Am. Midl. Nat. (2013) 170:260–273

Restored Wetlands Can Support Mammalian Assemblages Comparable to Those in Nonmitigated Reference Wetlands

DAVID J. KURZ
Department of Ecology and Evolutionary Biology, Princeton University, Princeton, New Jersey 08544-2016

NICHOLAS A. MCGINTY
Department of Biology and Geology, Baldwin Wallace University, Berea, Ohio 44017-2016

SARAH A. STANKAVICH[1]
Department of Biology, University of Akron, Akron, Ohio 44325-3908

A. JUSTIN NOWAKOWSKI
Department of Biological Sciences, Florida International University, Miami 33199

AND

GREGORY A. SMITH[2]
Department of Biology, University of Akron, Akron, Ohio 44325-3908

ABSTRACT.—Restoration of wetland ecosystems has typically focused on hydrology, soil, and vegetation; taking an, ''If you build it, they will come'' strategy for the recovery of wetland fauna. We tested this assumption by quantifying mammal richness and abundance in recently restored and nonmitigated reference wetland habitats to determine if mammalian community composition varies with wetland condition. Our study consisted of live trapping and infrared photography at three restored and three reference (''natural'') wetland sites in Northeastern Ohio. After 3000 potential trap nights and 120 potential camera nights, we documented the presence of nine species and nearly 300 unique individuals in reference and restored wetlands. We found no significant differences in mammalian richness, abundance, or species composition between reference and restored wetlands; however, mammal abundance in terms of individual captures was 62% higher in restored wetland patches (n = 194) than in reference wetlands (n = 104). Restored wetlands – if managed correctly – can harbor mammalian communities as rich as those found in nonmitigated wetland habitats. Our results support the ''Field of Dreams'' hypothesis which suggests, among other things, that if the necessary physical conditions are present then desired fauna will subsequently colonize the patch. For small to midsized mammals in our study area, this appears to be the case.

INTRODUCTION

Wetlands are disappearing globally. Historic estimates have concluded wetland loss has been as high as 70% in western Australia (Halse, 1989), 53% in the United States (Dahl, 1990), and 90% in New Zealand. Worldwide, we have likely lost around 50% of wetlands (Mitsch and Gosselink, 2007). Although loss of freshwater wetlands in the United States has slowed over the past five years, vegetated wetlands have maintained a long term declining trend (Dahl, 2011). Gibbs (2000) showed increased human populations lead to severe decreases in wetland abundance and that all wetlands greater than one acre likely need protection to support wetland flora and fauna. Accordingly, wetland conservation has

[1] Present address: Department of Biology, Eastern Washington University, Cheney, WA 99004-2440
[2] Corresponding author: Telephone (330) 972-7501; e-mail: gasmith@uakron.edu

become a priority in recent years, with policies such as George H. W. Bush's "No-Net-Loss" generating interest in the political realm (Salzman and Ruhl, 2005). This environmental policy has led to controversy and discussion about the value of wetland mitigation. The success of mitigation banks has been widely debated due to both a variety of approaches to restoring wetlands as well as differing standards of what constitutes a "successful" restoration project (Maguire, 1985; Erwin, 1991; Mitsch and Wilson, 1996; Brown and Lant, 1999; Gwin *et al.*, 1999; Turner *et al.*, 2001). This debate is an important one, as restoration (*i.e.,* recreating what was once wetland habitat) efforts are frequently undertaken to maintain or increase the abundance of wetlands that can be deemed "successful" according to certain fundamental requirements [*e.g.,* a wetland that persists despite environmental variation (Palmer *et al.*, 1997)]. While some feel the self-design capacity of nature coupled with time should guide biodiversity in restored wetlands, others consider delineated ecosystem criteria to be critical to wetland restoration projects (Mitsch and Wilson, 1996; Mitsch *et al.*, 1998).

A typical set of criteria, as well as the mandated regulatory criteria, for wetland restoration includes the presence of necessary soil, vegetation, and hydrology. For example, the Ohio Environmental Protection Agency recognizes wetlands as undisturbed areas characterized by: wetland hydrology including saturation or flooding during the growing season, hydric soils with poor drainage and low oxygen levels, and hydrophytic vegetation (Ohio EPA, 2007). While there is no legal requirement for the presence or diversity of fauna, a guiding principle in this approach to restoration is the "Field of Dreams" hypothesis, which suggests that if the necessary physical conditions are present then the desired flora and fauna will subsequently colonize the patch (Palmer *et al.*, 1997). Unfortunately, this hypothesis is often assumed, yet rarely tested. Basic comparisons of plant, invertebrate, avian, and anuran communities between restored and reference wetlands are sometimes used as methods for assessing restoration efforts (Wissinger *et al.*, 2001; Seabloom and van der Valk, 2003; Balcombe *et al.*, 2005). Here we test the "Field of Dreams" hypothesis for small to midsized mammals.

