TERRESTRIAL VEGETATION INVENTORY OF WATER DELIVERY SYSTEMS BETWEEN SAN ACACIA DIVERSION AND THE BOSQUE DEL APACHE NATIONAL WILDLIFE REFUGE

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ABSTRACT

Transects parallel and perpendicular to water conveyance structures of the Socorro Division of the Middle Rio Grande Conservancy District were used to characterize vegetation associated with them. Thirty-two plant species were identified in association with canals and drains. Dominant species included willow (19%), johnsongrass (13%), saltgrass (9%), and brome (6%). Willow (60%) and saltcedar (19%) occurred as midstory vegetation in 37% of the area sampled. Drains had higher percentages of ground cover as litter and vegetation than did canals, whereas the latter had higher percentages of bare ground and rock. Dominant species also differed between drains and canals, with willow (28%), saltgrass (13%), and brome (8%) dominant along drains. In contrast, grasses were dominant along canals [Johnsongrass (21%), bristle grass (12%), Canadian wildrye (12%), and scratch grass (10%)]. The willow midstory component along drains represented a greater potential to provide or contribute to fish and wildlife habitat.

Keywords: vegetation, Middle Rio Grande Conservancy District, conveyance, Bosque del Apache

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INTRODUCTION

This inventory was designed to quantify the habitat associated with Middle Rio Grande Conservancy District (MRGCD) drains and canals and provide a baseline for evaluating structural operational changes in the water conveyance system. The inventory was designed to provide vegetation data to compliment a larger research study entitled “Agricultural Irrigation Systems and Conservation of Native Fishes” by Dr. David Cowley. The current project was conducted in cooperation with the ESA Workgroup Collaborative Program for Rio Grande silvery minnow (*Hybognathus amarus*) and southwestern willow flycatcher (*Empidonax traillii extimus*).

The specific objectives of this project were to 1) inventory aquatic and terrestrial vegetation associated with the water conveyance structures for agricultural irrigation, 2) provide a quantitative assessment of the habitat types and availability associated with water conveyance structures for fish and wildlife.

DESCRIPTION OF STUDY AREA

The Socorro Division of the MRGCD extends from San Acacia Diversion (located approximately 14 miles north of Socorro) to the northern boundary of Bosque del Apache National Wildlife Refuge. The Socorro Division includes approximately 300 miles of water conveyance structures that serve some 17,000 acres of farmland. Water conveyance structures, including the service roads adjacent to many structures, dominate terrestrial habitat of the conveyance structures, while aquatic forbs are present in some submerged areas of some conveyance structures. Irrigation *canals* are those structures used for delivering water to agricultural fields whereas irrigation *drains* are used to deliver and return water from agricultural fields to the river. In general, canals are intermittent because they contain water only during the irrigation season, March 1 to October 31. Drains are perennial to intermittent dependent on their proximity to the river. Some of the interior drains along the outer periphery of the valley have little or no water during the irrigation off-season whereas the riverside drains and more centrally-located interior drains have remained wetted over the past three years.

Specific sampling locations along the water conveyance system between the San Acacia Diversion and Bosque del Apache were selected by Dr. Cowley during the Spring of 2003. A total of 15 sampling locations were used for this habitat inventory. Ten sampling locations were located on drains while the other 5 sampling locations were located on canals.

METHODS

At each sampling location, two transects parallel to the drain or canal, were established. Each transect was 25 m in length and one was located on each side of the drain or canal. The parallel transects were used to inventory vegetation attributes *along* the drains and canals.

Two transects perpendicular to the drain or canal, were also established at each location. Each transect was 50 m in length and one was located on each side of the drain or canal. The perpendicular transects were used to inventory vegetation attributes and land uses *adjacent to* drains and canals.

