Knowledge exchange in Dutch coastal dunes

With special attention to mobile dune restoration and IAS management

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28 and 29 October 2022

Introduction

Coastal sand dunes are one of the most threatened habitats in Europe. They offer space for various, often specialized animals and plants; and the unique landscape constitutes an important service for human well-being. Knowledge exchange about (management of) these habitat types is fundamental to improve management techniques and gain new insights.

On the 28th and 29th of October 2022 a knowledge exchange event concerning coastal dunes took place in the Netherlands. Scientists and representatives from different organizations from Wales, England, the Netherlands, Denmark and Belgium came together in order to discuss coastal dune management on the basis of concrete site visits (list of participants in annex). Representatives of 3 running LIFE projects (LIFE20-BE: LIFE DUNIAS, LIFE17-UK: Sands of LIFE, LIFE17-UK: Dynamic Dunescapes) and two finished LIFE project (LIFE11-NL: Amsterdam Dunes) and Dutch Dune Revival (LIFE 09 NAT/NL/418) were present.

Report

Amsterdam Dunes (AWD)– LIFE-project, overgrazing with fallow deer, IAS, blowouts, volunteers (Luc Geelen and Mark Van Til)

Fallow deer

Fallow deer are a big problem in this area. More than 10.000 animals were probably present, but since 2016 the animals are culled. Target is 600-800 animals, but these days around 1800 deer still live in the AWD. These animals have a large impact on the nature reserve. Biodiversity has been declining because mainly herbaceous plants are eaten. Besides, fallow deer have an huge impact on dune scrub and the understory of dune woodland. Because the share of flowers decreases, the share of insects decreases, which also has consequences for the presence of birds. For example, a decrease in the number of nightingales was observed.

Rabbits

A rabbit population crash in the area due to RHD virus in the 1990s has caused an increase in shrubs, especially Prunus serotina. Most of the Prunus has been removed mechanically. Encroachment with other species such as Hippophae rhamnoides and Crataegus monogyna is currently being compensated by the high numbers of fallow deer. A high number of rabbits is beneficial for the dune ecosystem: they provide calcium enrichment by digging, and bring lime back up to the surface.

Blowouts

In the framework of the nitrogen problematics, blowout development was stimulated. They don't have a direct effect on the deposition of nitrogen, but the new lime that comes into the ecosystem can fix phosphorous. In this way, one of the two macronutrients isn't available anymore in the system, causing nutrient limitation and making plants grow more slowly.

Several blowouts were created in the nature reserve. Aftercare was necessary until 2 years after the measure: marram was pulled out with the support of volunteers. Large blowouts will last longer than small blowouts. Blowouts were clustered in order to minimize negative effects

of transport routes and maximize impacts. The blowouts present turned out to be very successful!

