Adaptive Management Consultation
Sediment Removal to Restore Wetlands Workshop
Rydell NWR, January 29-30, 2008

Briefing Paper Prepared for the USFWS Biological Monitoring Team

Introduction

Historically, the wetlands and prairies that spread across the Midwest provided important breeding and rearing habitat for waterfowl and other wildlife. Wetland drainage and intensive farming practices in the prairie and transition regions of the Midwest have resulted in the loss of more than 90 percent of the historical wetlands throughout the region. While many National Wildlife Refuges, Waterfowl Production Areas (WPA) and state wildlife management areas were established to protect these wetlands, the vast majority remain in private ownership. Hence, in the Midwest Region, wetland habitat represents a priority habitat of the U.S. Fish and Wildlife Service's (Service) Partners for Fish and Wildlife (Partners) Program. Many wetlands are also being restored on Service lands (WPAs) and easements. Wetland restorations usually involve heavy construction equipment and earth moving. Typical wetland restoration projects include plugging drainage ditches and tile lines or constructing berms to restore degraded or drained wetland basins.

The Morris Wetland Management District (WMD) originally wrote this proposal to learn more about excavating sediment from the wetland in conjunction with restoring a drained wetland basin through typical restoration techniques. The literature describes adverse ecological impacts of sedimentation into wetlands in agricultural landscapes, many of which could lead to sub-optimal restorations. For example, wetland restoration in the Prairie Pothole Region depends on the theory that the plant seed and invertebrate egg bank remain viable even when the wetland has been drained; we assume that restoring the hydrology will allow the wetland's flora and fauna to recover on their own. However, recent research shows that just 0.5 cm of sediment is enough to greatly reduce seedling and invertebrate emergence (Gleason, et al. 2003).

A limited number of efforts have been made on Service lands and private lands to implement sediment removal as a restoration technique. The science seems to indicate that sediment negatively impacts the functioning of wetlands (Gleason et al. 2003); however, the science does not currently provide details on implementing or even on the results of sediment removal. This restoration technique is expensive and intensive, and therefore ensuring the science behind it is critical. We are also interested in exploring the potential for removing sediment in previously restored wetlands (e.g., the MN PLO has a site where they've restored many wetlands and the landowner is interested in excavating the sediment layer to improve wetland functions).

Define the Problem

Our planning committee (Dave Bennett, John Braastad, Cami Dixon, Becky Ekstein, Dave Jacobson, Stacy Salvevold, Lori Stevenson & Sara Vacek) met November 27, 2007, to talk about if and when sediment excavation is an appropriate wetland restoration tool. Our group discussed many situations, based largely on land use history, where sediment excavation may be appropriate. We narrowed that list down to two wetland states:

1) Wetlands most impacted by overloading of sediment are on old cropland (previously cultivated) areas. For efficiency and cost effectiveness, wetlands that are currently embedded in old cropland which is not currently in perennial, herbaceous cover, but planned for such cover, will be the first priority for wetland restoration using sediment removal.
2) A second priority will be given to wetlands that are embedded in old cropland that is currently in an herbaceous cover (i.e. native seed mixture, dense nesting cover, etc.).

Respective stations may choose to prioritize this further if the need suggests, especially where financial resources are limited.

We recognize that there will be other influences, as listed below, on a wetland's response to sediment excavation. We are uncertain if we should just consider our two priority wetland states or if these other influences can also be worked into the model:

- Recharge vs. Discharge wetlands (i.e., more temporary vs. more permanently ponded wetlands). Devils Lake has focused on recharge

basins because it is often too wet to do this work in discharge systems.

- Geographic area. There are landscape level issues that vary across the stations involved with this study, including the precipitation gradient, land use, soils, etc.
- Wetland types. Should we focus only on prairie potholes or can we include other kinds of wetlands as well?

We are also very concerned that we are careful to not alter the wetland class (e.g., digging a temporary wetland too deeply) or create wetlands (e.g., excavating where there was not a wetland historically). We presume this will require careful examination of aerial photography and soil cores to determine the true bottom and assess soil types. In Minnesota, we may be able to use the Restorable Wetland Inventory as a starting point.

While the cost to remove sediment is an important issue related to the restoration of a wetland, we feel that it's important to first determine the success or failure of sediment removal. The decision to remove sediment could be determined through a trigger point relating to depth of sediment or potential ecological success of the restoration which is more important than just the cost. A model predicting the success or failure of a wetland restoration based on sediment removal will be a very useful management tool.

Goals and Objectives

Goal: Provide healthy, functioning wetlands across the landscape for waterfowl and migratory bird breeding habitat.

Objectives:

- Restore or retain hydrology appropriate for wetland type and location
- Restore or retain plant community and structure appropriate for healthy wetland type and location (e.g., increase plant diversity, favor natives vs. non-natives, reduce cattail and reed canarygrass, maintain x% open water in specific precipitation regimes)
- Maintain or improve the invertebrate community appropriate for healthy wetland type and location

We recognize that we are not likely to restore a wetland to pristine conditions – we need to establish what is good enough to call it successful.

Euliss/Gleason's recent research on CRP wetlands might inform us of this question of what is "natural" or "good enough" in terms of prairie wetlands.

Metrics

This is a preliminary list of possible metrics:

- Native and non-native species richness or cover
- Plant structure (e.g., % open water, cover type classes)
- Sediment depth (what depth… 6 inches, 1 foot, 3 feet?)
- Macro-invertebrate abundance or richness
- Hydrology

Treatment Alternatives

At the most basic level, we see four possible treatment alternatives for restoring wetlands:

- Restore hydrology (ditch plug or tile break)
- Excavate sediment
- Restore hydrology + excavate sediment
- Do nothing

Background Materials

- *Sediment Removal on Temporary and Seasonal Prairie Potholes, Devils Lake Wetland Management District:* Cami Dixon and others have compiled a nice summary of the ongoing sediment removal work at Devil's Lake WMD. This document covers many of the logistical issues that our group discussed about sediment removal (e.g., what do you do with the sediment, costs, working with contractors).
- *Gleason, R.A., N.H. Euliss, D.E. Hubbard, and W.G. Duffy. 2003. Effects of sediment Load on Emergence of Aquatic Invertebrates and Plants from wetland soil egg and seed banks. Wetlands 23(1): 26-34.* This paper was cited in this briefing document. It provides an excellent overview of the problems associated with excessive sediment loads in prairie wetlands.