Although few mammals could be considered wetland obligates, those that do occur in wetlands help shape wetland communities by consuming aquatic prey, serving as prey items for other vertebrates, enhancing soil turnover, and altering habitat used by other wetland fauna (National Resources Conservation Service, 2001). Also, some species of concern—such as the bobcat (*Lynx rufus*) (threatened in Ohio) and gray bat (*Myotis grisescens*) (federally endangered)—depend on wetlands during some portion of their life cycle, making wetland mammalian communities an important conservation concern. Many of the most common mammals inhabiting wetlands are habitat generalists (Francl *et al.*, 2004) and while there have been attempts to document mammal communities at restoration sites (Croonquist and Brooks, 1991; Wike *et al.*, 2000; Whitsitt and Tappe, 2009), studies comparing restored sites to nonmitigated wetlands in an attempt to quantify the role of mammals as bioindicators are limited. Here we test the hypothesis that mammals can be indicators of the return of a degraded wetland to a condition that promotes wetland flora and, therefore, wetland fauna. If mammals can be used as bioindicators in wetlands, then vertebrate communities in general, and mammalian assemblages in particular, could be important factors to consider in wetland management decisions, especially with regard to post restoration monitoring. We aimed to fill some of these gaps in wetland research by determining to what extent mammal species composition and abundance differ between restored and reference wetland sites. Our prediction was restored wetlands would support the "Field of Dreams" hypothesis and, as such, would harbor similar mammalian communities as reference wetlands, evidenced by comparable species assemblages and overall numbers of mammals in restored and reference sites. Our paired design allowed us to compare restored wetlands, sites that were engineered to replicate "natural" habitat conditions as closely as possible, to their nonmitigated counterparts, using mammalian communities as a measure of similarity.

METHODS

STUDY SITES AND FIELD METHODS

We trapped at six wetland sites (three restored wetlands and three reference sites), all located in Summit County, Ohio (Fig. 1). All six wetland sites consisted primarily of wet meadow habitat dominated by forbs, grasses, cattails, scattered bushes, and small trees. Each restored site was a mitigation wetland and was paired with a nonmitigated reference wetland located in the same watershed within 5 km straight-line distance. Two of our restored sites [Restored A (41°3′55.06″N, 81°36′36.05″W) and Restored B (41°4′17.60″N, 81°36′27.22″W)] were located in Copley, Ohio; on the 42.5 ha Panzner Wetland Wildlife Reserve, a wetland mitigation bank in the Tuscarawas River Watershed, a sub-basin of the Ohio River. Restored A and Restored B were separated into different mitigation units and were constructed at different times. Before restoration, the sites were farmed for roughly 60 y, until 2000 (S. Panzner, pers. comm.). These restoration projects are located on what was originally forested peatland; today the soils in this area are classified as Carlisle muck and Olmstead loam soils, containing thick (>1 m) peat deposits (Hausman *et al.*, 2007). The vegetation within Restored A was composed of >90% wetland species dominated by (>65% coverage) cattail (*Typha sp.*), goldenrod (*Solidago sp.*) purpleleaf willowherb (*Epilobium coloratum*), rice cutgrass (*Leersia oryzoides*), and arrowleaf tearthumb (*Polygonum sagittatum*) (Davey Resource Group, 2008). Restored B contained >75% wetland vegetation at the time of this study, dominated by (>65% coverage) goldenrod, common rush (*Juncus effusus*), cattail, calico aster (*Aster lateriflorus*), woolgrass (*Scirpus cyperinus*), peachleaf willow (*Salix amygdaloides*), and eastern cottonwood (*Populus deltoides*) (Davey Resource Group, 2007). Restored B was the only restored site that flooded during our study. The third restored site [Restored C (41°19′26.13″N, 81°23′51.73″W)] is a mitigation project located in Liberty Park, Metro Parks Serving Summit County, Twinsburg, Ohio; part of the Cuyahoga River Watershed, a sub-basin of Lake Erie. As with the other two restored sites, Restored C represents an early successional emergent marsh dominated (>65% coverage) by rice cutgrass, common rush, and swamp smartweed (*Polygonum hydropiperoides*) (H. Garris, pers. comm.). Mean size of restored wetlands was 19.9 ha.

Reference sites were intended to represent "natural" wetlands and were defined as wetland areas that: (1) were not mitigation sites or restorations of any kind, (2) receive no current active management (plowing, seeding, spraying, water control, etc.), (3) were located within the same watershed, and within 5 km, of a restored site, (4) were large enough to contain five trapping stations with 50 m buffers to the site edge, and (5) were qualitatively assessed to be representative of nonmitigated wetlands in the region. The first reference site [Reference A (41°3′57.87″N, 81°36′54.67″W); note that Reference A was paired with Restoration A] was a private property holding that was essentially a large clearing in a forested wetland. As such, this site was the only one of the six wetland locations that was completely encircled by trees. Reference A was located 0.5 km from Restoration A, center-to-center. Reference B (41°5′2.39″N, 81°39′57.93″W) was a holding of the City of Barberton, Ohio used for flood control around the Barberton Reservoir. This was the smallest of the reference sites, nearly encircled by trees, dominated (>65% coverage) by cattail and reed