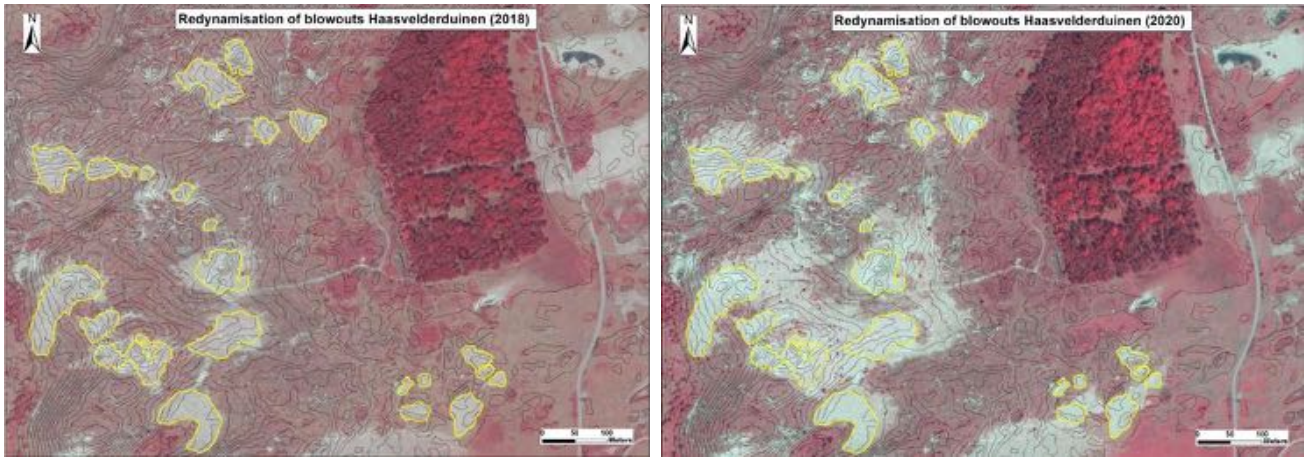

Figure 1: Creation of blowouts in the AWD © Waternet

Varia

Pinus nigra was removed in parts of the dune area. Trees were cut, after which stumps were drilled out. Hereafter the topsoil was removed (20 cm).

Drone mowers are used by Waternet. Weight: 1200 kg. Cost: 50.000 euros + 50.000 euros accessories.

Figure 2: Deltrak mower

National Park Zuid-Kennemerland - large scale dynamics, grazing, visitors and birds, IAS (Dick Groenendijk and Sven Pekel)

Mobile dunes are being grazed (cattle eat vital marram grass). In NPZK they use Scottish Highlanders and Konik horses.

Several big notches were created in the foredunes of the area. These work very well. Locally sand disappears, which is then deposited tens of meters further, and there dunes grow strongly. More land inward a set of Parabolic dunes were reactivated. Aftercare management was necessary for about 2 years (removing marram grass and Rubus caesius). Part of this project was done in Dutch Dune Revival (LIFE 09 NAT/NL/418).

Figure 3: Huge notch created in the foredune in NP Zuid-Kennemerland

Zwanenwater - summer grazing in the dunes, small scale dynamics, heather management, volunteers (Jitske Esselaar)

In the dune area 'Zwanenwater', dune sand is low in iron and lime content. This prevents nitrogen and phosphorus from binding, and as a consequence encroachment with plants such as marram grass is a problem in the area. A grazing regime with sheep is installed in order to suppress the dominance of marram. Also, sheep create new bare sand by trampling the ground with their hooves.

Due to the decalcified dune bottom and the naturally present more acidic sands, some special habitat types occur here: H2140 (decalcified fixed dunes with Empetrum nigrum) and H2150 (Atlantic decalcified fixed dunes (Calluno-Ulicetea).

Figure 4: A common sight in Zwanenwater: Empetrum, Calluna and Erica vegetations.

Schoorlse Duinen – restoration of the dynamics, fires, grazing (cows and sheep) and recreation versus nature (Boukelien Bos)

Prunus serotina is present in large amounts because of N deposition and acidification. The species is only controlled in open dune areas.

Wildfires reduced the amount of Pinus plantations in the area. Burned trees were removed and large parts were grazed in order to stimulate a development to H2130-40-50.

Pinus was removed locally, after which a top layer of 10cm was removed, in order to prevent prunus from germinating. This top layer was sold to a company growing flower bulbs.

Interesting fact is that no *Senecio inaequidens* was observed in this dune reserve, because of the acid dunes, whereas this species thrived in the AWD (more lime rich).

Discussion about IAS during the event

<u>Rosa rugosa</u>

In **Denmark**, in the framework of the LIFE REDCOHA project, 6 techniques were used. The two most successful techniques were discussed more into detail: burying and chemical treatment.

For the burial method, a large excavator was used. A 1.5-2 m deep hole was dug first, into which all vegetation and roots were laid and covered with clean sand. Post-treatment consists of pulling up any regrowth. Also larger surfaces were treated. The cost was around 2,5 euros

per square meters (but this was executed some 5 years ago, with inflation rates of today this would probably be more expensive).

The chemical treatment concerned spraying with glyphosate. A total of about 1 ha was treated with glyphosate at Vangså. The bushes were treated with a glyphosate 360 concentration of 2% in June and October 2016, and again in June and October 2017. A number of individual bushes were treated again in June 2018. To date, the areas treated twice per season for over 2 years have not showed any real signs of regrowth. Price in 2016: around 2,5 euros per square meter.