During October 2003, a step-point survey was conducted at 1 m intervals on each of the parallel and perpendicular transects. Percent cover of ground vegetation, rock, bare ground, litter, and land uses (i.e., road, agriculture field, railroad tracks) was documented. The nearest-neighbor technique was used at each data collection point to document plant species composition. In addition, midstory and overstory vegetation, based on growth form and canopy potential, was documented at each sampling point. For the purpose of this study, willow (*Salix* spp.), salt cedar (*Tamarix* spp.), wolfberry (*Lycium* spp.), seep willow (*Baccharis* spp.) and four-wing saltbush (*Atriplex canescens*) were treated as midstory vegetation.

During October 2003, both drains and canals contained significant water and flow regimes, preventing safely inventorying aquatic vegetation. Therefore, aquatic vegetation is being complied in conjunction with sampling for fish and aquatic invertebrates as part of a different study.

RESULTS AND DISCUSSION

Vegetation Attributes of Water Conveyance Structures:

Vegetation (34%) and litter (42%) comprised the majority of ground cover along the water conveyance structures (both drains and canals) (Fig. 1). Bare ground accounted for 22% of the ground cover while rock made up only 2% of the total ground cover.

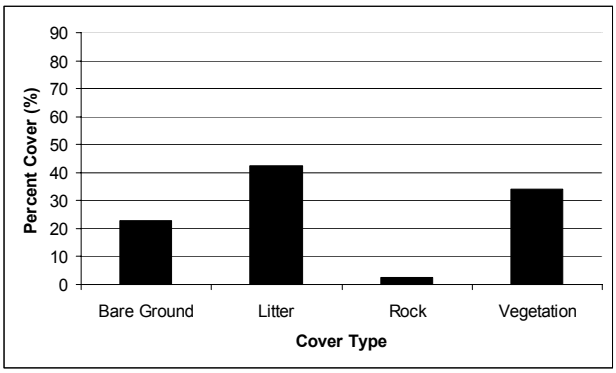

Figure 1. Ground cover along the water delivery systems between San Acacia Diversion and Bosque del Apache based on parallel transects.

Over 32 plant species were identified along the water conveyance structures. Willow (19%), Johnson grass (*Sorghum halepense*) (13%), saltgrass (*Distichlis spicata*) (9%), brome (*Bromus* spp.) (7%), and scratchgrass (*Muhlenbergia asperifolia*) (6%) were the dominant plant species (Figure 2).

Only 37% of the area sampled along the water conveyance structures had midstory canopy coverage. Midstory canopy vegetation was dominated by willow (60%) and salt cedar (19%). There was no overstory vegetation along either the drains or canals because of management practices (mowing and herbicide treatments) designed to prevent overstory vegetation from becoming established along the water conveyance systems.

Comparison of Vegetation Attributes Between Drains and Canals:

The percentage of vegetation along the drains and canals were similar (Table 1). However, differences were observed between drains and canals in percentages of litter and bare ground. The canals had a greater percentage of bare ground compared to the drains while the drains had a greater percentage of litter compared to the canals. A greater accumulation of litter along the drains is most likely associated with the greater midstory vegetation component observed along the drains compared to the canals (see below).

Table 1. Ground cover (%) along drains and canals between San Acacia Diversion and the Bosque del Apache.

	Drains	Canals
Bare Ground	18	32
Litter	49	29
Rock	1	5
Vegetation	32	38

Although the percentage of vegetation cover was similar between drains and canals, there were differences between dominant plant species. For example, the dominant plant species along the drains were willow (28%), saltgrass (13%), and brome (8%). Dominant plant species along the canals were Johnson grass (21%), bristle grass (*Setaria* spp.) (12%), Canadian wildrye (*Elymus canadensis*) (12%), and scratch grass (10%).

Differences in midstory vegetation composition were apparent between drains and canals. For example, 54% of the transects along the drains had midstory vegetal cover while only 4% of the transects along the canals had midstory vegetal cover (Fig. 2). Therefore, the canals were essentially void of any midstory cover. Willow and saltcedar were the dominant midstory vegetation species associated with the drains (accounted for 80% and 15% of the vegetation composition respectively). A much greater component of midstory vegetation along the drains compared to the canals may be because the drains are deeper than the canals, in closer proximity to the water table, and generally remain more mesic throughout the year compared to the canals.

