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DEER PRAIRIE SLOUGH HYDROLOGIC RESTORATION PROJECT: INITIAL RESULTS AND LESSONS LEARNED

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ABSTRACT

Sarasota County biologists undertook a restoration of the historic hydrology and ecology of Deer Prairie Slough, a tributary of the Myakka River in Sarasota County. The Slough was ditched in the early 1950s to drain the area for agriculture. Approximately 12 miles of Slough ditches existed on public lands. The Deer Prairie Slough Restoration Project will enhanced approximately 2,500 acres of hydric/mesic hammock and herbaceous marsh by eliminating approximately 8.4 miles of ditches. Ditch backfilling for the wetlands in Phase I (6.7 miles) was completed between April and June 2001, prior to the 2001 wet season, with Phase II scheduled to finish prior to the 2002 Florida wet season. Benefits of this project include improving and increasing wetland wildlife habitat, reducing exotic plant coverage, improving water quality to on-site and downstream locations including estuarine habitats, and reducing flood pulses by increasing water storage and water retention times of on-site wetlands. One important goal was to create natural grades with extremely gradual slopes. The temporarily disturbed restoration areas were initially intended to voluntarily recruit desirable wetland plants. The initial changes in wetland hydrology and vegetation are summarized, with special attention to lessons learned in funding, contracting, and project management. This project received grant funding from the Charlotte Harbor National Estuary Program and the Southwest Florida Water Management District.

INTRODUCTION

The following is a case study in which a county government initiated a restoration project on public reserve lands which included contracting, monitoring, and managing multiple grants. The Deer Prairie Slough Restoration Project was cooperatively funded and designed to restore and/or enhance 2,000 acres of freshwater marsh and adjacent mesic and hydric hammocks through backfilling of historic ditches. The project was initiated and managed by Sarasota County Government biologists and received matching grant funds from the Sarasota County Pollution Recovery Trust Fund, Southwest Florida Water Management SWIM program, and the Charlotte Harbor National Estuary Program. All contracting and procurement was achieved through Sarasota County Government Procurement standards and protocols based on Florida State Statutes. The project was designed as two phases, carried out by "cradle-to-grave" management strategy, which allowed for adaptations and field changes to ensure a successful final product.

STUDY SITE

The study site, Deer Prairie Slough (Figure 1), involves a series of freshwater wetlands and wet prairies with origins in the Myakka State Park and Sarasota County's T. Mabry Carlton Jr. Memorial Reserve (CMR). South of the CMR boundary, the Deer Prairie Slough's waters converge into a seasonally flooded creek, Deer Prairie Creek, which is a tributary to the Myakka River. The Myakka River ultimately empties into Charlotte Harbor. The size of the watershed entering the slough system is estimated at approximately 10,000 acres. Immediately following World War II, a channelization, achieved via mule teams and steam dredges for nearly 15 miles of channel for agricultural purposes, disturbed natural hydroperiods by forcing an early drawdown of adjacent wetlands and shrinking wetland acreage by reducing seasonal high water elevations. The introduction of a channel into this topographically conservative system resulted in continued erosion with seasonal rains. Subsequent fire suppression and sporadic cattle grazing combined with the hydrologic impacts, resulting in a highly disturbed series of freshwater wetlands often dominated by dog-fennel (*Eupatorium capillifolium*) and wax myrtle (*Myrica cerifera.*), with mesic hammocks encroaching towards the interior. Deep areas within the channel ultimately prevented the growth of native emergent macrophytes and served as seasonal holding pools for floating exotic species such as water lettuce (*Pistia stratiotes.*) and water hyacinth (*Eichornia crassipes*). The existing wet prairie areas within the slough were frequently infested with torpedo grass (*Panicum repens*) and occasional West Indian marsh grass (*Hymenachne amplexicaulis*).