Sands of LIFE: Management of Rosa rugosa with Glyphosate (90 liters dilute @ 300 ml round up/15 L = 1.2LRound up Vantage). A dye (acid blue 9) was added to the herbicide. This treatment was done twice a year (end of May and end of July), during 2/3 years, but in a much reduced area after initial measure. Rosa was mown, after which regrowth was sprayed.

The national trust used the more selective herbicide triclopyr to treat Rosa rugosa (doesn't affect grasses). This was done in the summer, when it was warm and dry for multiple days (august). Larger areas were also sprayed manually.

In **Belgium**, around 6 hectares of Rosa rugosa were removed in 2020. The plants were dug out with a large excavator till a depth of 1m, after which all the material was sieved with a large drum sieve with a mesh size of 2 cm. All roots and other plant fragments stayed in the sieve, whereas the sand was deposited in the dunes again, after which the dune was reprofiled. This method appeared to be quite successful. Still a small amount of regrowth is observed. Aftercare consist of manual removal of the shoots (digging out with a shovel).

<u>Prunus serotina</u>

Waternet carried out a remarkably successful management of *P. serotina* in the Amsterdam dunes (AWD). The AWD were completely overgrown by *Prunus serotina* around 2010. Where this species was almost absent in these dunes in 1989, in 1996 10 hectares were observed and in 2010 around 200 hectares of this IAS occurred in the AWD (scattered along the entire dune area, and infecting all European protected dune habitat of the 3400 hectares large reserve). During the LIFE project "Amsterdam dunes -source for nature" (LIFE11 NAT/NL/776) 169 hectares of Prunus serotina were successfully removed from these AWD. These days only small amounts of the shrub are present. No chemicals were used because of the water extraction in the area.

P. serotina loves decalcified dunes.

Applied methods:

-Pulling it out of the ground with excavators
-Removing dense vegetation with seedlings (eg Sea buckthorn)
-Removing of topsoil (5-10 cm): removing seeds
-Leaving some roots behind are no problem, regrowth capacities of prunus from the roots are limited.
-Grazing with sheep works well (young Prunus)

