

# AMSTERDAM DUNES SOURCE FOR NATURE

*Results of an ambitious dune restoration project*











The oneness of nature, recreation and water extraction

## DE AMSTERDAMSE WATERLEIDINGDUINEN

Between Zandvoort and Noordwijk lie the 3,400 hectares of the Amsterdamse Waterleidingduinen (Amsterdam Dunes). This varied landscape is internationally protected by the European Natura 2000 nature network and is extremely popular with the public. Every year, almost 1 million visitors follow the beautiful nature trails, play in the woods and dunes, take part in field trips or take pictures of the special flora and fauna the area is home to. And you don't even have to keep to the footpaths. That's unique in the Netherlands!

The Amsterdamse Waterleidingduinen is also the main source of drinking water for the city of Amsterdam. You can tell that by the various supply ditches, infiltration ponds, weirs and water extraction canals the water company Waternet uses for drinking water production. There is enough pre-treated freshwater stored underground and in the canals here to last for several months. The "raw material" travels via the collecting basin 'De Oranjekom' to the treatment station at Leiduin for post-treatment. Waternet produces around 260,000 m<sup>3</sup> of drinking water every day!

Nature conservation, recreation and water extraction go hand in hand at the Waterleidingduinen. By looking after the natural environment properly, we at Waternet are able to provide a secure supply of water. We cover the cost of this nature management mainly from the revenues we earn from the drinking water.

**This Layman's Report describes the comprehensive nature restoration project, Amsterdam dunes, Source for Nature, for which Waternet received a European subsidy. More information: [awd.waternet.nl/LIFE](http://awd.waternet.nl/LIFE)**

# MAJOR MAINTENANCE WITH EUROPEAN SUPPORT



*Between 2012 and 2016, major maintenance was carried out in the Amsterdamse Waterleidingduinen. And not a moment too soon. Over the previous 25 years the dunes had become overgrown with grasses, shrubs and trees. Black cherry had spread throughout the open dune landscape, pools had silted up and wet dune slacks had become clogged with tangled overgrowth. Nitrogen-rich precipitation was also preventing a diverse range of vegetation from thriving. Less and less of the original open dune landscape remained – a landscape of “grey” dunes, low vegetation, panoramic vistas, drifting sands, open sea buckthorn thickets and moist dune slacks rich in wild flowers.*

*With financial support from Europe (LIFE+ Nature) and the Province of North Holland, we have mown grasslands, felled trees and removed topsoil from 350 ha of the 3,400 ha site. Sheep have also been introduced to keep the vegetation in check and pools have been dredged and redug. All the surplus materials have been taken off site. A constant stream of excavators, tractors and trucks could be seen driving in and out of the area throughout the autumn and winter.*

*The “Source for Nature” dune restoration project generated a lot of traffic and caused some disruption. But the results speak for themselves! We have created an excellent basis for restoring the area’s very special flora and fauna. The visitors are reaping the benefits, and wonderful views have returned in many places. And once the number of fallow deer is back in balance with what the area can sustain, nature will recover even more. That’s something I’ll happily bet on. Enjoy!*

**Ed Cousin**, Head of Source & Nature Management, Waternet

## FACTS & FIGURES

- 110 ha of dune grassland and dune slacks mown
- 168 ha of rampant trees and bushes removed
- 100 ha of dense black cherry stands and wet dune slacks sod cutted
- 350 ha grazed by sheep
- 2.2 ha blowouts dug out
- 70 old ponds dredged and new ones dug

## COSTS

<b>Total cost</b>	<b>€ 2,800,000</b>
<b>EU contribution:</b>	<b>€ 1,241,512</b>
<b>Contribution from the Province of North Holland:</b>	<b>€ 484,190</b>
<b>Waternet contribution:</b>	<b>€ 1,074,298</b>







## FACELIFT FOR THE DUNES

A lot of big machines were brought in over the past couple of years to help restore 350 hectares of dunes. Here's what happened where and why.



All the areas shown were mown and the cuttings removed, clearing space in slightly overgrown areas for the typical flora and fauna that thrive on grey dunes.



