranwell, D.S,. 1972. *Ecology of Salt Marshes and Sand Dunes*. Chapman and Hall.

Rodwell, J.S., 2000. *British Plant Communities Volume 5: Maritime communities and vegetation of open habitats*. Cambs University Press.

Trew, M.J., 1973. The Effects and management of trampling on coastal sand dunes. *J. Environmental Planning and Pollution Control, Vol 1*, p38-49

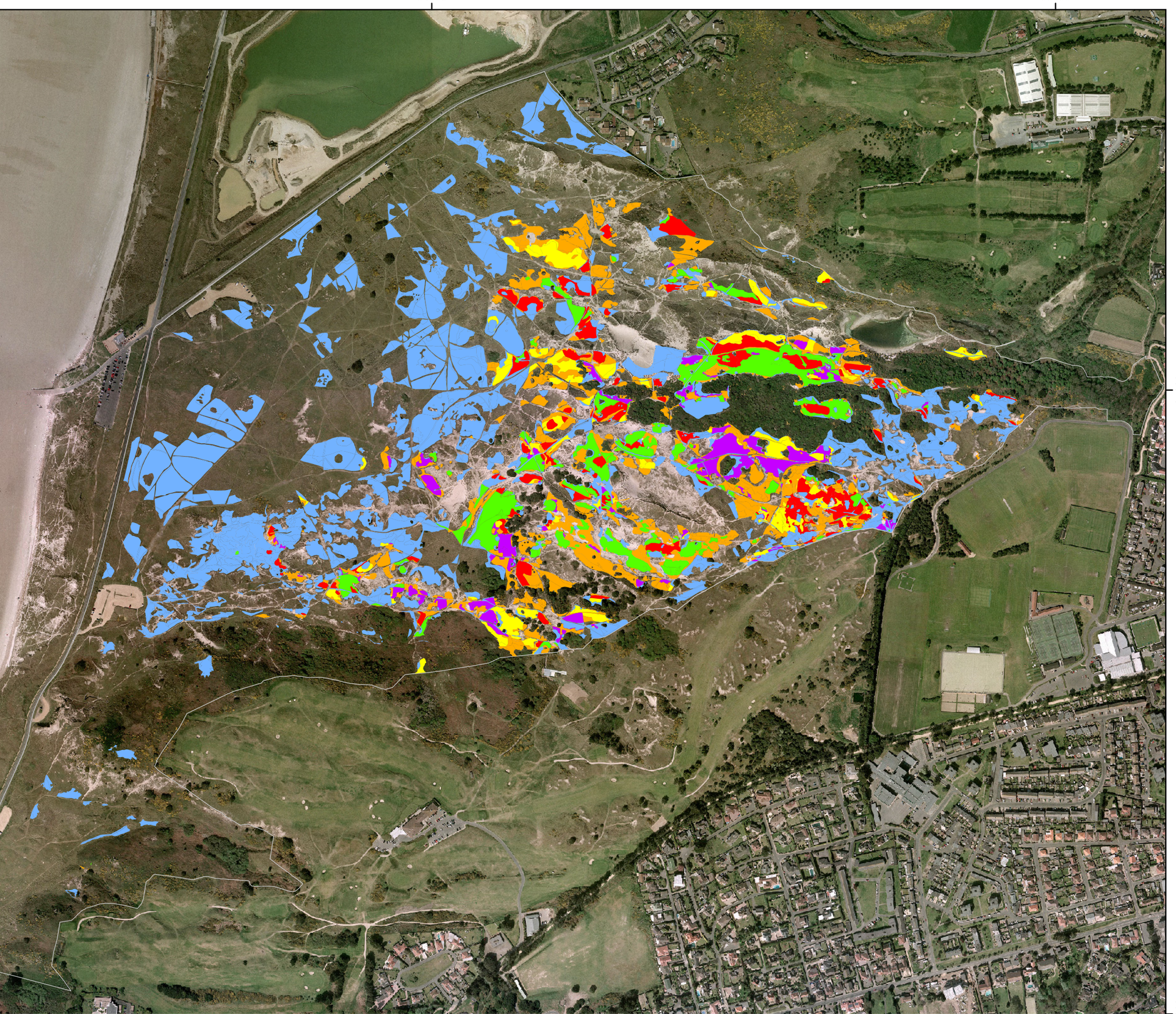
FIGURE

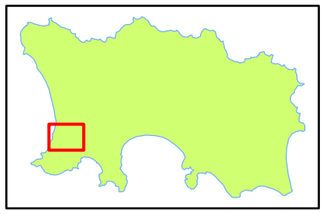
34000

35000

67000

66000





Legend

2005 survey boundary

Vegetation change

- Burnet rose (no change)
- Burnet rose mixture (no change)
- Change to burnet rose (including mixtures) from other communities
- Change to burnet rose from burnet rose mixture
- Change from burnet rose to burnet rose mixture
- Change to other communities from burnet rose

N

Jersey Transverse Mercator JTM2
Projection: Transverse_Mercator
False_Easting: 40000.00000000
False_Northing: 70000.00000000
Central_Meridian: -2.13500000
Scale_Factor: 1.00000000
Latitude_Of_Origin: 49.22500000
Linear Unit: Meter

ISO A3

Metres

0 25 50 100 150 200

States of Jersey

Environment Division
Howard Davis Farm
La Route de la Trinite
Trinity, Jersey
JE3 5JP

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Project Name: Habitat Condition Assessments 2013

Discipline: Ecology

Title:

The changes in the burnet rose (J) communities from 1994 to 2005

Scale: 1:6,000		Drawing No.: Figure 1	
Drawn By: CC	Originator: PA	Date: 14/08/2013	
PAA Ref.: G:\IIDC27_Jersey_Condition_Assessments_2013		Revision: 1.0	

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