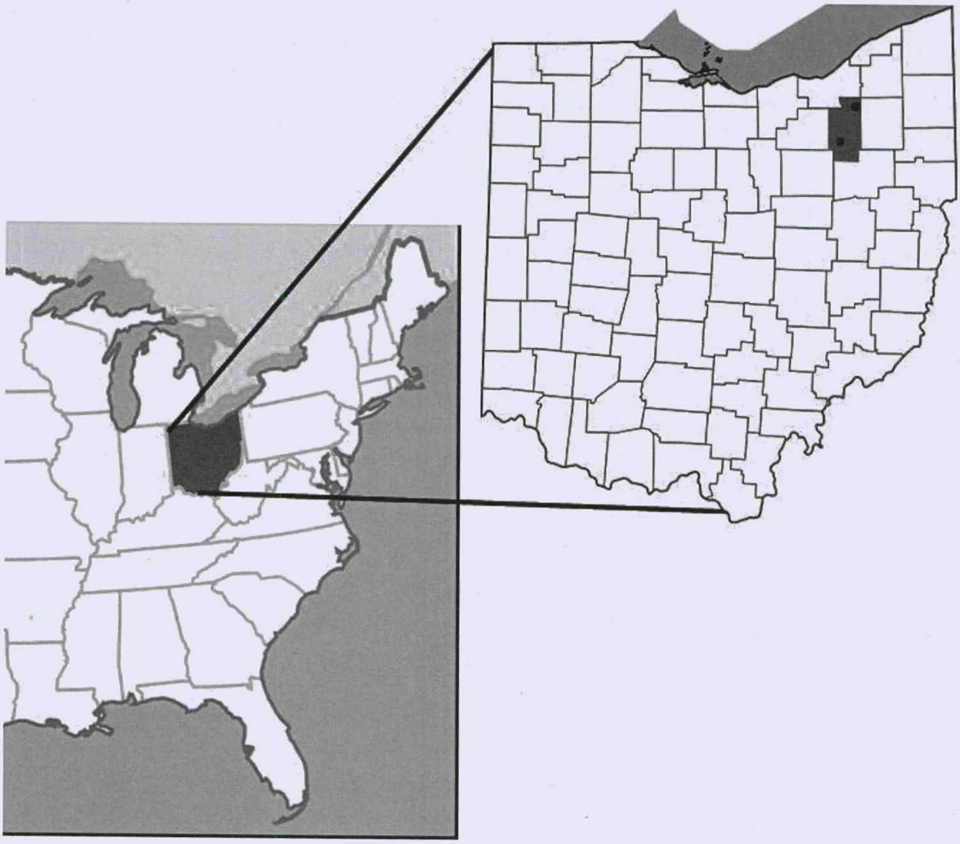

FIG. 1.—Location of sampling sites in Summit County, Ohio, Jun.–Aug. 2009. Dots indicate two clusters of field sites. Restored A (41°3′55.06″N, 81°36′36.05″W) and Reference A (41°3′57.87″N, 81°36′54.67″W) as well as Restored B (41°4′17.60″N, 81°36′27.22″W) and Reference B (41°5′2.39″N, 81°39′57.93″W) were located in the southern cluster, whereas Restored C (41°19′26.13″N, 81°23′51.73″W) and Reference C (41°18′30.22″N, 81°23′33.60″W) were located in the northern cluster

canary grass (*Phalaris arundinacea*), and located 5.0 km from Restoration B. Reference C (41°18′30.22″N, 81°23′33.60″W) was located in the same park property as Restoration C. Reference C was a beaver marsh and the only one of the six sites that contained open water at the time of this research. It was also the only reference location that flooded during the course of our work. Reference C was a near monoculture of goldenrod, located 1.7 km from Restoration C. Mean size of reference wetlands was 7.6 ha. All trapping, photography, and observation took place from Jun.–Aug. of 2009. We installed five trap stations and one infrared camera at each study wetland. Trap stations were spaced approximately every 50 m along a transect perpendicular to the nearest edge of the wetland. At every trap station, we set one chipmunk-sized Tomahawk live-trap (12.7 × 12.7 × 40.8 cm; Tomahawk Live Trap, Tomahawk, Wisconsin), one extra-large Sherman live-trap (10.2 × 11.4 × 38.1 cm; H.B. Sherman Traps, Tallahassee, Florida) and three large Sherman live-traps (7.6 × 7.6 ×

22.9 cm; H.B. Sherman Traps, Tallahassee, Florida). The Tomahawk trap occupied the center of each station and was surrounded by the Sherman traps placed 5 m away to the north, south, east, and west of the center. All traps were placed at the same elevation. For bait, we used pink salmon (Tomahawks only), peanut butter and oats, scratch grain, and sliced apples. Cameras were set up in small clearings, where we attracted mammals using beef cubes in addition to the standard bait mixture. We set up cameras for the duration of each trap session and checked and maintained them as needed.