The CMR was established by Sarasota County in a series of land acquisitions and donations culminating in the mid-1980's, and currently contains an active water well-field which is operated by Sarasota County. As a part of the Southwest Florida Water Management District's requirements for operating the wellfield, an extensive system of groundwater, surface water, and precipitation monitoring sites has been in place since 1989. Hyroperiod data collected over the years, coupled with a vegetative community clearly indicative of disturbance, led to the concept of restoring the Deer Prairie Slough channel. Sarasota County biologist viewed the nearly twelve miles of channelized slough on public lands as a site offering the perfect opportunity to improve the quality of the environment.

MATERIALS AND METHODS

Design

Acknowledging a potential lack of funds for a large-scale project, the researchers began to consider various methods whereby the Deer Prairie Slough system could be restored. Historic aerials and topographic data suggested that many of the interconnected wetlands of the Deer Prairie Slough system had previously been connected via sheet-flow during maximum seasonal high water, yet remained separate for most of the year. To achieve this set of conditions would require careful attention to channel backfill elevations, particularly with regard to transitional zones between wetlands. Phasing of the project

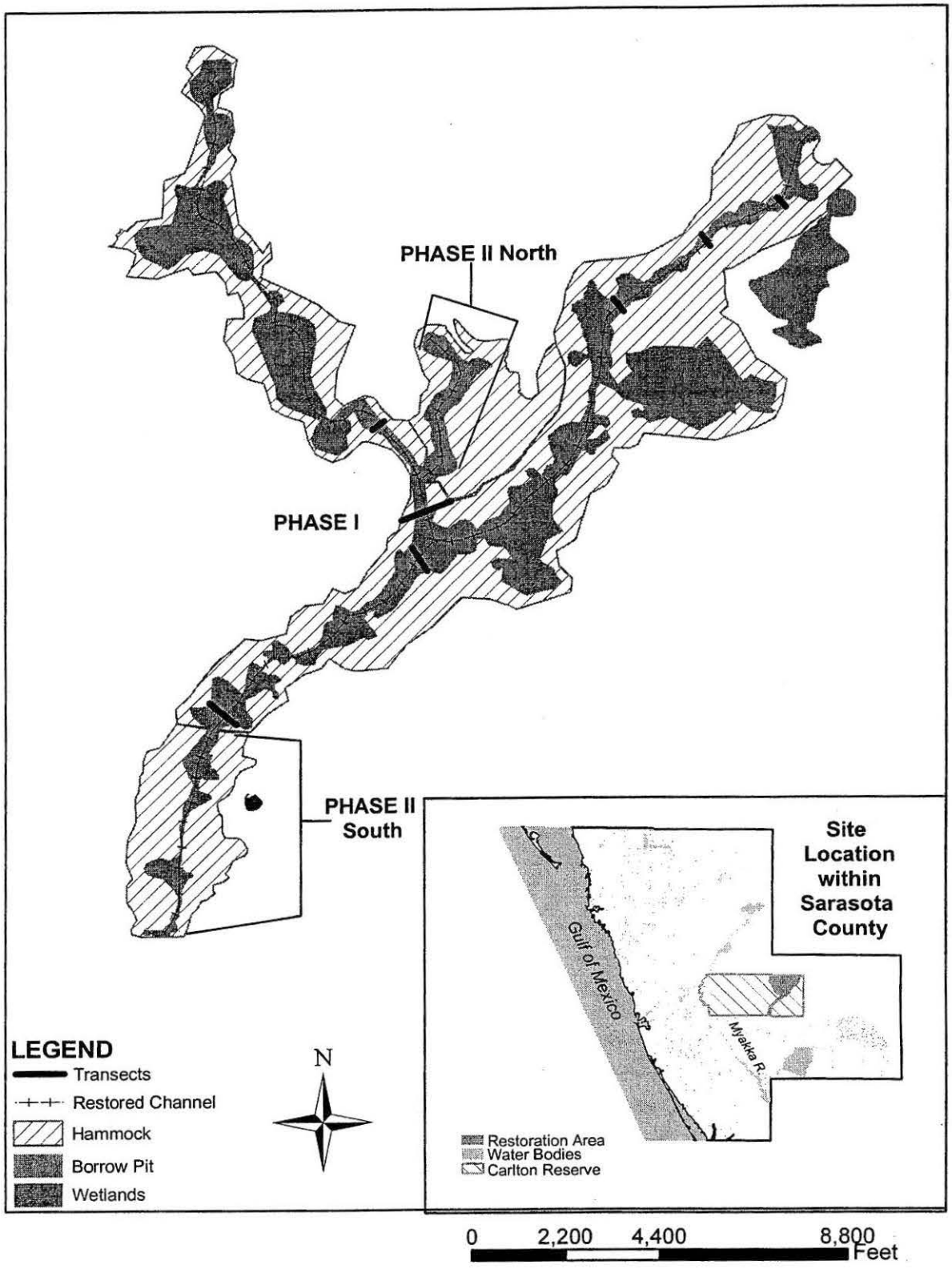

Figure 1. Deer Prairie Slough Restoration Project site location map, Sarasota County, Florida.

would allow for the work to be timed during the driest times of the year. Drawing on anecdotal and published data from other attempts involving restoration of channelized systems (Anderson and Ohmart, 1985; Evans and Allen, 1995), the use of ditchblocks as a restorative technique was discarded in favor of a comprehensive attempt to eliminate the artificial deepwater areas and provide natural transitions between historically distinct wetlands. It appeared very simple at that point – utilize the existing spoil left along the channel to backfill the ditch, and the area would be restored.

Funding

After careful research into available funds, grants were obtained from the Charlotte Harbor National Estuary Program and the Southwest Florida Water Management District's SWIM fund. Sarasota County provided the match required to obtain these funds through their Pollution Recovery Trust Fund. Additional match was realized as in-kind services provided by the biologists in the form of project management, monitoring, and reporting hours. The pre-existing data set for the project area, combined with monitoring schedules and equipment already in place, provided an opportunity to submit solid grant proposals with a guarantee of clear and measurable results as deliverables.

Contracting

