

MAN-MADE SECONDARY CHANNELS ALONG THE RIVER RHINE (THE NETHERLANDS); RESULTS OF POST-PROJECT MONITORING

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ABSTRACT

Owing to river regulations in the past and intensive farming, the ecological value of the floodplains of the River Rhine in The Netherlands has decreased dramatically. One way to restore riverine biotopes is to create permanently flowing channels in the floodplain. Along the River Waal, the main branch of the Lower River Rhine, two such secondary channels have been created since 1994. A post-project monitoring programme of 5 years was set up, which included hydrological, morphological and ecological parameters. This article focuses on the monitoring of aquatic macrophytes, aquatic macroinvertebrates, fish and wading-birds.

The results show that man-made, excavated secondary channels function as a biotope for riverine species including the more demanding rheophilic species. The demands for shipping and protection against flooding on the River Waal cause constraints on secondary channels. Despite these constraints there is still enough space for hydromorphological processes to create new habitats in secondary channel 1, near Opijnen. The space for hydromorphological processes is less in secondary channel 2, near Beneden-Leeuwen. The density and the number of (rheophilic) species are for a large part influenced by the water level and frequent inundation caused by the high hydrological connectivity. Man-made secondary channels seem to provide suitable habitat that is currently lacking for a broad range of rheophilic macroinvertebrate and fish species in the Lower River Rhine in The Netherlands. Owing to the lack of suitable habitats for rheophilic macroinvertebrate and fish species before the creation of the secondary channels, the importance of longitudinal and transversal migration could be illustrated by the drift of macroinvertebrates during floods and the seasonal migration of Age-0 and Age-1 + fish species. Copyright © 2001 John Wiley & Sons, Ltd.

KEY WORDS: ecology; floodplain restoration; post-project monitoring; river–floodplain; river restoration; side channel

INTRODUCTION

The River Rhine in The Netherlands

The River Rhine rises in the Swiss Alps and flows through Germany, France and The Netherlands towards the North Sea. Its basin covers 185 000 km², and the average discharge at its mouth measures 2300 m³/s. In The Netherlands the River Rhine divides into three branches, Rivers Waal, Nederrijn and IJssel (Figure 1). The largest of these branches is the free-flowing River Waal, which carries about 70% of the total Rhine flow. In addition, the River Waal is an important shipping connection between the port of Rotterdam and Germany, with 160 000 cargo vessels crossing the German–Dutch border every year. The hydrological and morphological characteristics of the River Waal are described in Table I.

Since the river regulation works of the 19th and 20th century, the low-water bed of the River Waal has been fixed by groynes. They create a deep and uniform shipping channel and protect the riverbanks from

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