We ran a total of four 10 d trap sessions. Due to the logistics of reaching all six sites in a reasonable amount of time for releasing captured individuals, we did not trap all sites in each session. We trapped three of the six sites per trap session. We alternated the sites we trapped in each session, trapping three sites per session so that each site was sampled twice, in order to minimize the stochastic effects of weather and vegetative growth on trapping. Within a session, all traps were checked and rebaited daily. Small mammals of manageable size (*e.g.*, mice, voles, shrews) were marked (by toe clipping), weighed, sexed, and released. Larger captures (*e.g.*, weasels, skunks) were either marked with an ear tag or photographed and released. Animal handling protocols followed American Society of Mammalogists guidelines (Sikes *et al.*, 2011) and were approved by the University of Akron Institutional Animal Care and Use Committee (#09-3C). Across all sites and trap sessions, we conducted trapping over 40 n, totaling 3000 potential trap nights and 120 potential camera nights.

ABUNDANCE

We calculated relative abundance of each mammal species by dividing the total number of unique individuals by the number of functional trap nights (Lomolino and Smith, 2003). We determined the number of functional trap nights by starting with total potential trap nights and subtracting: 1.0 for nonfunctional traps (*i.e.*, those that jammed or did not close properly), or 0.5 for those traps that, at the end of the night, were disturbed, closed and empty, contained a recaptured individual, or contained a nonmammal (Songer *et al.*, 1997; Beauvais and Buskirk, 1999).

VEGETATION

During each session, we measured the vegetative structure (within height categories) and general composition (percent cover of general vegetation type) surrounding each trap station. We used a point count method along a 10 m transect from the center of the trapping station. A 10 m rope, knotted at 1 m intervals, was laid over the vegetation from the center trap at each station. At each knot, we recorded vegetation height ($<$10 cm; 11–25 cm; 26–50 cm; 51–75 cm; 76–100 cm; $>$100 cm) and vegetation type (grass, forb, soil, shrub, litter, water, rock, cattail or other). Point counts were conducted in each of the four cardinal directions and combined to produce a percent cover of each vegetation type and height category.

STATISTICAL ANALYSIS

For all analyses of species composition we used the Bray-Curtis similarity metric (1 – dissimilarity) calculated between pairs of wetlands. Before calculation of Bray-Curtis similarity metrics, we applied square-root and presence-absence transformations to the species-abundance matrix. To visualize rank-similarity in species composition between restored and reference wetland sites, we used Primer-E v.6 to make a nonmetric multidimensional scaling plot (NMDS) based on the pairwise similarity matrix (Clarke and Warwick, 2001). We overlaid NMDS plots with a cluster analysis in which unweighted group-averaging linkage rules were used to determine the distances between clusters by calculating the average distances between all pairs of sites in each cluster. One way Analysis

TABLE 1.—Site summary for three restored wetlands and three reference sites in Summit County, Ohio. Sites were sampled for small mammals, Jun.–Aug., 2009. Locations are given to the approximate center of the wetland patch, through which the trapping transect was established. Watershed is the name associated with the eight digit Hydrologic Unit Code (HUC). Age refers to time post restoration. Since reference sites were not restored, they do not have ages. Functional trap nights are total potential trap nights minus a trap night correction (see Methods). Potential trap nights was 500 per site

Site	Location	HUC-8 watershed	Size (ha)	Age (years)	Elevation (m)	Functional trap nights
Restored A	41°3′55.06″N 81°36′36.05″W	Tuscarawas	25.1	6	295	432.5
Restored B	41°4′17.60″N 81°36′27.22″W	Tuscarawas	4.6	7	294	419.5
Restored C	41°19′26.13″N 81°23′51.73″W	Cuyahoga	30.0	5	303	453.0
Reference A	41°3′57.87″N 81°36′54.67″W	Tuscarawas	5.8	—	297	376.5
Reference B	41°5′2.39″N 81°39′57.93″W	Tuscarawas	5.3	—	304	408.0
Reference C	41°18′30.22″N 81°23′33.60″W	Cuyahoga	11.8	—	303	355.0

of Similarity (ANOSIM) was used to evaluate the null hypothesis of no statistical difference in community similarities between reference and restored wetlands (Clarke and Warwick, 1994). We performed this analysis on the square root transformed matrix and significance level was obtained through random permutation of the similarity matrix. Species dominance was compared between reference and restored wetlands using rank abundance plots (Magurran, 2004).

We compared total unique captures and species richness between wetland condition (mitigated and nonmitigated) and the two trapping sessions using an Analysis of Variance (ANOVA). The number of unique captures and number of species observed between two separate capture instances were treated as repeated measures for each wetland site. We performed ANOVAs using SPSS version 16.

To compare vegetation structure between wetland conditions, we used a one way ANOSIM. We also analyzed the relationship between vegetation variables and species composition, small mammal captures, and small mammal abundance. We used a Mantel test to evaluate the relationship between the community similarity matrix and a similarity matrix of vegetation variables, in which values were calculated as Euclidean distances. Matrices were randomized 999 times to obtain an approximate p-value. To construct the vegetation matrix, we selected a subset of vegetation variables using the BVSTEP routine, which is analogous to stepwise variable selection in multiple linear regression analysis in Primer-E (Clarke and Warwick, 2001). To examine correlations between species richness, capture numbers, vegetation variables, and wetland size across sites, we used nonparametric Spearman's rank correlation coefficients.

