

tussen Duin & Dijk

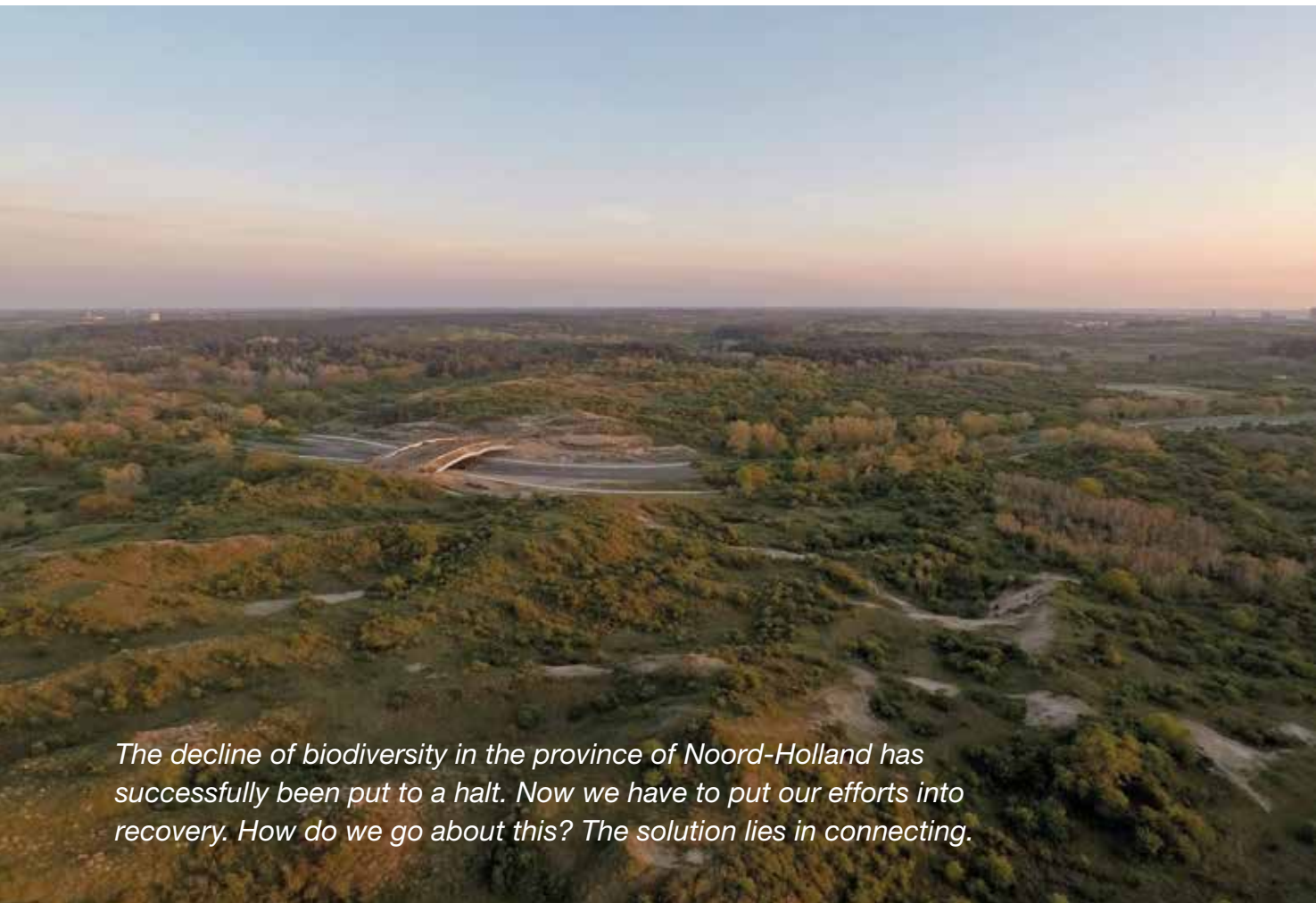


Connection and defragmentation

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Roads for

● Ecoduct Zandpoort from above. Photo: Ruud Maaskant.



The decline of biodiversity in the province of Noord-Holland has successfully been put to a halt. Now we have to put our efforts into recovery. How do we go about this? The solution lies in connecting.

Our Wadden region, dunes, polders, peatlands, the IJsselmeer's shorelines, woodland, heathland and even sand drifts – Noord-Holland has it all. All these ecosystems are home to a wide variety of animal and plant species. This makes Noord-Holland a paradise for nature lovers. From research to recreation: whatever your purpose, there is lots of nature to enjoy in Noord-Holland.