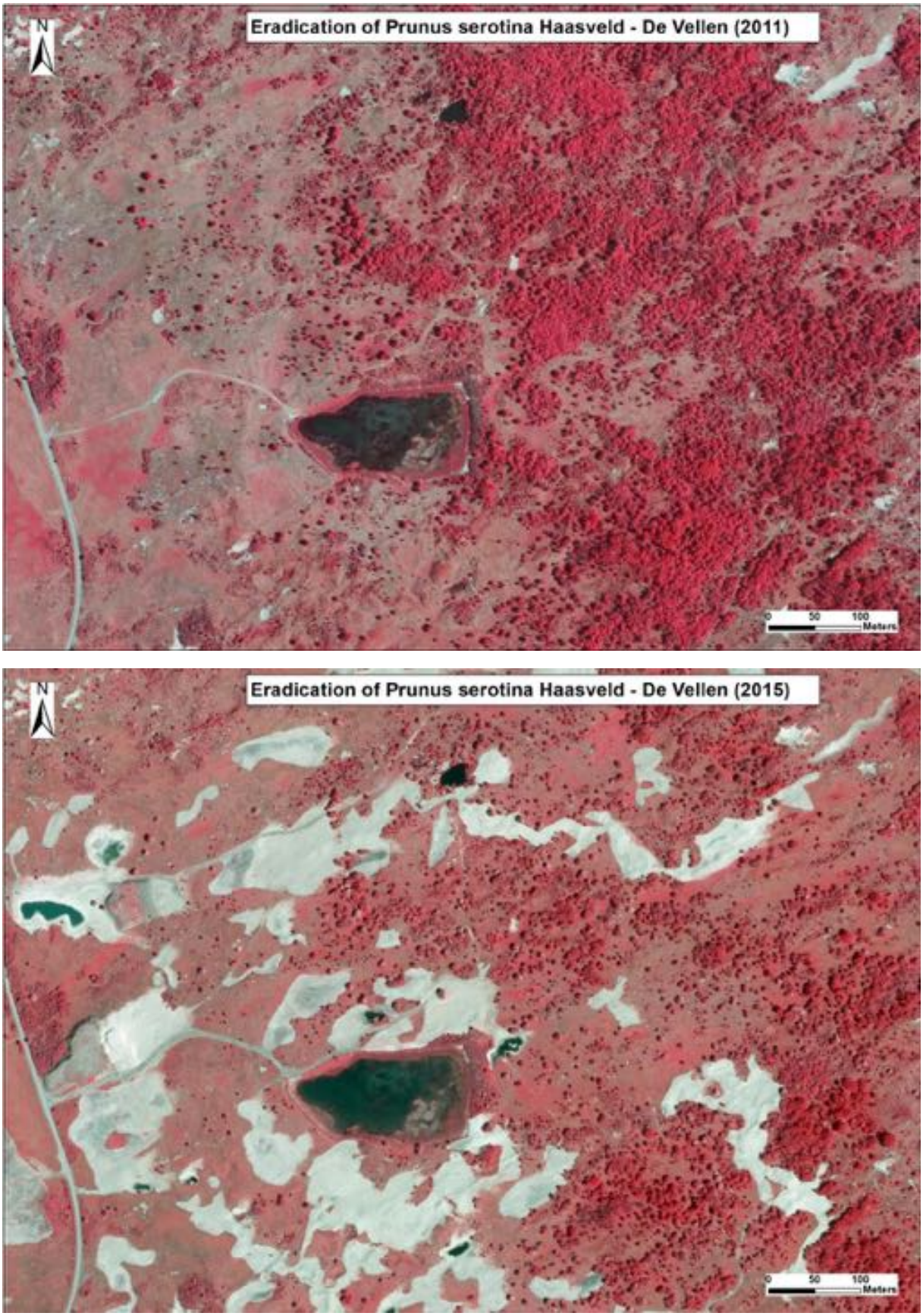

Figure 5: P. serotina eradication © Waternet

Senecio inaequidens

In Denmark Senecio inaequidens is observed and assessed to be an IAS by the Danish Environmental Protection Agency and the potential of dispersal is assessed to be high. However, it is not a problem in Denmark yet. In the period from 2004 – 2015 it was observed on 53 locations in Denmark mainly close to railway tracks.

Broom

The Danish Environmental Protection Agency has assessed broom not to be an IAS, however, there has been some debate regarding this assessment. The argumentation is, that it is "self-dispersed" to Denmark, and therefore not an AIS. IAS or not, broom is a thread to some dune areas in Denmark.

Figure 6: Broom in Danish dunes © Thy National Park

In the framework of the LIFE DUNIAS project, a priority list is being developed dealing the most persistent IAS in dune ecosystems. LIFE DUNIAS project coordinator Reinhardt Strubbe will share this list at the end of 2022.

Annexes

Annex 1: List of participants

Name	Organisation	e-mail
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Annex 2: Conservation status and amount of coastal habitat types in Europe

Habitat	Habitat code	Area (ha)	Overall assessment
Embryonic shifting dunes	2110	5,456	U1 poor
Shifting dunes along the shoreline with Ammophila arenaria (white dunes)	2120	28,232	U1 poor
Fixed coastal dunes with herbaceous vegetation (grey dunes)	2130*	117,321	U2 bad
Decalcified fixed dunes with Empetrum nigrum	2140*	23,377	U1 poor
Atlantic decalcified fixed dunes (Calluno-Ulicetea)	2150*	2,271	U2 bad
Dunes with Hippophae rhamnoides	2160	14,439	FV good
Dunes with Salix repens ssp. argentea (Salicion arenariae)	2170	4,136	U1 poor
Wooded dunes of the Atlantic, Continental and Boreal Region	2180	129,807	U1 poor
Humid dune slacks	2190	14,751	U2 bad
Machairs (* in Ireland)	21A0	14,768	U1 poor
Total for Atlantic region		**354,558**	

Annex 3: Conservation status of coastal habitat types in the countries representing the event

