Passive Establishment of Vegetation in Constructed Wetlands in Agricultural Settings: a Case Study

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ABSTRACT Three wetlands constructed in 1995 on land adjacent to agricultural fields in northwest Ohio were allowed to establish vegetation passively. Survey data collected 1998-2001 from quadrats in open water, frequently and infrequently submerged zones within the basin, identified 77 species over the three sites. Greatest species diversity occurred in the infrequently and frequently submerged zones. The dominant species within the wetlands originated from agricultural fields, nearby drainage ditches, streams, and the seeded erosion control buffer zones surrounding the wetlands. Six years following construction, less than 50% of the dominant species were wetland species. Results suggest that for constructed wetlands in agricultural settings, plantings or seeding of desired species will be required to supplement the existing sources of wetland vegetation species.

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INTRODUCTION

The introduction of constructed wetlands in agricultural watersheds of the Mississippi basin has been recommended to reduce non-point source nutrient contributions to the Gulf of Mexico (Mitsch and others 1999, 2001; Hey 2002). Vegetation in such wetlands is most often established by seeding or transplanting seedlings in the basin following construction, and there is much literature available on the methodology and results (Alien and others 1989; Marble 1992; Payne 1992; Thunhorst 1993; Hammer 1997). An alternative approach is to allow for species that may passively establish from the seed bank or be recruited from outside the wetland. Wetland management for passive establishment selects for species to establish from the seed bank or from outside the wetland (Welling and others 1988; Collins and Wein 1995). Risks of passive vegetation establishment are that seed bank richness may he insufficient or that the surrounding areas may provide both suitable and undesired or invasive species (Weinhold and van der Valk 1989; Galatowitsch and van der Valk 1995).

The objective of this work was to examine how constructed wetlands built on converted cropland passively develop vegetation Specifically, this study was conducted to document the rate and type of passive vegetation establishment in Wetland Reservoir Subirrigation Systems (WRSIS) project sites and, thereby, aid in the decision to use passive revegetation in future project sites.

SITE DESCRIPTION AND METHODS

This time limited study examined and identified the vegetation that established in three constructed wetlands located in the Maumee River watershed in Defiance, Fulton, and Van Wert counties in northwest Ohio. Each location had been under row crops or sod for at least 20 years prior to construction, which occurred in 1995. The size of the constructed wetland was 0.12 ha in Defiance County, 0.57 ha in Fulton County, and 0.79 ha in Van Wert County. The average water depth in the wetland was >30 cm, but features such as shelves, earthen dividers, and gentle bank slopes (6-10:1) were designed into the basins to promote vegetation establishment. Vegetation was allowed to establish passively, with the exception of erosion control seeding along the buffers of the basin. The buffers of the three sites received similar species in the erosion control applications, that is, *Medicago saliva* L., *Phleum pratense* L., *Echinochloa crusgalli (L.)* P. Beauv., *Festuca pratensis* Hudson., *Dactylis glomerata* L., and *Trifolium repens* L. The Fulton and Van Wert locations also received *Bromus* spp. The wetlands received subsurface drainage and runoff waters from adjacent agricultural fields under corn *(Zea mays* L.), soybean *(Glycine max* L.) rotation cropping systems. The annual water level of the constructed wetlands varied 15-25 cm during the study.

Field surveys were conducted to determine plant species, number of individuals and zonation of growth by randomly placing four 1.0 m^2 quadrats in each of

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