RESULTS

During 2444.5 functional trap nights (Nelson and Clark, 1973; Table 1) we made 481 individual captures and documented 298 unique individuals from nine mammalian species

TABLE 2.—Summary of unique live-captures for mammal species by wetland condition in Summit County, Ohio, Jun.–Aug. 2009. Species are listed alphabetically. Trap nights associated with each wetland location are given in Table 1. For overall species richness, including camera results, see Fig. 4

Species	Restored A	Restored B	Restored C	Total restored	Reference A	Reference B	Reference C	Total reference
Blarina brevicauda	3	5	0	8	10	0	2	12
Didelphis virginiana	3	1	0	4	0	0	1	1
Marmota monax	0	0	0	0	1	0	0	1
Mephitis mephitis	1	0	4	5	0	0	0	0
Microtus pennsylvanicus	81	41	49	171	29	37	15	81
Mustela frenata	0	1	0	1	1	0	0	1
Neovison vison	0	2	0	2	0	0	0	0
Peromyscus leucopus	3	0	0	3	4	0	2	6
Procyon lotor	0	0	0	0	0	1	1	2
Total Captures	91	50	53	194	45	38	21	104

(Table 2). Although the results from camera stations did not add new species to our list, it did add an additional species to a site where it was not trapped. Within the trapping component of the study, species richness varied within the study areas, ranging from two to six species per site. There was no significant difference in species richness between capture sessions ($F = 0.643$, $df = 1$, $P = 0.468$) or wetland condition ($F = 0.237$, $df = 1$, $P = 0.652$). Species composition did not differ between restored and reference wetland sites (ANOSIM $R = 0.074$, $P = 0.60$; Fig. 2). Species richness was not correlated with wetland size (Spearman Correlation Coefficient $= -0.525$, $P = 0.297$; Fig. 3). Likewise, species richness did not differ between restored and reference wetlands when all sites in each category were combined (Fig. 4). However, species composition (species lists) was not uniform across all sites (see Table 2 and Fig. 5).

We trapped 86% more individuals on restored sites than on reference sites. However, trap disturbance occurred much more frequently in reference wetlands, probably due to interference by larger mammals such as raccoons and skunks as well as a flooding event at one reference site (Reference C), resulting in more lost trap nights (average trap night correction was 65.0 and 120.2 for restored and reference sites, respectively; Table 1). The corrected abundance in terms of unique individuals per trap night lessens the disparity in abundance but restored patches still had 62% more unique captures of mammals than reference patches. However, total capture numbers (grand total of mammal captures regardless of uniqueness) did not differ significantly between restored and reference wetlands ($F = 4.002$, $df = 1$, $P = 0.116$). There was also no significant effect of capture session on total capture numbers ($F = 0.307$, $df = 1$, $P = 0.609$).

Vegetation structure, quantified by height category and coverage of general vegetation types (Table 3), did not differ significantly between restored and reference wetlands (ANOSIM $R = -0.037$, $P = 0.50$). However, percent cover of grass, shrubs, and "other" vegetation were selected by the BVSTEP procedure and these variables combined as Euclidean distances were significantly correlated with community similarity across all sites (Mantel $r = -0.434$, $P = 0.032$). Simple nonparametric correlations suggest that percent cover of grass and shrubs may be an important predictor of mammal species richness, and the amount of standing water and vegetation height influence overall abundance (Table 3).

