

FORMER TIDAL WETLANDS REVITALISED: NATURE DEVELOPMENT IN THE DORDTSE BIESBOSCH RESERVE, THE NETHERLANDS

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ABSTRACT

Geomorphological and ecological features belonging to the freshwater tidal landscape in the Rhine/Meuse estuary have been degrading over the past decades. In particular, the intertidal zone was affected due to diminishing of tides and serious bank erosion.

To enhance the remaining tidal water movement locally, a plan was proposed to create side channels in the Dordtse Biesbosch, an area adjoining the Nieuwe Merwede riverbranch. In this plan, which was effectuated in the course of 1992, a connection was made between the creeks and the river at both ends, creating small side channels.

A monitoring programme was designed to test if predicted developments actually take place, at what timescale, and to observe the impact of extreme events. It involves measurement of sediment topography, water movement, vegetation, benthic meiofauna, fish, and water birds.

INTRODUCTION

The Biesbosch area, situated in the southwest part of The Netherlands (figure 1), potentially has high natural values. The extensive unembanked parts are covered by rough reedlands and degenerated former coppice cultures. Locally, these show a rich flora, and form a breeding habitat for numerous birds. Additionally, large areas of shallow open water are a characteristic feature.

The present landscape of the area originates from the period before the closure of the Haringvliet estuary in 1970. In the former situation it was characterised by a unique series of vegetation types, depending upon the freshwater tidal water movement. Gradients of flooding intensity and exposure to currents and waves were the main determinants of the vegetation (Zonneveld, 1960).

Sediment import into the shallow basin of the Biesbosch resulted in a gradual increment of tidal flats. Vegetation development, often accompanied by cultural management, was associated with this silting up and consisted of several stages. Clubrush was planted for its products and to promote further sedimentation. After reaching high enough elevation and the start of surface drainage, reed was planted, again increasing the catchment of fine sediment. Eventually, the vitality of the reed decreased again and low embankment took place. The highest raised flats, which only incidentally became flooded, were planted with willows or transformed into permanent meadows.

Tidal influence largely disappeared as the result of the closure of the wide estuarine outlets Volkerak (1969) and Haringvliet (1970) (De Boois, 1982). Creeks and passages are now no longer maintained and created by tidal water movement, and establishment of terrestrial vegetation occurs on spots

formerly covered by clubrush and reed. Re-establishment of the latter does not occur due to the absence of tidal flats.

Severely contaminated sediment has filled up the smaller creeks, while unprotected banks lining the larger creeks are subject to substantial erosion.

In the Dordtse Biesbosch reserve (figure 1), the opportunity emerged to restore some of the tidal action, thereby improving conditions for clubrush and reed growth and enlarging the foraging habitat for water birds.