Group	Feature name + code	Group	Region	Member State	Presence	CS-2012	CS-2018
Dunes habitats	2110 - Embryonic shifting...	Dunes habit...	ATL	BE	PRE	U2	U1
	2120 - Shifting dunes alon...	Dunes habit...	ATL	BE	PRE	U2	U2
	2130 - Fixed coastal dunes...	Dunes habit...	ATL	BE	PRE	U2	U2
	2150 - Atlantic decalcified...	Dunes habit...	ATL	BE	PRE	U2	U2
	2160 - Dunes with Hippoph...	Dunes habit...	ATL	BE	PRE	FV	FV
	2170 - Dunes with Salix re...	Dunes habit...	ATL	BE	PRE	U1	U2
	2180 - Wooded dunes of th...	Dunes habit...	ATL	BE	PRE	U2	U2
	2190 - Humid dune slacks	Dunes habit...	ATL	BE	PRE	U2	U2

Group	Feature name + code	Group	Region	Member State	Presence	CS-2012	CS-2018
Dunes habitats	2110 - Embryonic shifting dunes	Dunes habitats	ATL	DK	PRE	FV	FV
			CON	DK	PRE	U1	U2
	2120 - Shifting dunes along the shoreline with Ammop...	Dunes habitats	ATL	DK	PRE	U2	U1
			CON	DK	PRE	U2	U1
	2130 - Fixed coastal dunes with herbaceous vegetatio...	Dunes habitats	ATL	DK	PRE	U2	U2
			CON	DK	PRE	U2	U2
	2140 - Decalcified fixed dunes with Empetrum nigr...	Dunes habitats	ATL	DK	PRE	U1	U1
			CON	DK	PRE	U1	U1
	2160 - Dunes with Hippophae rhamnoides	Dunes habitats	ATL	DK	PRE	U2	U2
			CON	DK	PRE	U2	U2
	2170 - Dunes with Salix repens ssp. argentea (Sali...	Dunes habitats	ATL	DK	PRE	U1	U1
			CON	DK	PRE	U1	U2
	2180 - Wooded dunes of the Atlantic, Continental and...	Dunes habitats	ATL	DK	PRE	U2	U2
			CON	DK	PRE	U2	U2
	2190 - Humid dune slacks	Dunes habitats	ATL	DK	PRE	U1	U2
			CON	DK	PRE	U2	U2

Group	Feature name + code	Group	Region	Member State	Presence	CS-2012	CS-2018
Dunes habitats	2110 - Embryonic shifting...	Dunes habit...	ATL	NL	PRE	FV	FV
	2120 - Shifting dunes alon...	Dunes habit...	ATL	NL	PRE	U1	FV
	2130 - Fixed coastal dunes...	Dunes habit...	ATL	NL	PRE	U2	U1
	2140 - Decalcified fixed du...	Dunes habit...	ATL	NL	PRE	U1	FV
	2150 - Atlantic decalcified...	Dunes habit...	ATL	NL	PRE	U1	U1
	2160 - Dunes with Hippoph...	Dunes habit...	ATL	NL	PRE	FV	FV
	2170 - Dunes with Salix re...	Dunes habit...	ATL	NL	PRE	U1	FV
	2180 - Wooded dunes of th...	Dunes habit...	ATL	NL	PRE	U1	U1
	2190 - Humid dune slacks	Dunes habit...	ATL	NL	PRE	U1	U1

Group	Feature name + code	Group	Region	Member State	Presence	CS-2012	CS-2018
Dunes habitats	2110 - Embryonic shifting ...	Dunes habit...	ATL	UK	PRE	U2	U2
	2120 - Shifting dunes alon...	Dunes habit...	ATL	UK	PRE	U2	U2
	2130 - Fixed coastal dunes ...	Dunes habit...	ATL	UK	PRE	U2	U2
	2140 - Decalcified fixed du...	Dunes habit...	ATL	UK	PRE	U2	U2
	2150 - Atlantic decalcified ...	Dunes habit...	ATL	UK	PRE	U2	U2
	2160 - Dunes with Hippoph...	Dunes habit...	ATL	UK	PRE	U2	U2
	2170 - Dunes with Salix re...	Dunes habit...	ATL	UK	PRE	U2	U2
	2190 - Humid dune slacks	Dunes habit...	ATL	UK	PRE	U2	U2

Annex 4: pictures taken during the event

Figure 7: participants of the knowledge exchange event

Figure 8: Natterjack toad in Zwanewater

Figure 9: Scottish Highlanders in national park Zuid-Kennemerland

Figure 10: Knowledge exchange in national park Zuid Kennemerland