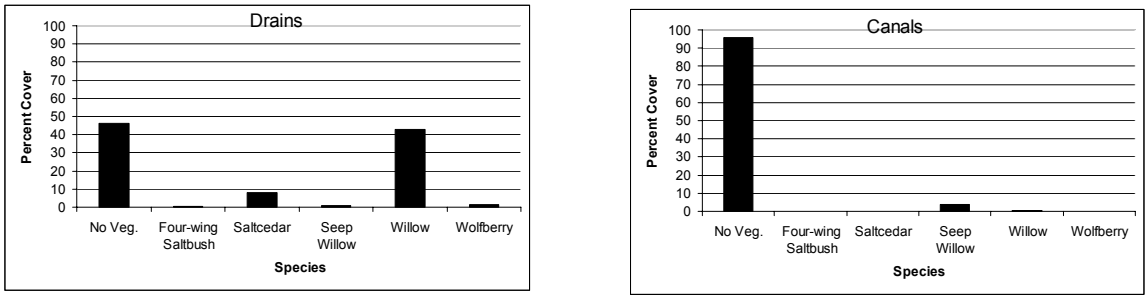

Figure 2. Midstory vegetation along the drains and canals between San Acacia Diversion and Bosque del Apache based on parallel transects [four-wing saltbush (*Atriplex canescens*), saltcedar (*Tamarix* spp.), seep willow (*Baccharis* spp.), willow (*Salix* spp.), wolfberry (*Lycium* spp.)].

Land Uses Adjacent to Drains and Canals:

Based on the perpendicular transects adjacent to the water conveyance systems between San Acacia Diversion and Bosque del Apache, roads and agricultural fields (46%) accounted for a relatively large percentage of the ground cover types (Fig. 3). The percentage of roads adjacent to drains (27%) and canals (26%) were similar (Fig. 4). However, there was approximately 7% more agricultural field component adjacent to canals compared to drains. The relatively large percentage of "other" adjacent to canals also was largely attributed to railroad beds.

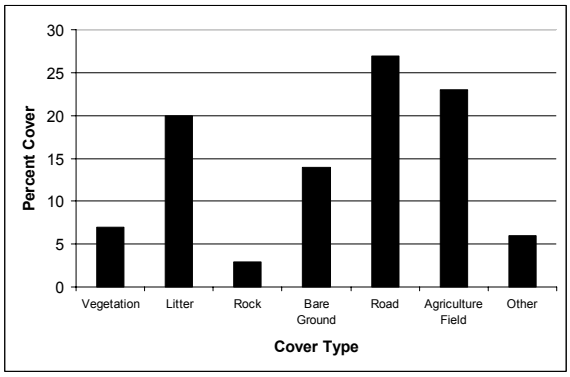

Figure 3. Ground cover (%) adjacent to drains and canals between San Acacia Diversion and Bosque del Apache based on perpendicular transects.

