Journal of Arid Environments 75 (2011) 1182–1190

Contents lists available at ScienceDirect

Journal of Arid Environments

journal homepage: www.elsevier.com/locate/jaridenv

Restoring habitat for riparian birds in the lower Colorado River watershed: An example from the Las Vegas Wash, Nevada

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ARTICLE INFO

Article history:
Received 23 August 2010
Received in revised form
18 April 2011
Accepted 22 June 2011
Available online 20 July 2011

Keywords:
Conservation
Invertebrates
Populus
Salix
Soil moisture
Tamarix

ABSTRACT

The success of riparian restoration projects in the arid southwestern U.S. is often measured in terms of vegetation characteristics such as growth, cover, and structure. Among low-elevation riverine environments within the Colorado River watershed, restoration is typically conducted to improve degraded habitats for birds of conservation concern by replacing the exotic tamarisk (*Tamarix ramosissima*) with native cottonwoods (*Populus* spp.) and willows (*Salix* spp.). The working assumption for many restoration practitioners is that replacing exotic plants with native plants will improve habitat quality and will, therefore, benefit birds. Based on data collected at exotic and restored (i.e., native) sites along the Las Vegas Wash, Nevada, not all birds benefit from restoration. Broad measures of community benefit, including benefits to birds of conservation concern and riparian obligate/dependent birds, were not detected. There were, however, some species-specific benefits. Some environmental variables that were associated with exotic and native sites were significant in explaining the composition of the bird community. For example, the richness of forbs and grass-like plants (a proxy of soil moisture), invertebrate mass, and percent shade (a proxy for canopy characteristics) were important. Considering our results and depending on restoration goals, tamarisk replacement projects may not inherently provide benefits to birds.

1. Introduction

Concerns with riparian restoration include whether restored environments result in net wildlife benefits and how these benefits are derived. Considering the example of birds in lowland riparian environments of the southwestern U.S., it is important that projects result in measurable benefits to wildlife because of the high cost of restoration (Zavaleta, 2000). Benefits from restoration, however, are unclear (Sogge et al., 2008) and without rigorous monitoring they may never be detected. Although many studies document that native vegetation may be more valuable than in-situ exotic vegetation (Anderson and Ohmart, 1977; Brand et al., 2008; Hunter et al., 1988; see Sogge et al., 2008), few restoration projects assess results of the replacement of exotic plants. To improve the practice of riparian restoration it is imperative that wildlife responses (positive and negative) are analyzed at these sites.

Controversy surrounds the value of riparian restoration for bird communities (Sogge et al., 2008) in association with tamarisk (*Tamarix ramosissima*) control. Recently, Shafroth et al. (2005) have asked whether the environment that occurs following tamarisk control and revegetation is any better for wildlife than the original tamarisk habitat. The impact of tamarisk on avian communities is especially unclear when it seems that even a small percentage (20–40% cover) of native trees and shrubs within the tamarisk landscape can have a large positive influence on avian species diversity and abundance (van Riper et al., 2008). Bird use of tamarisk depends upon stand structure (Brown and Trosset, 1989), flowering phenology (McGrath et al., 2008), and stopover ecology (Paxton et al., 2008). Walker (2006) proposes that more studies are needed at a variety of tamarisk vegetation types and Walker (2006) also suggests that bird use of tamarisk is highly variable and that presently little information exists to explain why.

Hinojosa-Huerta et al. (2008) found that different factors play a role when comparing the value for birds of exotic versus native vegetation in riparian areas, including vegetation biomass, structural habitat diversity, and presence of surface water. Some variables such as proximity to water, attractiveness to pollinating insects, and understory plant characteristics are mentioned in Sogge et al. (2008) and might not be expected to necessarily have greater values in revegetated sites. Overall, it appears that the

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0140-1963/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jaridenv.2011.06.017

response of avian assemblages to various riparian environments is dependent upon multiple factors at different spatial and temporal levels.

A major effort to restore and enhance ecological services in the Las Vegas Wash in Nevada has been underway since 2000. Because the channel is important to water resource infrastructure (i.e., flood conveyance, wastewater conveyance, etc.), the Southern Nevada Water Authority (SNWA) has been implementing enhancements on behalf of the 30-member Las Vegas Wash Coordination Committee stakeholder program (Las Vegas Wash Coordination Committee, 2010) to counteract past degradation. The Las Vegas Wash serves as the major surface water outlet for the Las Vegas Valley where population growth and increased water usage over the past five decades have dramatically increased water flow. Mean annual flows in the Las Vegas Wash doubled between 1990 and 2005. These increased daily flows, together with storm flows, caused erosion that led to an incised channel and disappearance of wetlands (Las Vegas Wash Coordination Committee, 2010). Stabilization of the channel bed has been taking place through constructed weirs, in conjunction with bank protection and revegetation. Revegetation with native plant species included structural dominants Fremont cottonwood (*Populus fremontii*) and willow (*Salix* spp.). In many cases vegetated sites were placed in areas where the terrain surface had been lowered and concrete or rock rubble structures had been placed in the channel to stabilize the riverine environment. The effect was to mimic a naturally functioning floodplain which provided the opportunity for occasional flooding. Historically the Las Vegas Wash was an intermittent stream that contained little mesic riparian woody vegetation (see Malmberg, 1965; Stave, 2001) and therefore the aim of "restoration" in this case is not directed to a pre-existing condition but rather toward what might be expected in a perennial stream in the region (Kloeppel et al., 2006).