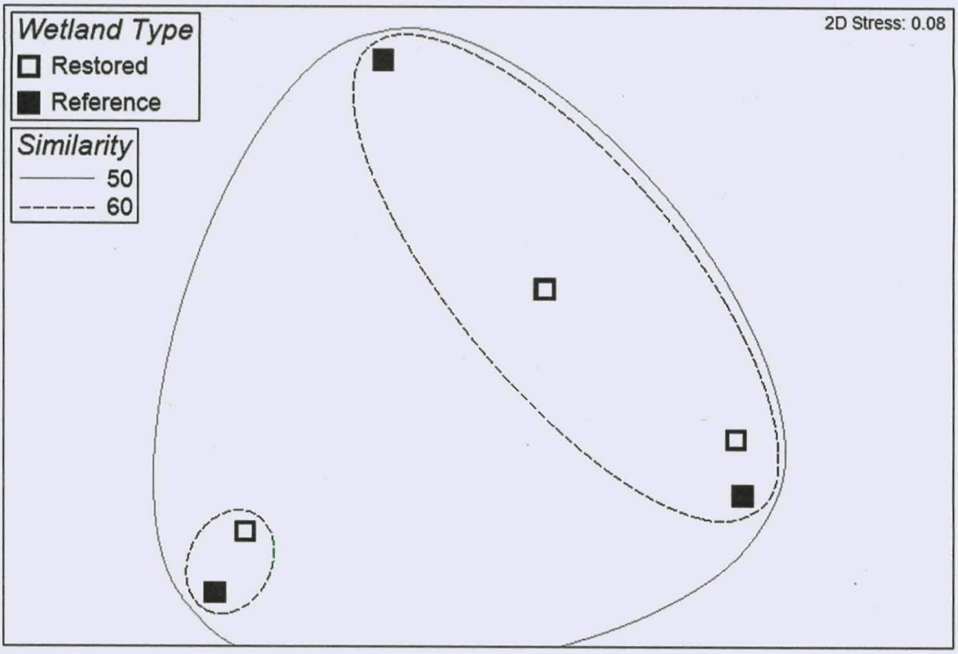

FIG. 2.—Nonmetric multidimensional scaling plot showing rank similarity among pairs of restored and reference wetlands based on the Bray-Curtis community similarity (1 – dissimilarity) metric. Bray-Curtis similarity was calculated from square root transformed species abundances. Groups are defined by group average cluster analysis

DISCUSSION

We found that restored sites compared favorably with reference counterparts in terms of mammalian richness and abundance. Although recreated wetland environments—especially mitigation banks—do not always succeed (Maguire, 1985; Erwin, 1991), our results indicate that well-designed, well-maintained restoration areas may constitute a viable solution to at least some of the ecological problems caused by disappearing wetlands. Our findings may provide the basis for future evaluation of wetland restoration, especially post restoration monitoring, that complements the near-exclusive attention given to vegetation in the field of wetland restoration science (Shisler, 1989).

Because our sites consisted of relatively small wetland fragments (≤30 ha), our trapping provided an interesting opportunity to evaluate mammalian biodiversity in small wetlands. That we were able to record the presence of nine mammal species in just one summer of sampling demonstrates small wetland habitats can be home to diverse mammalian communities. Positive correlations between wetland size and species richness are well documented (Findlay and Houlahan, 1997; Francl *et al.*, 2004) and point to the importance of large wetland reserves. Our data did not show this positive relationship between patch size and richness, perhaps because our sites were below the size threshold for which pattern detection would be possible by traditional models (semilog or log-log; Lomolino and Weiser, 2001). Nevertheless, our data corroborate many other findings that have pointed to the ecological significance of small wetlands as habitat for vertebrates (Gibbs, 1993;

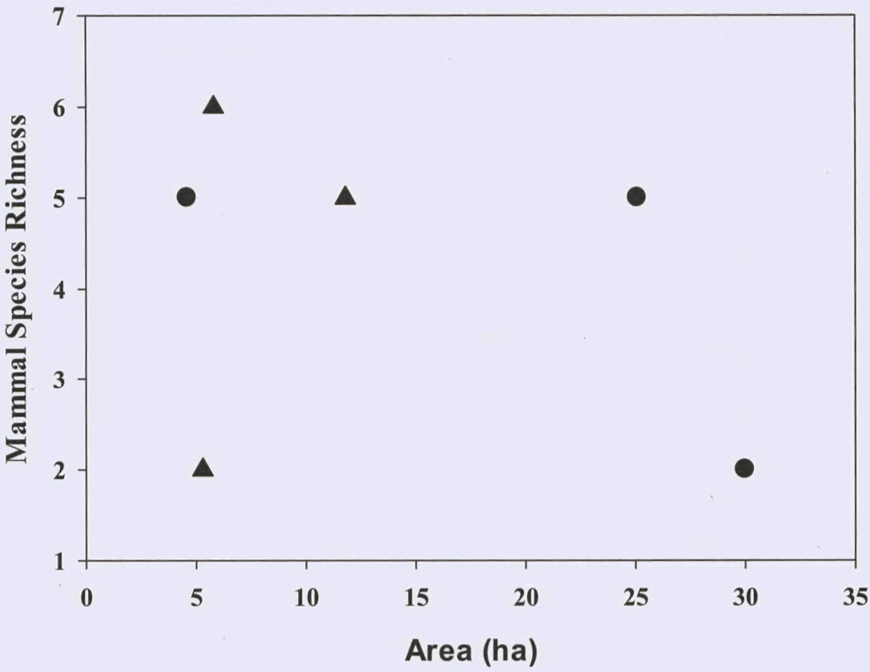

FIG. 3.—Mammal species richness as a function of area for three restored wetland sites and three reference wetlands in Summit County, Ohio, Jun.–Aug. 2009. Restored wetlands are indicated by circles, reference wetlands are indicated by triangles. The relationship is not significant (Spearman Correlation Coefficient = −0.525, P = 0.297)

Semlitsch and Bodie, 1998; Snodgrass *et al.*, 2000; Stevens *et al.*, 2002; Stevens *et al.*, 2003). In fact, Gibbs (1993) conducted simulations of small wetland loss and found that local populations of small mammals and other vertebrates, stable under conditions of no habitat loss, faced a significantly increased risk of extinction (P >5% for all taxa and 15% for small mammals) after the loss of small wetlands in their habitat. Furthermore, evidence that flexible habitat requirements of mammals may allow them to be somewhat resilient to human impacts in wetland areas (Croonquist and Brooks, 1991) suggests that mammals are often well-suited to inhabit small, restored wetland areas.