Wageningen Environmental Research (formerly: Alterra) has been commissioned by the province to study the state of Noord-Holland's biodiversity (Van der Graft-van Rossum *et al.*, 2014). The results were shocking. Over the last

century, biodiversity in Noord-Holland has plummeted. But there was also good news: the sharp decline in the last decade of the twentieth century has been halted (Provincie Noord-Holland, 2017a). Yet just stopping the decline is not enough. We also want to work on recovery. It is mostly the vulnerable and sensitive species that are still in trouble. In addition to eutrophication, drying-out and the disappearance of suitable habitats, the fragmentation of habitats is seen to be the biggest problem.

We know what has to be done. With the worst of the decline in biodiversity behind us, we want to work on recovery (Provincie Noord-Holland,

2017b). Which is no small task in an industrious and vibrant province such as Noord-Holland. But there are also many opportunities.

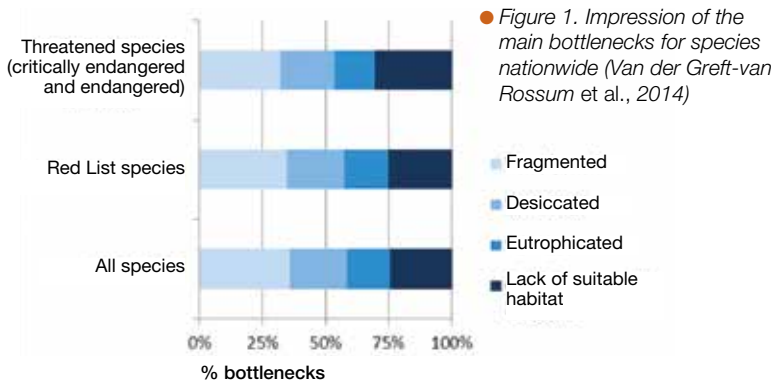
The island theory in a crowded Noord-Holland

How can we restore biodiversity? To be able to answer this question, first we need some theoretical understanding. It was known more than half a century ago: populations of animal and plant species will not survive in natural areas that are too small. Edward Wilson and Robert MacArthur described this phenomenon in the so-called 'island theory' (MacArthur & Wilson, 1967). They proved that the surface area of a

humans and nature



● For the survival of the Field cricket (*Gryllus campestris*) ecological connections are crucial. Photo: Bert Pijs.



The models of island biogeography can now be complemented by modern research, using cameras, trackers and genetic research.

natural site and the distance to the next natural site are determining factors for biodiversity within an area. The species in an area exist in a dynamic balance. It is the result of a permanent cycle of extinction and recolonisation among species. The smaller the distance between the natural sites, or the better they are connected, the greater the chance of recolonisation and survival of a species. It is precisely this island theory that is the core idea behind the Natuurnetwerk Nederland (NNN).

Connecting small and vulnerable sites so all areas can interact and in effect become one large nature reserve.

The ecological connections within the network are crucial, because they help compensate for local extinction and inbreeding in small habitats by giving recolonisation and genetic exchange a chance (Van der Grint & Pouwels, 2006). A great example of this is the badger (*Meles meles*). Over the twenty-five

Research into the viability of populations in isolated habitats has taken a leap forward with the availability of genetic research techniques. The ecoducts at Zwaluwenberg (passing over the A27 and the Hilversum-Utrecht railway line) and Hoorneboeg (passing over the N416 provincial road) are the scene of unique and innovative research into the effects of ecoducts on the restoration of genetic diversity of slowworm (*Anguis fragilis*) populations on both sides of the infrastructural barriers. During the first leg of the study, 153 slowworms from populations to the west and east of the road were genetically mapped. This revealed that the western population was already isolated to such an extent that the first signs of inbreeding were visible. It is expected that the slowworms will colonise the ecoducts and prevent further inbreeding this way. In a few years we will be repeating this study, and hopefully be able to demonstrate the benefits of ecoducts (Van der Grint et al., in press).

years that traffic in the Gooi region has been getting busier and urbanisation increased, it turns out the region was still able to accommodate a viable population of badgers. That population grew from one family to at least eighty inhabited setts! This was the result of strategically planning their habitats and establishing effective connections (Jonker & Loehr, 2015).

Wilson and MacArthur had to make do with live sightings and manual modelling exercises. Nowadays, we have access to a wide range of new technologies that have enhanced our ability to do research (Strijp, 2018). The models of island biogeography can now be complemented ►



● Slowworm. Photo: Bert Pijs.

by modern research, using cameras, trackers and genetic research, giving us even better insight into the dynamics of populations for different species within our natural sites (Warren *et al.*, 2015; La Haye, 2017; Van der Grift *et al.*, in press). This also allows us to get a firmer grasp of the factors that make an ecological connection a success.