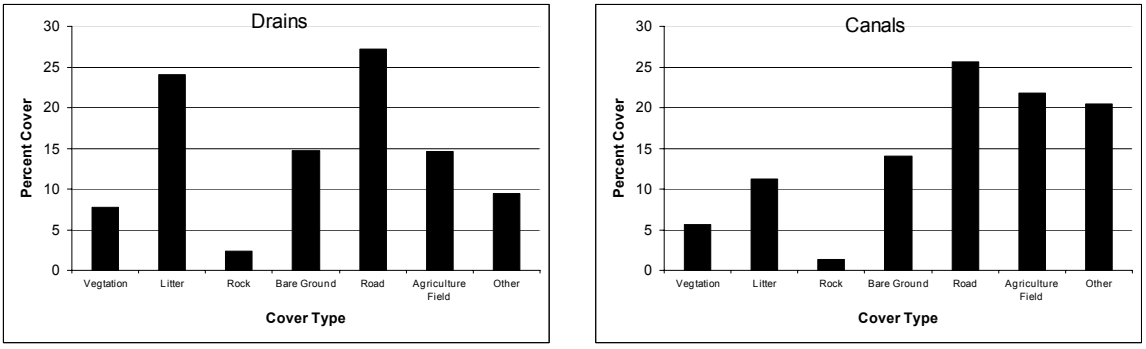

Figure 4. Ground cover (%) adjacent to the drains and canals between San Acacia Diversion and Bosque del Apache based on perpendicular transects.

Although there was no overstory vegetation adjacent to the drains or canals documented between the San Acacia Diversion and Bosque del Apache (based on parallel transects), approximately a 10% overstory vegetation component was found adjacent to the drains based on perpendicular transects (Fig. 5). Cottonwoods (*Populus* spp.) represented 60% of the vegetation overstory component while saltcedar represented 40% of the vegetation overstory component. Only a 2% overstory component was documented for the canals.

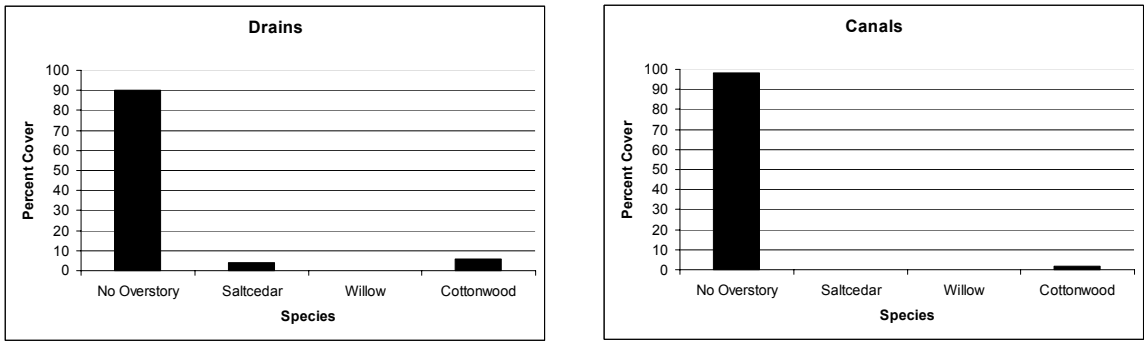

Figure 5. Overstory vegetation along the drains and canals between San Acacia Diversion and Bosque del Apache based on parallel transects.

MANAGEMENT IMPLICATIONS

Because of the midstory component, especially willow, drains have a greater potential to provide or contribute to fish and wildlife habitat than canals. Coupled with a greater overstory component, the habitat associated with drains provides more potential for management of sensitive species including the southwestern willow flycatcher than canals. However, for these habitats to become suitable for conservation efforts, especially in improving midstory and overstory vegetation, the flexibility and opportunities to alter some of the current maintenance practices (e.g. mowing and spraying) associated with the ditches should be explored.

With regards to aquatic wildlife, the perennial nature of the drains could potentially provide short-term refugia for native fishes and is currently being investigated under a different study. Before drains are used for listed species (e.g. Rio Grande silvery minnow or southwestern willow flycatcher) it would be advisable for the MRGCD to negotiate a Safe Harbor Agreement with the United States Fish and Wildlife Service. Safe Harbor Agreements are voluntary arrangements between the United States Fish and Wildlife Service and cooperating non-Federal landowners. The Agreements benefit endangered and threatened species while giving the landowners assurances from additional restrictions (see http://endangered.fws.gov/recovery/harborqa.pdf). Potential complications with managing for sensitive species include maintaining the water conveyance functions, controlling invasive species such as saltcedar and parrot feather (*Myriophyllum aquaticum*), and providing access for clearance of obstructions or repair of bank erosion.