With money practically in-hand, the next obstacle was to produce a construction contract that would adequately address the scope and existing conditions of the project. This was to be accomplished, under Florida Statute, by selecting the lowest bidder. Quantification then became an important factor in preparing the bid specifications; no funds were earmarked for a thorough survey whereby the earthmoving costs could be quantified. An in-house team of surveyors was utilized to provide representative cross sections which were incorporated into the bid documents as characteristic of the site, with the added caveat that all contractors would be responsible for final quantities. These surveys revealed the need for existing fill in spoil piles adjacent to the channel to be supplemented with fills from a borrow pit. Two technical provisions were written for this Contract Specifications Document following Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000; one for mobilization and one for excavation, grading, and offsite borrow.

The clearing and grubbing provisions described removal of vegetation from existing spoil materials, as well as the site preparation for the borrow pit. The contract indicated removal of the existing shrubby oaks and wax myrtle from the spoil and subsequent scattering of dead vegetative material adjacent to the construction corridor. It was surmised that this material would quickly breakdown while providing additional structural components as temporary habitat. Exotic plants within the designated earthwork areas were targeted prior to any work to reduce transport and re-distribution of undesirable seeds.

All earthmoving costs were then contracted as "lump sum" instead of "unit cost" to circumvent the potential change orders often characteristic of low-bid contracts. The lump sum earthmoving specifications left all mobilization techniques, fill and excavation quantities, equipment and operators to the contractor's professional opinion. Specific

indications for ditch backfilling required utilization of available fill materials to "create natural grades that are characteristic of those from the surrounding wetlands." Except for designated haul routes, the contractor was restricted to operating within a 150' corridor centered on the existing channel.

Following previous design ideas, the backfilling of the DPS channels was written into an earthmoving contract as two phases representing two distinct ditch configurations. The contract allowed for both phases to be completed within the same dry season (March through late June) or for them to be accomplished during two successive dry seasons. The onset of the wet season, marked by rising water levels in the slough, was variable and difficult to address in contract language. Specific construction windows, based on recent years' hydrology, were written into the contract documents with a liquidated damages clause providing some assurance. Because the contractor was to be aware of the difficult working environment of the slough, exceptional rainfall events resulting in delays during construction were described as rainfall "greater than a five-year average for that 24 hour period."