Whereas richness did not differ significantly between restored and reference wetlands, rank abundance curves suggest that species dominance may differ with wetland condition (Fig. 5). Most notably, striped skunk (*Mephitis mephitis*), the third most abundant species in restored wetlands, was undetected in reference wetlands. This observation may reflect a difference in habitat quality between restored and reference sites for this particular species that was not reflected by our vegetation data. Alternatively, this could be explained by the limited sample size of our study or differences in the effectiveness of detection of *M. mephitis* between restored and reference wetlands. Our results suggest that percent cover of certain vegetation types and structure may be important determinants of mammal richness, overall abundance, and species composition. A more likely explanation for rank-abundance differences as a function of wetland condition is the dominance of the meadow vole (*Microtus pennsylvanicus*) in our data. Our communities were uneven in that meadow voles

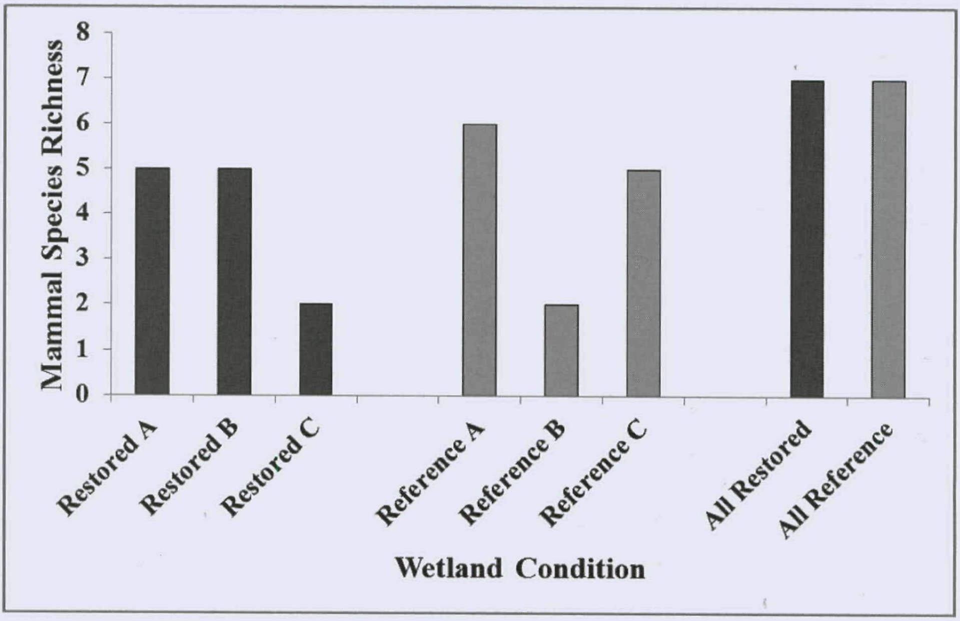

FIG. 4.—Comparison of mammal species richness between reference and restored wetland sites in Summit County, Ohio, Jun.–Aug. 2009. Data include all species from Table 2 as well as an additional species (opossum) for Reference A recorded from camera traps

alone accounted for 84.6% of unique captures for all sites combined (88.1% for restored sites and 77.9% for reference sites). The rank abundace plots are useful in that they demonstrate differences in species composition even though richness was the same. The magnitude of the differences is probably somewhat magnified by the dominance of a single species.

Although not all mammals depend heavily on wetland habitat (Mitchell *et al.*, 1997), if mammals, in general, are able to thrive in restored wetland settings, then restoration can still represent a boon both for mammal populations as well as the healthy functioning of the entire ecosystem (Preston, 1990; Carey and Johnson, 1995). Even isolated wetland patches seem to be valuable for mammalian communities. Of our six sites, five were bordered or surrounded by woodland (and thus disconnected from other wetland areas), and we trapped and observed several types of mammals typically associated with a forest environment—*Procyon lotor* (raccoon), *Didelphis virginiana* (opossums), and *Peromyscus leucopus* (white-footed mice) were all recorded multiple times.

The proximity of forest matrix to many of our wetland sites and the presence of mammals that seemed to use—at least as a corridor if not primary habitat—both forested and wetland areas raises the possibility of protected, mixed habitats to support mammal conservation. In areas where mammal richness in wetlands is positively correlated with the proportion of nearby forest cover, reserve designers should ensure the presence of forested areas that complement protected wetlands and benefit wetland associated mammal species (Findlay and Houlahan, 1997). For instance, the establishment of woodland corridors that connect