Following the mowing and clearing, a 10 cm layer of soil was removed, mainly in severely overgrown areas and places where Black cherry dominated. The nutrient-rich top layer was taken off site. In many places there is calcium-rich sand on the surface once again – an ideal breeding ground for dune pansies, broad-leaved thyme and birdsfoot trefoil.

At Haasvelderduinen-Boeveld and Haasveld, suitable sites were created for wet dune slacks. We removed the topsoil and dug out overgrown blowouts. The coniferous woods in the Haasveld area were cleared. And we dug some new ponds here too.

We cleared all the invasive alien black cherry from Groot Zwarteveld and the Middenduinen-Noord and Middenduinen-Centraal areas without using any chemicals, as elsewhere in the dune landscape. The soil was removed to ensure that no seeds of invasive species like the wild black cherry were left behind. Poplar and common maple were also felled here and there.



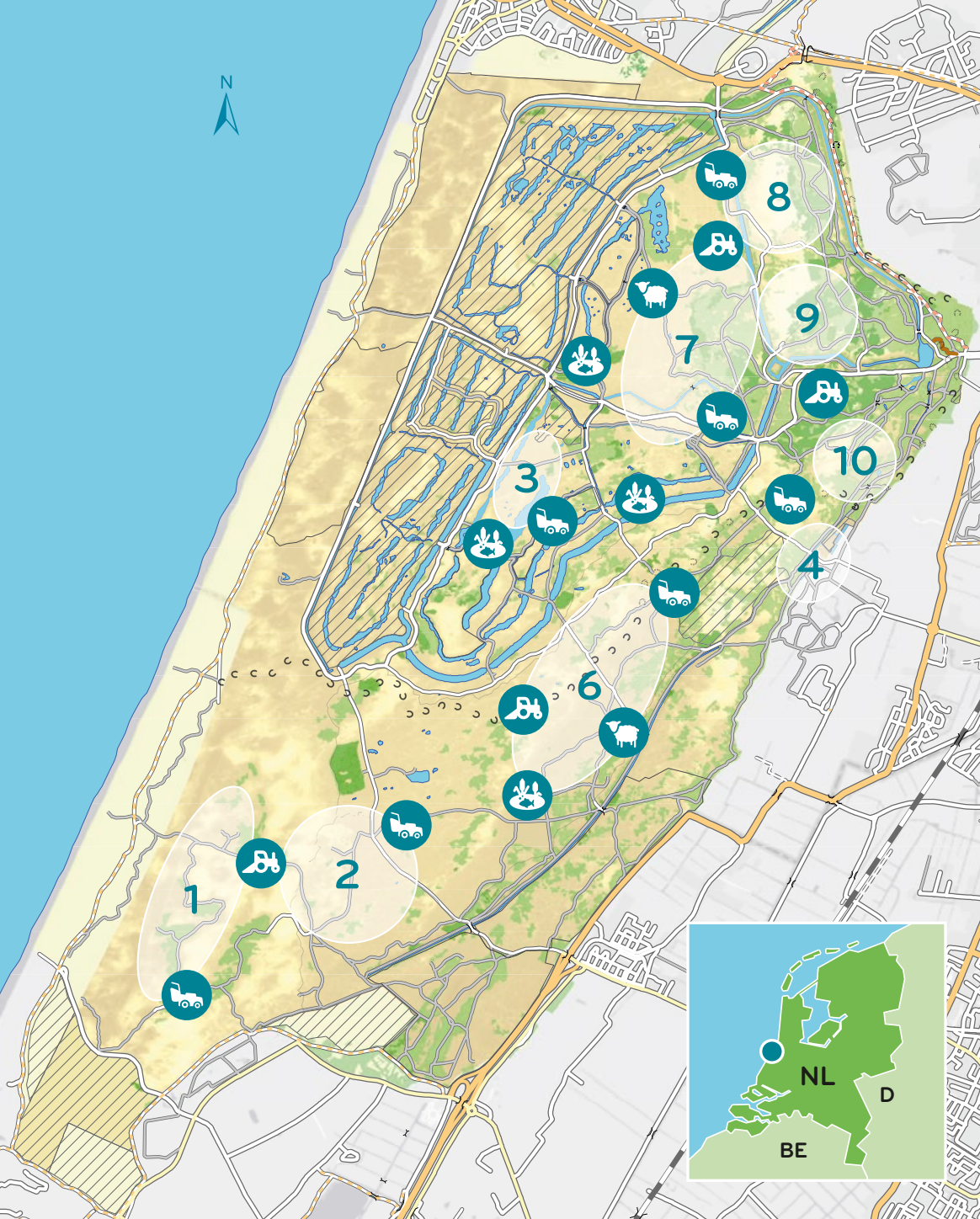
Right across the dune, work was done to restore ponds. We removed vegetation growing around the edges of the ponds so that the water could warm up more quickly in the spring. This is beneficial to amphibian and dragonfly reproduction. The ponds were dredged, and some new ones were dug in the Haasveld area. In Middenduinen-Noord, we discovered ponds which had become completely buried under black cherry woods. Ponds in Groot Zwarteveld and Eiland van Rolvers were cleaned to prevent the wetlands reverting to dry land.