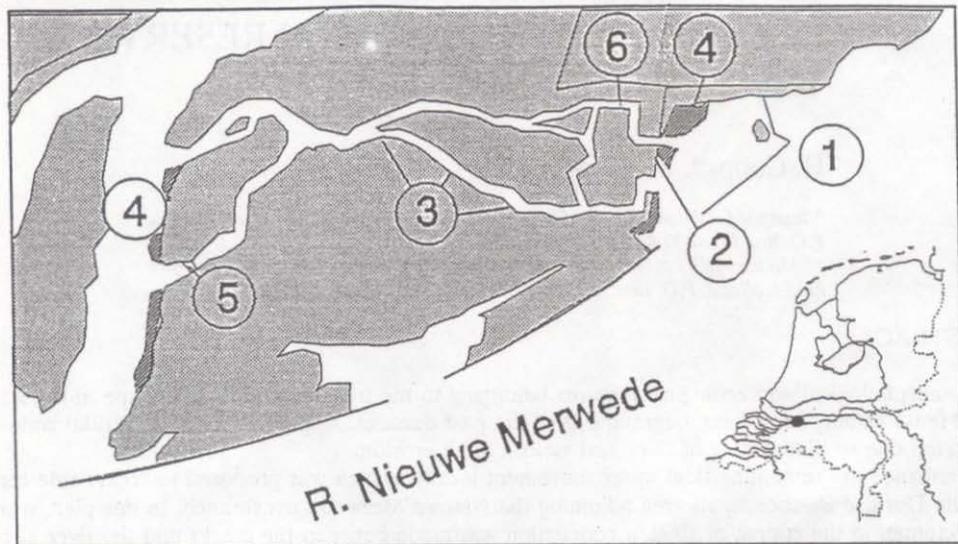


Figure 1. The Dordtse Biesbosch reserve with the main creeks. Elements of the nature development plan are indicated: 1. Reconstruction of groynes and breakwaters; 2. Lowered dam and entrance channel; 3. Lowered bank profiles planted with reed; 4. Mudflats planted with clubrush; 5. Dam with valve culvert; 6. Newly dug channel through coppicewood.

NATURE DEVELOPMENT PLAN

Measures aiming at increasing tidal current may result in altered flooding conditions of the Biesbosch area (Waterloopkundig Laboratorium, 1991). In recent years, the water quality of the River Rhine has improved significantly, lowering the risk of adverse effects of flooding and sedimentation on organisms. However, sediments deposited over the past decades often appear to be contaminated; to avoid the risk of exposing these sediments, material obtained by digging out creeks has to be removed to waste deposits outside of the area (Ministry of Transport and Public Works, 1989).

In 1992, channel flow parallel to the river was restored in the Dordtse Biesbosch nature reserve by lowering a dam, thereby connecting the upstream river with several creek ends (Rijkswaterstaat Directie Zuid-Holland, 1992) (figure 1).

Additional measures were taken by creating a sedimentation basin in front of the east entrance by relocating a dam; in this basin, sandy flats are expected to emerge, while sedimentation is stimulated by planting helophytes: clubrush (*Scirpus lacustris*) and reed (*Phragmites australis*). In the area, small dykes were removed to promote superficial inundation of the floodplain forest. Also, shallow zones

were created along creeks where colonisation by marsh plants is expected to occur. It is expected that this vegetation, once established, will act as a sediment trap. Along the main creek through the area, bank profiles were lowered. In this way, better conditions for marsh fringe development were created (including redevelopment of a typical form of marsh-marigold, *Caltha palustris* ssp. *araneosa*). Soil containing reed rhizomes that was dug off was deposited in a layer beneath the relocated dam mentioned before. Reed growth from this layer is expected. At some places, small dykes surrounding degenerated coppice were cut to promote surfacial water movement through the forest at high water levels. The southwesternmost entrance of water into the area was closed by a culvert dam, by which a one-direction water movement became possible. This was done to maximise the water passage and tidal currents.

MONITORING THE DEVELOPMENT

In October 1992, the "Dam van Engeland" was lowered to promote water movement through the area, parallel to the river. In the months before, various other activities had been conducted: reconstruction of groynes and breakwaters, lowering of bank profiles and cutting of small dykes, planting of reed and clubrush, etc. To evaluate the effects of the reconstruction measures in the Dordtse Biesbosch reserve after a number of years, a monitoring programme was initiated. Several interested parties were represented in the monitoring working group:

- Stichting Natuur- en Vogelwacht Dordrecht (local Nature- and Bird Conservancy group);
- Vogelbescherming (Dutch Society for the Protection of Birds);
- Staatsbosbeheer (State Forestry);
- Rijkswaterstaat Zuid-Holland (Regional office of the Department of Transport, Public Works and Water Management);
- RIZA (Institute for Inland Water Management and Waste Water Treatment).

The development that is taking place will be monitored and reported annually:

- 1) topography of sediment surface and bank profiles are measured in transects across the area, and differences after a couple of years are evaluated;
- 2) (tidal) water movement through the area is measured under differing river discharge conditions;
- 3) (semi-)aquatic vegetation development on banks and in shallow water is described annually in bank transects and by mapping of target species;
- 4) benthic macroinvertebrates in the sediment are sampled annually at a number of stations;
- 5) fish stock in the shallow basin is sampled;
- 6) breeding bird numbers in the area, and seasonal numbers of migrating birds are counted on a regular basis.

The next years will show if the predicted developments occur. The results may lead to further enhancing the quality of nature development plans in the estuarine parts of the Rivers Rhine and Meuse, and provide guidelines for design.

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