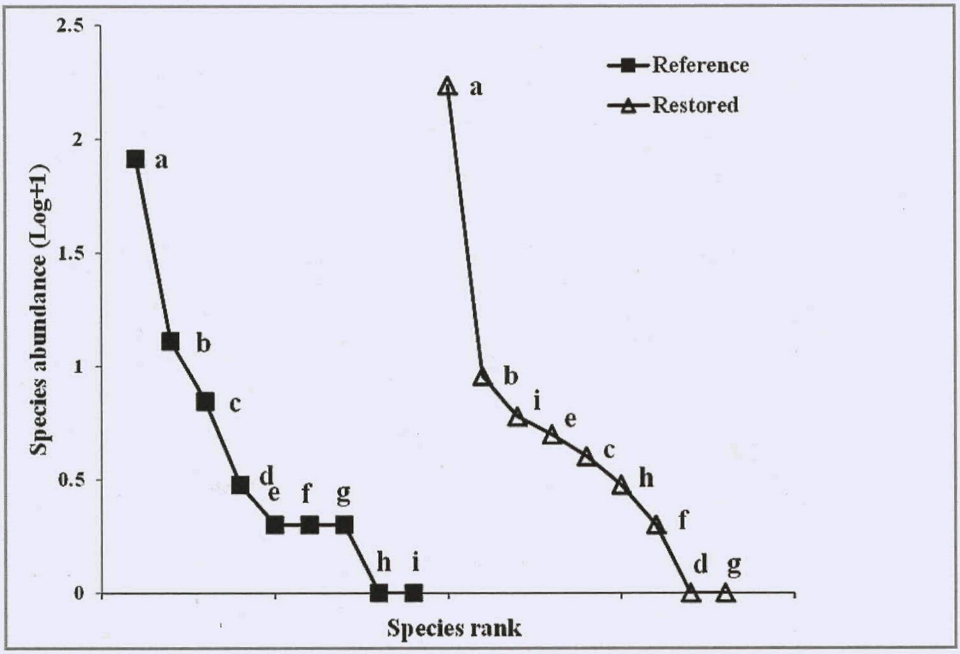

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FIG. 5.—Rank-abundance curves for species captured in traps within reference and restored wetlands, sampled in Summit County Ohio, Jun.–Aug. 2009. Lower-case letters represent species: **(A)** *Microtus pennsylvanicus*; **(B)** *Blarina brevicauda;* **(C)** *Peromyscus leucopus*; **(D)** *Procyon lotor*; **(E)** *Didelphis virginiana*; **(F)** *Mustela frenata*; **(G)** *Marmota monax*; **(H)** *Neovison vison*; **(I)** *Mephitis mephitis*

wetland patches could allow for larger areas of unbroken mammalian habitat (Gibbons, 2003). Regardless of the specific habitat strategy, establishment of a diverse matrix of habitat types would seem to be a reasonable approach for the maintenance of biodiversity. There are indications that heterogenous vegetative structure and spatial characteristics at the lanscape level benefit small mammals (Carey and Wilson, 2001; Moro and Gadal, 2007). The presence of wetland patches that add to the habitat options available within the larger landscape could therefore benefit small mammal communities. Notwithstanding future applications, our results suggest that restored wetlands can have value beyond the legal requirements for mitigation; these restoration projects can also aid the reestablishment of wetland faunas. For mammals in our study area, the ''Field of Dreams'' hypothesis seems to apply.

Acknowledgments.—We would like to thank Steve and Jerry Panzner of the Panzner Wetland Wildlife Reserve (PWWR), Daniel Dempsey, Metro Parks Serving Summit County, and the City of Barberton for permission to use sites. Support was provided by the National Science Foundation's Research Experiences for Undergraduates (REU) program (DBI-0851782) and the Choose Ohio First Tiered Mentoring Program between the University of Akron and Baldwin Wallace University. Heath Garris helped with site descriptions. Brett DeGregorio and three anonymous reviewers provided valuable feedback on a draft of the manuscript. This is publication #32 in the University of Akron Field Station Series.

TABLE 3.—Correlation matrix showing Spearman rank correlation coefficients and significance values based on two-tailed tests for pairs of variables. ''Captures'' refers to the number of individuals recorded during the trapping component of the study. The categories <10, 26–50, etc., refer to percent cover of vegetation within a height category and of a certain vegetation type

	<10	10–25	26–50	51–75	76–100	>100	Grass	Forb	Soil	Shrub	Litter	Water	Cattail	Other
Species														
Spearman's rho	0.621	0.210	−0.207	−0.315	−0.414	0.000	−0.828	0.000	0.671	0.828	0.414	0.105	0.000	0.490
P	0.188	0.690	0.694	0.543	0.414	1.000	**0.042***	1.000	0.145	**0.042***	0.414	0.843	1.000	0.324
Captures														
Spearman's rho	0.086	0.464	0.600	0.058	−0.829	−0.600	0.029	0.086	0.123	−0.314	0.257	−0.928	0.257	−0.676
P	0.872	0.354	0.208	0.913	**0.042***	0.208	0.957	0.872	0.816	0.544	0.623	**0.008****	0.623	0.140

* Significant at $\alpha = 0.05$ for individual tests

** Significant after Bonferroni correction

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SUBMITTED 27 FEBRUARY 2012 ACCEPTED 27 FEBRUARY 2013