For a short time, sheep were grazed on overgrown grassland and in places where black cherry was returning, to help prevent the dune from becoming overgrown again. Because of the massive increase in the fallow deer population, we stopped using sheep in autumn 2015.







### WORK SITES

1. Haasvelderduinen-Boeveld
2. Haasveld and surroundings
3. Groot Zwartevelt and surroundings
4. Oosterduinrel - Schapenwei
5. Ponds (dispersed around the dunes)
6. Middenduinen Centraal
7. Middenduinen-Noord
8. Tonneblink
9. Pollenberg – Museumduin
10. Vinkenveld





# MIDDENDUINEN-NOORD

## BEFORE THE INTERVENTIONS

Black cherry as far as the eye can see. And where are the ponds, and where did the horizon go? A few buckthorn thickets can be seen under the trees, but their chances of survival are slim. Black cherry is rampant everywhere. Birds spread the cherry stones, so the dunes soon became overrun with this invasive species.





## AFTER THE INTERVENTIONS

We brought in some heavy-duty machinery to clear bushes and trees. An 8 cm layer of topsoil was scraped away. We carted away soil full of cherry stones and restored ponds, and now there is bare sand on the surface once again. We also mowed large expanses of grassland. And just look at that view!





## HELPING NATURE RECOVER

Ten sites were restored as part of the Source for Nature project. Project team members describe the challenges and the results at the sites they were responsible for.



### SITE: HAASVELD

**Project team member:** Luc Geelen

**Mission:** "To tackle desiccation and acidification, halt the invasion of black cherry and transform a pine forest back into open dunes."

**Challenge:** "The key question was: should we keep the pine forest with its special woodland birds, or go for a unique dune landscape? You don't just dig up a forest without very good reason. European dune experts advised us to 'dig for gold where the gold is: you can only restore a special dune landscape in the coastal dunes.'"

**Results:** "Now that the forest is gone, you can see the dunes again. Lapwings and plovers have taken the place of woodland birds. Less visible is the positive impact our work is having on the water level and the water quality. The impact of this extends beyond Haasveld. I have already seen the rare bog pimpnel flowering in a place where there wasn't any before."

### SITE: MIDDENDUINEN-NOORD

**Project team member:** Martijn van Schaik

**Mission:** "To clear vast areas of former dune grasslands and sea buckthorn thickets of rampant vegetation."

**Challenge:** "Bringing in big machinery to dig up bushes and trees, clear black cherry forests and dredge ponds. That in itself can easily damage and disturb vulnerable nature. Our challenge was to protect vulnerable parts. The work we were doing was closely monitored by some critical nature lovers. They complained about 'clear-cutting' and the disappearance of woodland birds. We engaged with them, but sadly you can't always keep everyone happy when you're doing large-scale nature restoration work."

**Results:** "We've cleared space for low vegetation where there was once a dense wild black cherry forest. The ponds look lovely again."



## SITE: POLLENBERG

**Project team member:** Mark van Til

**Mission:** "To restore around 20 ha of overgrown dune grassland back to open dunes with small blowouts rich in flowers and insects."

**Challenge:** "The soil at Pollenberg was too acid and overfertilised with nitrogen-rich precipitation. Wood small-reed and burnet rose dominated the landscape. We had to tread very carefully in areas that still had varied vegetation. That meant using 'mosaic management', alternating between mowing and deep or surface soil clearance. It was a great challenge which involved a lot of close liaising with the contractor."

