

Using simple structures for flow dispersion in wet meadow restoration

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Abstract.—Historically, wet meadow recovery projects have relied on heavy earth moving equipment to harden nick points and install gully plugs or terraces to trap and detain sediments. We experimented with a variety of simple hand-built structures fashioned of logs, rocks, geotextile fabrics and/or sandbags designed to disperse runoff, rewet surface and subsurface soils and stimulate the growth of wetland dependent vegetation adapted to erosion control and sediment detention. We utilized workers from a variety of labor pools to implement projects.

INTRODUCTION

Wet meadows are riparian grasslands having low velocity surface and subsurface flows, hydric soils and wetland dependent vegetation dominated by grasses and grass-like plants. Wet meadow vegetation requires soil moisture in excess of that available from direct on-site precipitation alone. Well dispersed runoff originating from upslope or groundwater sources is essential to wet meadow function. Surface irregularities, such as rills and gullies resulting from accelerating soil erosion, impede wet meadow functions by progressively constraining the dispersion of surface and subsurface flows originating from off-site sources and draining moisture from adjacent areas by capillary action.

Historically, wet meadow restoration projects have attempted to reclaim damaged sites by using costly erosion control devices, such as hardened nick points, sediment traps, dams and terraces. Usually construction is accomplished using expensive earth moving equipment. Few projects have focused on flow dispersion as the primary treatment.

OBJECTIVES

We attempted to bring about wet meadow recovery by improving the dispersion of surface and subsurface flows using simple, hand-built structures. Our goal was to secure conditions favoring natural ecological processes. Primarily we wished to stimulate the growth of wetland dependent and wetland facultative plants, such as sedges and rushes because wetland vegetation has the ability to retard runoff, increase rates of infiltration and percolation, trap and retain sediments, assimilate nutrients and is self perpetuating.

Primary objectives were to:

1. Disperse surface flows and expand the area periodically saturated by seasonal runoff.
2. Extend the duration of seasonally available soil moisture.
3. Stimulate colonization by wetland vegetation and increase plant densities.

Secondary objectives were to:

1. Control and prevent soil erosion through increased vegetative cover.
2. Detain and retain sediments through vegetational filtering and bonding.

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METHODS

Beginning September 1993, various simple labor-intensive structures fashioned of geotextile fabric, logs, rocks and/or sandbags were installed on Cibola National Forest, Carson National Forest, wet meadow sites, and Zuni Pueblo. Labor was provided from a variety of human resource programs, volunteer organizations and agency programs. We purposefully ruled out the use of earth moving equipment in order to test the feasibility of hand-built structures and to minimize soil compaction.

Structure types and locations were identified and flagged prior to construction, placing emphasis on the primary objectives of flow dispersion and extended soil moisture availability, therefore we selected sites where flows could be easily dispersed over wider areas.

Structure types included log structures, with and without geotextile fabrics, sandbag structures one and two tiers high in various arrangements, rock structures with and without geotextile fabrics, and log or rock structures faced with sandbags. All log structures were installed with logs placed parallel with channel flow to minimize scour pool formation and end cutting. Two types of geotextile fabrics were tested.

Evaluation and monitoring was by visual examination and photo documentation conducted at the end of each growing season and immediately following spring runoff. We examined structural performance, vegetative response, extent of surface wetting and sediment accumulation.

RESULTS

Results have been variable due not only to variations in structure types and applications, but also to local vagaries in precipitation, soil types, vegetation composition, watershed characteristics and other factors.

- Flow dispersion objectives have been met and soil moisture is increasing.
- The duration of seasonal wetting has been extended especially where sand bags were incorporated into structure design.
- Wetland plants have increased in density and have colonized many treated sites.
- Sediment deposition is occurring as channel roughness increases with increasing plant densities and stubble heights.

- As sediment accumulates in treated channels, more frequent overbank spilling is occurring further expanding the wetted soil surface.
- Sandbag structures have been easier to install than either log or rock structures and can be readily modified as needed in response to changing patterns of flow or erosion.
- Results derived from the use of geotextile fabrics have been mixed. The benefits of increased sediment capture have been offset by the suppression of vegetation growth. Silt fencing fabrics, used without stakes or wire reinforcement, have been effective and convenient to use.

DISCUSSION

We have noted an obvious increase in plant densities and vigor within a year of structure installation at most sites. The primary objectives of increased flow dispersion, surface wetting and duration of wetting are being realized.

Sandbag or sandbag-faced structures seemed to be more effective than log or rock structures alone, especially where vegetation is sparse.

Lower structures perform better than taller structures, being less prone to damage by end cutting, under cutting or scouring.

The use of volunteers enlisted from citizen conservation organizations has proven beneficial not only in numbers of treatments installed, but also in increased enthusiasm for wetland restoration.

Little maintenance has been required, or if needed, has been easily performed with hand labor.

ACKNOWLEDGMENTS

The authors appreciate the administrative support extended by District Ranger Dan Rael, Carson National Forest, and Project Leader, Jim Enote, Zuni Conservation Project. We especially appreciate the dedication and enthusiasm extended by Technicians Nelson Luna and Vernon Quam, Zuni Fish and Wildlife Department, who coordinated activities of Zuni Restoration Crews. Wildlife Biologist Jim Anderson, formerly of Cibola National Forest, coordinated construction at La Ciengita.