All contractors were urged to visit the project site, and two pre-bid tours were provided for all interested contractors with biologists leading the discussion and overview of the bid specifications.

Permitting

While the design and contracting phases of the project were underway, applications for relevant permits were being prepared and submitted. Both phases of the Deer Prairie Slough involved temporary wetland impacts. Under Florida Water Management District Rules, an Environmental Resource Permit application was submitted, requesting a Noticed General Permit. As a result of numerous meetings and discussions with the Southwest Florida Water Management District, the County created a partnership with the Florida Department of Environmental Protection to apply for the SWFWMD Noticed General Permit. In this case, the representative cross sections of the project area described in the contract proved invaluable. It should be noted that the location of the restoration project within a County reserve facilitated the permitting process by reducing the project's potential for impacting adjacent landowners.

The United States Army Corps of Engineers recommended permitting under a Nationwide Permit. Once again, all data collected during the design and contract writing proved invaluable in obtaining the permit in a timely manner.

Monitoring

As stated above, numerous surface water, groundwater and precipitation monitoring locations existed on site as part of an ongoing water-use permit. This data extended back to 1989, providing a baseline for monitoring changes in hydrology and vegetative communities. Additional vegetation monitoring transects were installed at selected sites along the slough corridor to assess changes in upland, transitional, disturbed wetland, and channel areas following restoration efforts.

RESULTS AND DISCUSSION

The Deer Prairie Slough Restoration Project required an adaptive management approach. Figure 2 shows the initial two phases of the project divided into subtasks and milestones. Bids were opened in early March 2001, and the contract was awarded to the lowest bidder. One day after signing the contract, the contractor recognized that he had not had a clear indication of site conditions and extent of the project. While the confusion was quickly dissipated, the project could easily have been delayed or halted for an indefinite period. Lesson learned: Mandatory pre-bid and pre-contract signing meetings should provide clarity and consistent information regarding the scope and nature of the contract.

Two days into clearing and grubbing of the Phase I area it became clear that daily site visits and contractor discussions would be crucial. There was an emerging issue of deepwater areas with thick vegetation mats where no equipment could be safety operated, and other issues relating to final grade. It became clear that all communications with the contractor should be consistent, with particular effort made to coordinate all communications with the contractor's designated contact.

A month into the earthmoving on Phase I, a nearby prescription burn escaped its boundaries and swept eastward into the restoration area. Having set up a flexible budget with some reserve, a change order was added to the contract for subsequent fire line repair within the slough system. This change order included funds for utilization of another windfall for the project well near the end of Phase I. A major pipeline construction project crossed the slough system at the boundary between Phases I and II. The earthmoving contractor for the pipeline agreed to leave nearly 6000 cubic yards of fill stockpiled for use in the restoration project. A change order was executed to transport this material and spread to grade in eleven target locations to achieve proper transitional zones between wetlands. This additional fill material came from nearby wetlands and proved to be a valuable seed source for initial colonization of the corridor.

Phase I earthwork was completed in June 2001, and revegetation of the corridor depended entirely on natural recruitment and a small volunteer planting effort in the downstream end of Phase I, where erosion was expected. A 24 hour, 7 inch rainfall event was recorded two weeks after de-mobilization i.e., tropical storm Gabrielle. Once the high waters receded, the need for erosion and sediment rework was apparent in the unvegetated areas and at the terminal end of Phase I where a temporary earth and geosynthetic plug had been placed.