**Results:** "The landscape is more varied and more expansive now, with new blowouts. And the wind can now spread calcium-rich sand up from the blowouts. This sand is essential for lime-loving plants like dune pansies to become established. There is more wild thyme and common milkwort growing here already."

## SITES: SEVENTY PONDS

**Project team member:** Willem Stuulen

**Mission:** "To clean up and dredge existing ponds and create new ones so as to encourage the return of water plants and water insects."

**Challenge:** "We restored or created seventy ponds altogether. Most of them had become clogged with leaf litter or overgrown with reeds, and many were filling up and would have disappeared completely if we hadn't intervened. Healthy ponds are rich in aquatic plants and insects and are habitats for a variety of amphibians. We had to work carefully in ponds with amphibians. Dredgings were left on banks for a day so that any seeds and larvae would be washed back into the water. We spared small refuge areas with rare species. Some ponds were difficult to access, so we laid temporary road plates to minimise the damage. It was painstaking, labour-intensive work."

**Results:** "Lots of different life forms are reappearing in the clear, nutrient poor water of the restored ponds. We removed surrounding tall vegetation to allow the water to warm up more quickly in the spring. We're seeing lots of frogs, toads and dragonflies again. Pond weed is returning and we're expecting the banks to be full of flowers soon."

## SITE: SCHAPENWEI

**Project team member:** Menno van den Bos

**Mission:** "To remove the acidified, nutrient-rich top layer of soil overgrown with soft rush on the inland edges of the dunes. To excavate the meadows to various depths and widths. To retain calcium-rich seepage water in the area and remove acid rainwater."

**Challenge:** "It was precision work. We couldn't dig away the soil too deep because otherwise the nutrient-rich, acid rainwater could not run off and soft rush would come back.. Then we'd have to start all over again in a couple of years' time."

**Results:** "Since we did the work, varied inland dune grassland has been developing which is being nourished with calcium-rich seepage water. A spoonbill has even been spotted there."





The dune pansy is a true spring flower. The plant loves open dune grassland with calcium-rich drifting sand. And that's back in abundance. Little Queen of Spain fritillary butterflies also love dune pansies and lay their eggs on them.









# PONDS

## BEFORE THE INTERVENTIONS

More and more ponds across the dunes were becoming overgrown. Trees kept out the sun. Leaf litter was clouding the water and oversupplying it with nutrients. Water plants like Chara and pondweed were disappearing. More and more ponds had become unsuitable habitats for reproducing insects, amphibians and snails.





## AFTER THE INTERVENTIONS

Tall vegetation along the banks of the ponds has been removed. The spring sunshine can now penetrate through to the shallow waters, warming them up again quickly after the winter. The ponds have been dredged. The water is clear and low in nutrients again, encouraging water plants to return. The ponds have been quickly repopulated. Toads and dragonflies have started to reproduce there again and water mint is growing along the banks.





## PERFECT HABITAT FOR SPECIAL SPECIES

Special species of flora and fauna are thriving in the newly restored Amsterdamse Waterleidingduinen. These 10 AWD residents are feeling very much at home here again.



### **SAND LIZARD**

Cold-blooded insectivore. Prefers alternating habitats of low bushes and bare sand. Warms itself in the sun before going hunting for prey. Lays its eggs in open sand. Benefits greatly from soil removal and open drifting sand.

### **COMMON MILKWORT**

Clearing the soil in the restored grey dunes exposes calcium-rich sand on the surface. The common milkwort feels very much at home here. As do broad-leaved thyme, dune pansies and birdsfoot trefoil.

### **LAPWING**

Spotted in the Haasveld area in 2016 along with the little ringed plover. Was able to establish itself in this wet dune slack once the coniferous forest was removed.

### **SEASIDE CENTAURY**

Returning to dune slacks where the soil has been removed. Benefits from calcium-rich seepage water and is in good company with water pimpnel, little green sedge and sometimes even bog pimpnel.

### **EUROPEAN MARRAM GRASS**

Grows on the top of restored sand drifts. Summer chafer larvae feed off the roots of vigorous European marram grass. These larvae are eaten by breeding birds such as the Northern wheatear and the red-backed shrike.