The province of Noord-Holland continues to invest in ecological connections

Over the past decades, the province of Noord-Holland has made significant investments in defragmentation measures on all scales. The first major ecoduct, Zanderij Crailoo, is already 12 years old by now. Since its completion, other ecoducts have been built in the Gooi region (Zwaluwenberg, Laarderhoogt) and the dunes in Zuid-Kennemerland have been interconnected through the construction of three ecoducts.

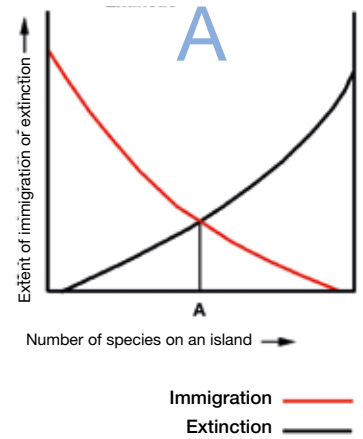
In addition to these eye-catchers, the province has also been working on smaller defragmentation measures. Combined with large scale maintenance, provincial roads are being equipped with facilities for animals such as toad tunnels, or underpass tunnels for badgers, pine martens (*Martes martes*) or otters (*Lutra lutra*).

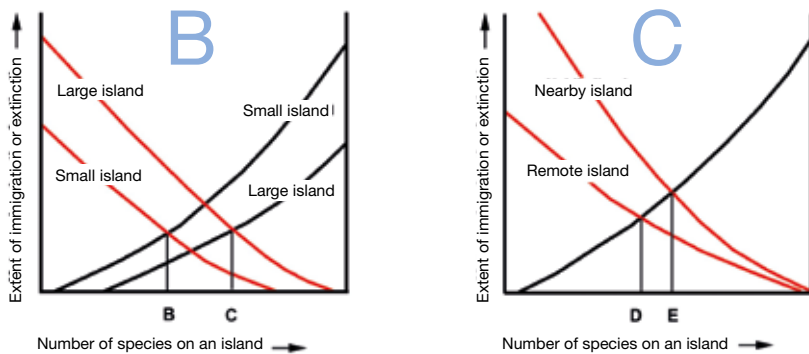
Of course such investments also require adequate monitoring, to help inform future policy and projects and make them even more effective (Provincie Noord-Holland, 2017c). The research results gathered in this special edition of *tussen Duin & Dijk* offer us a wealth of information.

The people within the metropolis: new coalitions

We are well aware of what plants and animals need: more space and better connections. But what do people need? Nature reserves are a major attraction for visitors and

locals alike to enjoy (NBTC NIPO, 2016). Natuurnetwerk Nederland could even be called the largest recreational area in the Netherlands. And it is going to be ever more important to have sufficient, attractive and resilient natural sites in our busy 'Randstad' province, where 240,000 additional homes will be built over the coming decades. Fortunately, everyone agrees that the inhabitants of Amsterdam, Zaanstad, Hoofddorp and all other cities in Noord-Holland should have access to a green environment sufficiently nearby and be able to enjoy the peace and quiet. No one wants the endless grey of built-up cities. And within cities there needs to be more green space as well: as a buffer against heat stress, torrential downpours and other climate impacts, but also because a green city is just more attractive to live in. Of course, the province will continue to focus on the further completion of Natuurnetwerk Nederland, an ecological structure that is of great importance for the wider region. But the real challenge lies in the integration of nature with other developments and building activities in the area, such as the construction of housing, the energy transition, agriculture, soil subsidence, water storage and infrastructure. The 55,000 ha of Natuurnetwerk established in Noord-Holland by 2027 will not suffice, neither for the people in the surrounding cities, nor for the environment. Coalitions between nature and the city, nature and energy, nature and water storage, nature





● Figure 2. Schematic representation of the island theory, balance between colonisation and extinction (Wikipedia contributors, 2018).

and agriculture, nature and infrastructure: they are a dire necessity if we are to have sufficient options to offer to all our busy province's dynamic developments in the future (Provincie Noord-Holland, 2017b). There is simply not enough space

nature alike, situated to the north of Amsterdam, between the dunes and dikes. Together with our partners we are trying to get government funding for this project. We will also continue to look for opportunities that extend across the borders

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to allow all of it to develop independently.