Initial hydrologic changes following Phase I of the restoration are summarized in Figure 3. While downstream erosion allowed for an earlier drawdown than expected, the hydroperiods of the northern sites demonstrated increases in wetland water depth and duration as a result of channel filling. Initial changes to vegetation are summarized in Table 1. Following initial erosion and storm damage, the backfilled sediments were stabilized, and further plant colonization continued. The initial emergence along most of the Phase I corridor consisted of smartweed (*Polygonum punctatum*) and maidencane

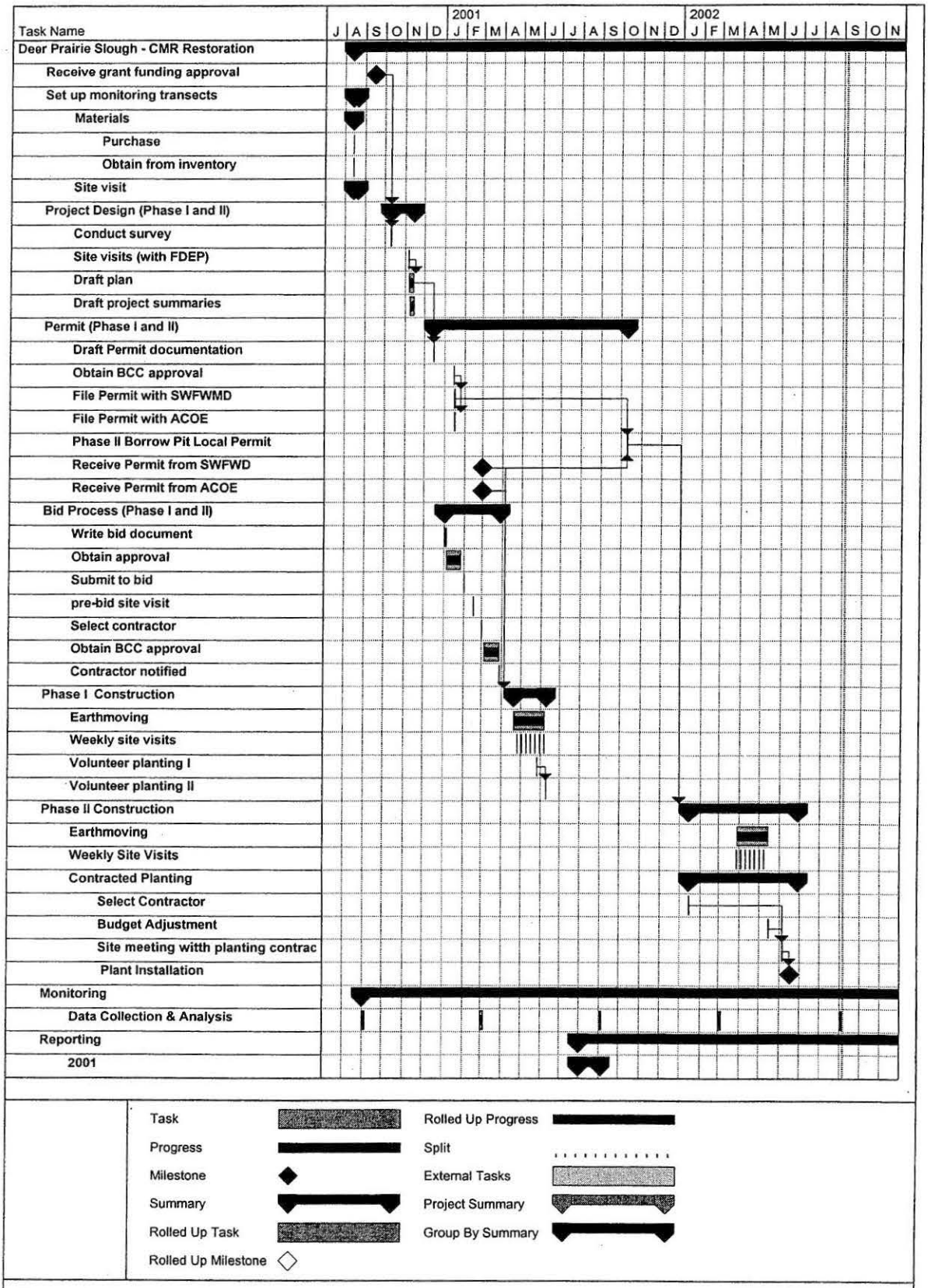

Figure 2. Deer Prairie Slough Restoration Project compressed gantt chart for phased management. Note additional plantings planned during Phase II.