### GREAT HAIRY SCREW-MOSS

Benefits from incoming calcium-rich sand in a low-calcium environment. Calcareous sand is a tonic for acidified grey dunes. It protects the dunes against nitrogen-rich precipitation. Where great hairy screw-moss grows, you will also often find grey hair-grass and the greyling butterfly, which you only notice when they fly past because they are so well camouflaged.

### LARGE WHITE-FACED DARTER

This small dragonfly can't survive without nutrient-poor, clear water, and is extremely fussy to boot. Ponds are its favourite habitat. This little jewel has already been spotted after just a few ponds were restored. All being well, it should become a permanent resident.

### QUEEN OF SPAIN FRITILLARY

Loves grey dunes. Lays its eggs on the host plant dune pansy, a species that depends on dune grasslands with calcium-rich, open dune sand. Benefits from the kind of small-scale "mosaic management" we have been carrying out on the overgrown inland dune grasslands.

### SEA BUCKTHORN

In winter, sea buckthorn berries are on the menu of winter visitors like fieldfare and redwing. Many sea buckthorn bushes disappeared in the Middenduin area as a result of the black cherry invasion. Now that the alien vegetation has been cleared, sea buckthorn is returning in various places.

### NATTERJACK TOAD

In spring, inhabits shallow ponds with sandy banks that warm up quickly. Lays strings of eggs which produce thousands of tadpoles. Natterjack toads love the 70 ponds we have restored or constructed.





Old overgrown blowouts have been opened up and new ones dug. Lime-loving plants like dune pansies are thriving in the fine, calcium-rich drifting sand.









## COMMUNICATING WITH THE LOCAL COMMUNITY

You can't just slip big machinery into a popular nature conservation area to mow, clear soil and fell trees unnoticed. Visitors, local residents and interest groups want to know why the landscape is undergoing such dramatic change. Waternet initiated a conversation with the public, informing people via its website, articles in magazines and news reports in regional media. We also set up information signs at various worksites throughout the dunes to keep the public informed about the work we were doing. Our foresters organised themed walks through the dunes.

One individual described what we were doing as "clear-cutting in the dunes". Waternet explained that these interventions are the starting point for restoring a unique dune landscape.

To inform colleagues, we held an Expert Meeting at the start of the project, and we finished with a symposium at which knowledge was shared and experience exchanged at an international level.