The purpose of this study was to evaluate the success of recently completed restoration efforts (3–7 yr old) at the Las Vegas Wash by comparing breeding season bird assemblages found at non-manipulated exotic sites and at sites that were restored (manipulated) to more natural conditions (native sites). In particular we wanted to determine if restored riparian sites had higher diversity and abundance of birds, and identify differences at the community and species levels. We characterized environmental variables to help clarify expected differences in avian communities and we evaluated the consequences of restoration from a conservation perspective.

2. Materials and methods

2.1. Study area

Research took place along the Las Vegas Wash just east of Las Vegas, Nevada below 600 m a.s.l. (Fig. 1). The Las Vegas Wash is a perennial river consisting mostly of highly treated wastewater with lesser amounts of urban runoff and shallow groundwater. The general management goal for wildlife in the Las Vegas Wash is to enhance biodiversity services by providing best attainable conditions (Stoddard et al., 2006).

2.2. Study sites

We selected 10 sites to study in 2008 among 31 existing sites that were monitored for birds by Braden et al. (2009). Sites were selected to coincide with terrestrial invertebrate sampling sites. Of the 10 sites, half were exotic vegetation sites and half were native vegetation sites (Fig. 1; E = exotic, N = native). Exotic sites were dominated by tamarisk and common reed (*Phragmites australis;* invasive haplotype) whereas native sites were dominated by mixed

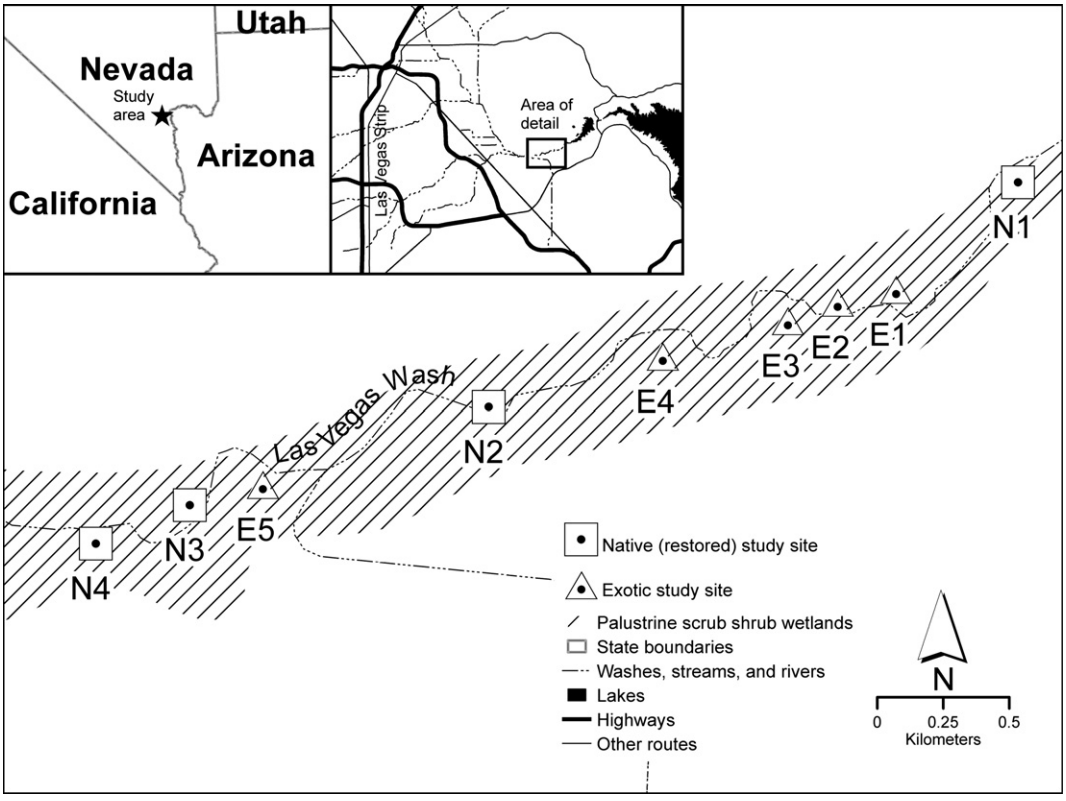

Fig. 1. Sites studied in 2008 for birds and environmental variables along Las Vegas Wash, NV USA. The Las Vegas Wash flows from left to right in the figure.