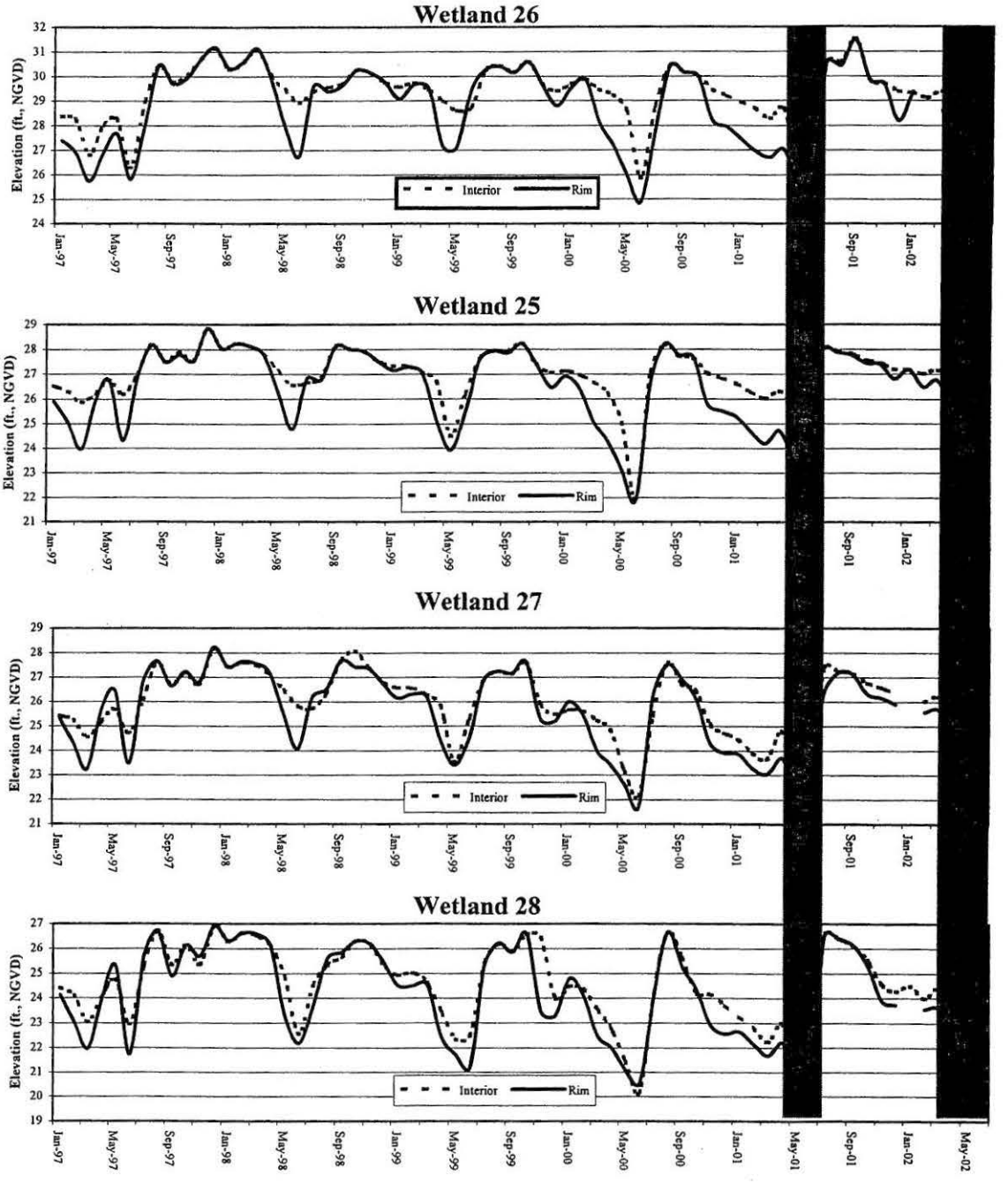

Figure 3. Deer Prairie Slough wetland hydrographs showing construction phases. Individual monitoring sites are arranged from north (upstream) to south (downstream).