We think that biodiversity is now more or less at the point where 'sustainability' was ten years ago: there are many good examples, but its importance is not yet self-evident for everyone. But that could quickly change. In the same way that it is now inconceivable for newly constructed homes to still be connected to the gas network, in ten years' time, it will be inconceivable for homes to be built without a green roof, nesting sites for swallows and sparrows and other nature-inclusive features. Nature will no longer be a topic only 'nature lovers' care about, but it will become intertwined with all other issues as a matter of course. Because nature means so much more than just serving the interests of animals and plants. For this reason, we also want to return to the notion of 'robust connections' (corridors) within the National Ecological Network with the big project 'Amsterdam Wetlands': a multi-purpose, robust green zone for people, water and

of our province. Otters will benefit from robust connections between wetland areas in Noord-Holland, Flevoland, Utrecht, Zuid-Holland, all the way down to Zeeland: from the IJsselmeer to the Delta. We see new coalitions and smart combinations of functions as a necessary addition of the completion of the Natura 2000 network, the ecological restoration measures within Natura 2000 areas and large scale regional programmes such as the Oostelijke Vechtplassen. We will continue our efforts confident that by reconnecting our natural areas for the benefit of people, plants and animals alike, we will be restoring biodiversity and making our environment more beautiful and more enjoyable every day.

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Reference literature

- JONKER, N. & V. LOEHR, 2015. Resultaten project: 'Dassen Onderweg'. P.13 in Van Bommel, F., S. Vreugdenhil & M. la Haye. De Das. KNNV, Zeist.
- LA HAYE, M., 2017. Op zoek naar de noordse woelmuis, eDNA als alternatief voor inloopvallen. Zoogdier 28(2): 3-5.
- MACARTHUR, R.H. & E.O. WILSON, 1967. The theory of island biogeography. Princeton University Press.
- NBTC-NIPO, 2016. Bezoekersonderzoek recreatiegebieden Noord-Holland 2016
- PROVINCIE NOORD-HOLLAND, 2017a. Rapport biodiversiteit in Noord-Holland. Haarlem.
- PROVINCIE NOORD-HOLLAND, 2017b. Koers 2050. Haarlem.
- PROVINCIE NOORD-HOLLAND, 2017c. Noord-Hollandse natuurbruggen 2017. Haarlem.
- STRIJP, P., 2018. Provinciaal bestuur bij technologische innovatie. NSOB, Den Haag.
- VAN DER GREFT-VAN ROSSUM, J.G.M., B. DE KNEGT, G.W.W. WAMELINK, J. CLEMENT, J.Y. FRISSEL, R. POWELS, P. VAN PUIJENBROEK, M.E. SANDERS, L.B. SPARRIUS, C.A.M. VAN SWAAY & R.M.A. WEGMAN, 2014. Biodiversiteitsgraadmeters Noord-Holland. Status en trend van ecosystemen en soorten, 2014. Alterra-rapport 2543, Alterra Wageningen UR (University & Research centre), Wageningen.
- VAN DER GRIFT, E.A., G.A. DE GROOT, F.G.W.A. OTTBURG, H.A.H. JANSMAAN & I. LAROS, *in press*. Evaluating the effectiveness of a wildlife overpass in restoring gene flow in a slowworm population. IENE 2018.
- VAN DER GRIFT, E.A. & R. POWELS, 2006. Restoring habitat connectivity across transport corridors: Identifying high-priority locations for de-fragmentation with the use of an expert-based model. Pp. 205-231 in Davenport, J. & J.L. Davenport (eds.), The Ecology of Transportation: Managing Mobility for the Environment. Springer, Netherlands.
- WARREN, B.H., R.E. RICKLEFS, R. AGUILÉE, F.L. CONDAKINE, D. GRAVEL, H. MORLON, N. MOUQUET, J. ROSINDELL, J. CASQUET, E. CONTI, J. CORNUAULT, J.M. FERNÁNDEZ-PALACIOS, T. HENGL, S.J. NORDER, K.F. RIJSDIJK, I. SANMARTÍN, D. STRASBERG, K.A. TRIANTIS, L.M. VALENTE, R.J. WHITTAKER, R.G. GILLESPIE, B.C. EMERSON, C. THÉBAUD, 2015. Islands as model systems in ecology and evolution: prospects fifty years after MacArthur-Wilson. Ecology Letters, (2015) 18: 200-217.
- WIKIPEDIA-BIJDRAGERS, 2018. Eilandbiogeografie [Internet]. Wikipedia, de vrije encyclopedie; 10 mei 2018, 14:11 (UTC). // nl.wikipedia.org/w/index.php?title=Eilandbiogeografie&oldid=51603073.