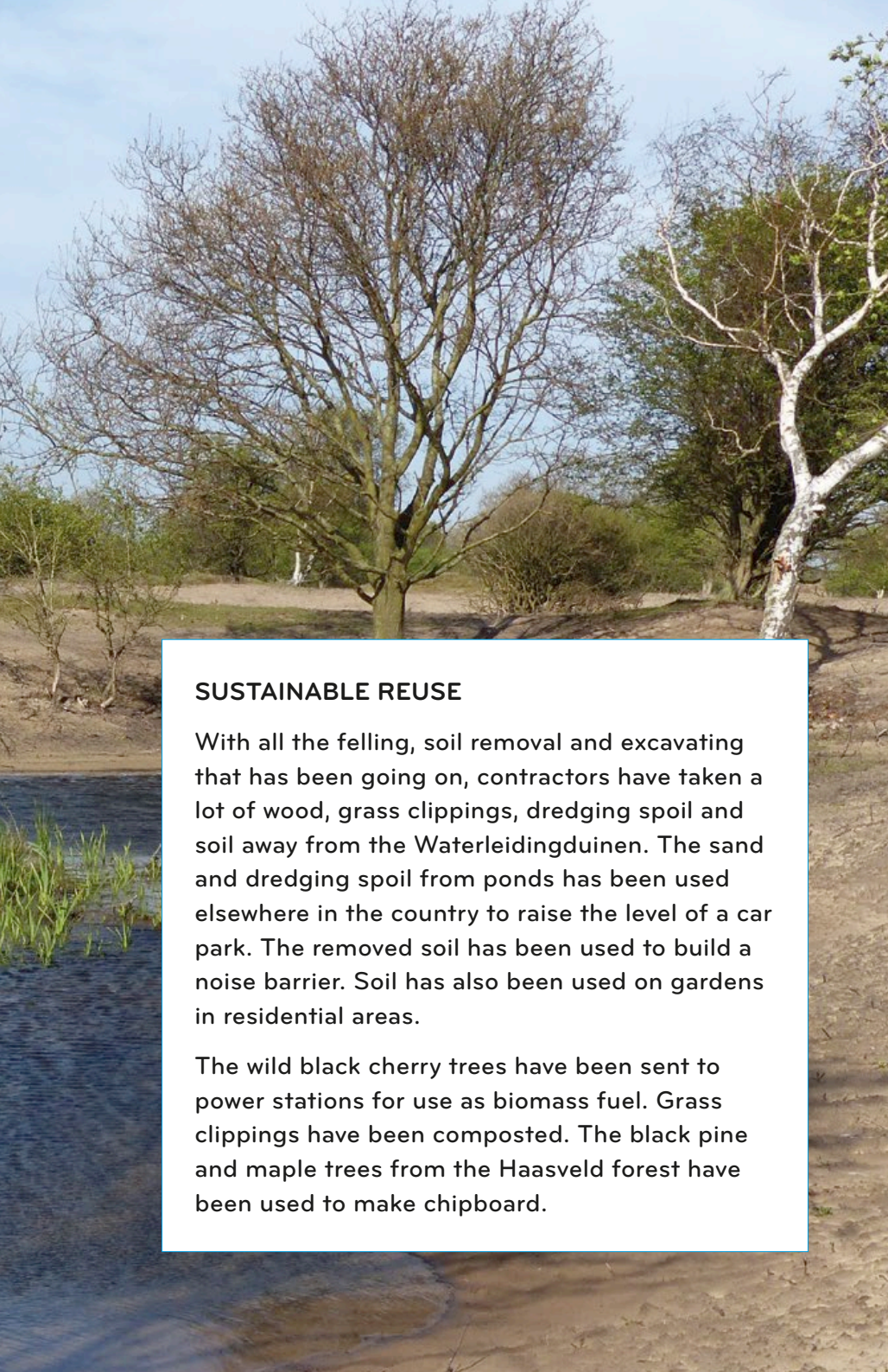
### DESICCATION TACKLED

Restoring nature in the Amsterdamse Waterleidingduinen was not only good for the flora and fauna there. It also benefited the groundwater level. Since 150 ha of black cherry and four ha of coniferous forest were felled, more rainwater has been saved and retained.

More of this rainwater is emerging as calcium-rich seepage water at the surface of wet dune slacks. The dune vegetation is improving there too!







## SUSTAINABLE REUSE

With all the felling, soil removal and excavating that has been going on, contractors have taken a lot of wood, grass clippings, dredging spoil and soil away from the Waterleidingduinen. The sand and dredging spoil from ponds has been used elsewhere in the country to raise the level of a car park. The removed soil has been used to build a noise barrier. Soil has also been used on gardens in residential areas.

The wild black cherry trees have been sent to power stations for use as biomass fuel. Grass clippings have been composted. The black pine and maple trees from the Haasveld forest have been used to make chipboard.

## WORK DONE, MAINTENANCE STARTS

Source for Nature may have finished, but our work is by no means done. At Waternet we will continue to manage and restore the dunes. Over the next few years we will be reducing overgrazing by fallow deer.

We will also be taking part in a national nature restoration programme: Programma Aanpak Stikstof (PAS) – Nitrogen Strategy Programme. We will be continuing to monitor the results of the Source for Nature project and will be providing post-project management wherever necessary. Our volunteers will remove any remaining root residues and new vegetation, mow grasslands and take the waste materials off-site. And they will be keeping any dune-unfriendly black cherry trees in check.





Pine trees have been removed from the Haasveld area so they are no longer consuming rainwater and more water ends up in the ground. We have also removed topsoil, cleared out overgrown blowouts and created a number of ponds. In doing so, Waternet has put the perfect conditions in place for the return of moist, flower-rich dune slacks.









A landscape photograph of a dune area. In the foreground, there is a stream with a sandy bank. The middle ground is filled with various trees and shrubs, some with green leaves and others bare. The background shows a sandy dune under a cloudy sky.

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