Table 1. Dominant species by transect, in order of decreasing dominance, for the North Branch of the Deer Prairie Slough Restoration Project, Phase I. This area represents the first area within the corridor to recruit naturally prior to the 2001 wet season.

	Phase I Pre-restoration		Phase I Post-restoration
Transect #	August 2000	March 2001	August 2001
6	*Polygonum punctatum* *Panicum hemitomon* *Mikania scandens* *Spartina bakeri* *Eupatorium capillifolium*	*Panicum hemitomon* *Polygonum punctatum* *Centella asiatica* *Lippia nodiflora* *Andropogon virgnicus*	*Spartina bakeri* *Panicum repens* *Panicum hemitomon* *Polygonum punctatum* *Centella asiatica*
7	*Panicum hemitomon* *Panicum repens* *Sparina bakeri* *Andropogon virginicus* *Hypericum fasciculatum*	*Panicum hemitomon* *Panicum repens* *Centella asiatica* *Andropogon virgnicus* *Lippia nodiflora*	*Panicum repens* *Panicum hemitomon* *Spartina bakeri* *Polygonum punctatum* *Urtricularia foliosa*
8	*Panicum hemitomon* *Myrica cerifera* *Mikania scandens* *Centella asiatica* *Andropogon virginicus*	*Panicum hemitomon* *Ptilimnium capillaceum* *Eupatorium capillifolium* *Centella asiatica* *Lippia nodiflora*	*Panicum hemitomon* *Sacciolepis striata* *Eupatorium capillifolium* *Polygonun punctatum* *Andropogon virginicus*
9	*Panicum hemitomon* *Polygonum punctatum* *Andropogon virginicus* *Panicum repens* *Sacciolepis striata*	*Panicum hemitomon* *Polygonum punctatum* *Lippia nodiflora* *Eupatorium leptophyllum* *Galium tinctorium*	*Panicum hemitomon* *Polygonum punctatum* *Alternathera philoxeroides* *Panicum repens* *Urtricularia foliosa*

(*Panicum hemitomon*). Torpedo grass recolonized the margins of the earthwork corridor but senesced as water levels reached late summer maximums. Areas where earthwork had been kept to a 50-foot wide corridor vegetated completely by colonization from adjacent source areas. Wider corridor areas did not colonize completely prior to the peak seasonal high water. This concurs with much of the published literature regarding macrophyte emergence and recolonization in flowing systems (van der Walk, 1994; Henry, *et al.* 1996), suggesting that site conditions favoring vegetative reproduction prior to inundation would increase corridor revegetation for Phase II.

Phase II earthmoving began in late March 2002 and was completed by mid-May 2002. The following lessons learned were implemented into the adapted management plan for Phase II:

1) Coordinate construction phases carefully to gain full advantage of weather patterns and water levels to minimize down time and promote revegetation.
2) Reduce temporary impact area as much as possible.
3) Require pre-construction contractor meetings and site visits with weekly follow-ups.
4) Maintain budget flexibility.
5) Plan for temporary wildlife protection and relocation.
6) Acquire additional needed fills through creating a nearby vegetated borrow pit.

CONCLUSIONS

The Deer Prairie Slough Restoration project represents a successful restoration of channelized wetlands on public lands, utilizing public funds. Creative funding and partnering for permitting were crucial to the success of the project. An adaptive approach, combined with a flexible budget and careful attention to contract document detail customization, maximized efficiency and enhanced success. Phasing of the project and cradle-to-grave management allowed for a learning and adaptation period between phases. The channel fill method appears to provide tremendous restoration potential for linear slough projects.

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