Appendix A – Blocked Indicator Species Analysis for 30 species. * denotes no data, bold numbers denote significance (α = 0.05). Functional groups are Sh = shrubland specialist, G = grassland specialist, GF = grassland facultative.

| | Functional | Species | Relative abundance | | Relative frequency | | Maximum IndVal | | p | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2010 | 2011 | 2010 | 2011 | 2010 | 2011 | 2010 | 2011 |
| Shrubland | GF | American Kestrel (*Falco spavarius*) | 50 | * | 13 | * | 6.2 | * | 1 | * |
| Reference | Sh | Black-chinned Hummingbird (*Archilochus alexandri*) | * | 75 | * | 19 | * | 14 | * | 0.4979 |
| | Sh | Black-tailed Gnatcatcher (*Polioptila caerulea*) | 100 | 94 | 38 | 33 | 38 | 31 | **0.0318** | **0.0146** |
| | Sh | Black-throated Sparrow (*Amphispiza bilineata*) | 51 | 53 | 100 | 100 | 51 | 53 | 0.5671 | 0.243 |
| | Sh | Brown-headed Cowbird (*Molothrus ater*) | 62 | 67 | 31 | 48 | 19 | 32 | 0.6005 | 0.144 |
| | Sh | Blue Grosbeak (*Passerina caerulea*) | 65 | 56 | 69 | 29 | 45 | 16 | 0.2194 | 0.8432 |
| | Sh | Common Nighthawk (*Chordeiles minor*) | 71 | 56 | 50 | 29 | 36 | 16 | 0.135 | 0.6891 |
| | Sh | Greater Roadrunner (*Geococcyx californianus*) | 44 | 100 | 13 | 14 | 5 | 14 | 1 | 0.2515 |
| | Sh | House Finch (*Carpodacus mexicanus*) | * | 65 | * | 24 | * | 16 | * | 0.4561 |
| | Sh | Scott's Oriole (*Icterus parisorum*) | 56 | 59 | 31 | 43 | 18 | 25 | 0.7411 | 0.4079 |
| | Sh | Verdin (*Auriparus flaviceps*) | * | 58 | * | 29 | * | 17 | * | 0.6157 |
| | Sh | Lesser Nighthawk (*Chordleiles acutipennis*) | 50 | * | 25 | * | 13 | * | 1 | * |
| | Sh | Rufous-crowned Sparrow (*Aimophila ruficeps*) | 65 | * | 31 | * | 20 | * | 0.4997 | * |
| | Sh | Grey Flycatcher (*Empidonax wrightii*) | * | 67 | * | 10 | * | 6.3 | * | 1 |
| | Other | Barn Swallow (*Hirundo rustica*) | * | 50 | * | 14 | * | 7.1 | * | 1 |
| Treatment | Sh | Ash-Throated Flycatcher (*Myiarchus cinerascens*) | 45 | 52 | 78 | 71 | 39 | 37 | * | 0.6891 |
| | Sh | Cactus Wren (*Campylorhynchus brunneicapillus*) | 63 | 64 | 81 | 43 | 51 | 27 | 0.1376 | 0.2617 |
| | G | Cassin's Sparrow (*Peucaea cassinii*) | 87 | 75 | 81 | 48 | 71 | 36 | **0.0026** | 0.095 |
| | Sh | Curve-billed Thrasher (*Toxostoma curvirostre*) | * | 75 | * | 14 | * | 11 | * | 0.5021 |
| | Sh | Chihuahuan Raven (*Corvus cryptoleucus*) | 55 | 52 | 56 | 52 | 31 | 27 | 0.7506 | 0.9144 |
| | G | Eastern Meadowlark (*Sturnella magna*) | 89 | 81 | 44 | 29 | 39 | 23 | **0.016** | 0.1208 |
| | G | Horned Lark (*Eremophila alpestris*) | 75 | 73 | 38 | 19 | 28 | 14 | 0.2873 | 0.3767 |
| | Sh | Loggerhead Shrike (*Lanius ludovicianus*) | 80 | 69 | 56 | 29 | 45 | 20 | **0.0396** | 0.4553 |
| | Sh | Mourning Dove (*Zenaida aurita*) | 56 | 56 | 81 | 48 | 46 | 24 | 0.6473 | 0.8326 |
| | Sh | Northern Mockingbird (*Mimus polyglottos*) | 58 | 59 | 100 | 71 | 58 | 42 | 0.1202 | 0.3035 |
| | GF | Scaled Quail (*Callipepla squamata*) | 86 | 70 | 100 | 48 | 86 | 33 | **0.0004** | 0.1492 |
| | G | Swainson's Hawk (*Buteo swainsoni*) | 65 | 53 | 63 | 38 | 40 | 20 | 0.2771 | 1 |
| | Other | Violet-green Swallow (*Tachycineta thalassina*) | 50 | 67 | 6 | 19 | 3.1 | 13 | 1 | 0.6323 |
| | Sh | Western Kingbird (*Tyrannus verticalis*) | 70 | 61 | 81 | 71 | 57 | 43 | **0.0386** | 0.2849 |
| | Sh | Canyon Towhee (*Pipilo fuscus*) | * | 67 | * | 10 | * | 6.3 | * | 1 |

Appendix B – HyperNiche™ analysis details

      To explore responses of focal bird species to environmental gradients, we applied non-metric multiplicative regression (NMPR) using HyperNiche™ v2.0 (McCune and Mefford 2011b). Probability of occurrence was estimated from presence-absence data for the selected bird species, and then modeled against four environmental gradients: grass, shrub, basal cover, and open ground cover. NMPR uses a local multiplicative smoothing function with leave-one-out cross validation to estimate probability of occurrence. We used a Gaussian weighting function with a local mean estimator in a forward stepwise regression of probability of occurrence with respect to environmental gradients. A log-likelihood ratio ($\log B$) is applied in the sense of "weight of evidence" to describe the strength of relationships in the model (for computational details see McCune and Mefford 2011b). To deem the addition of variables to the model worthwhile, the increase of $\log B$ must be larger than 1.0. The tolerance ($s$) or standard deviation of the Gaussian weighting function determines the shape of the function and is ecologically interpretable (McCune and Mefford 2011b). For example, if a species probability of occurrence is modeled by a narrow tolerance for grass cover, the species occurrence is likely to shift dramatically with a small change in grass cover. Sensitivity ($Q$) is the mean absolute difference that results from nudging the environmental gradient values of the model up and down and is presented as a proportion of the range of the probability of occurrence. In this case, $Q$ is defined as the standardized change in probability of occurrence per standardized change in the predictor.

Appendix C – Indicator Species Analysis between untreated shrub-dominated, treated formerly shrub-dominated, and grassland areas for data collected in 2011.

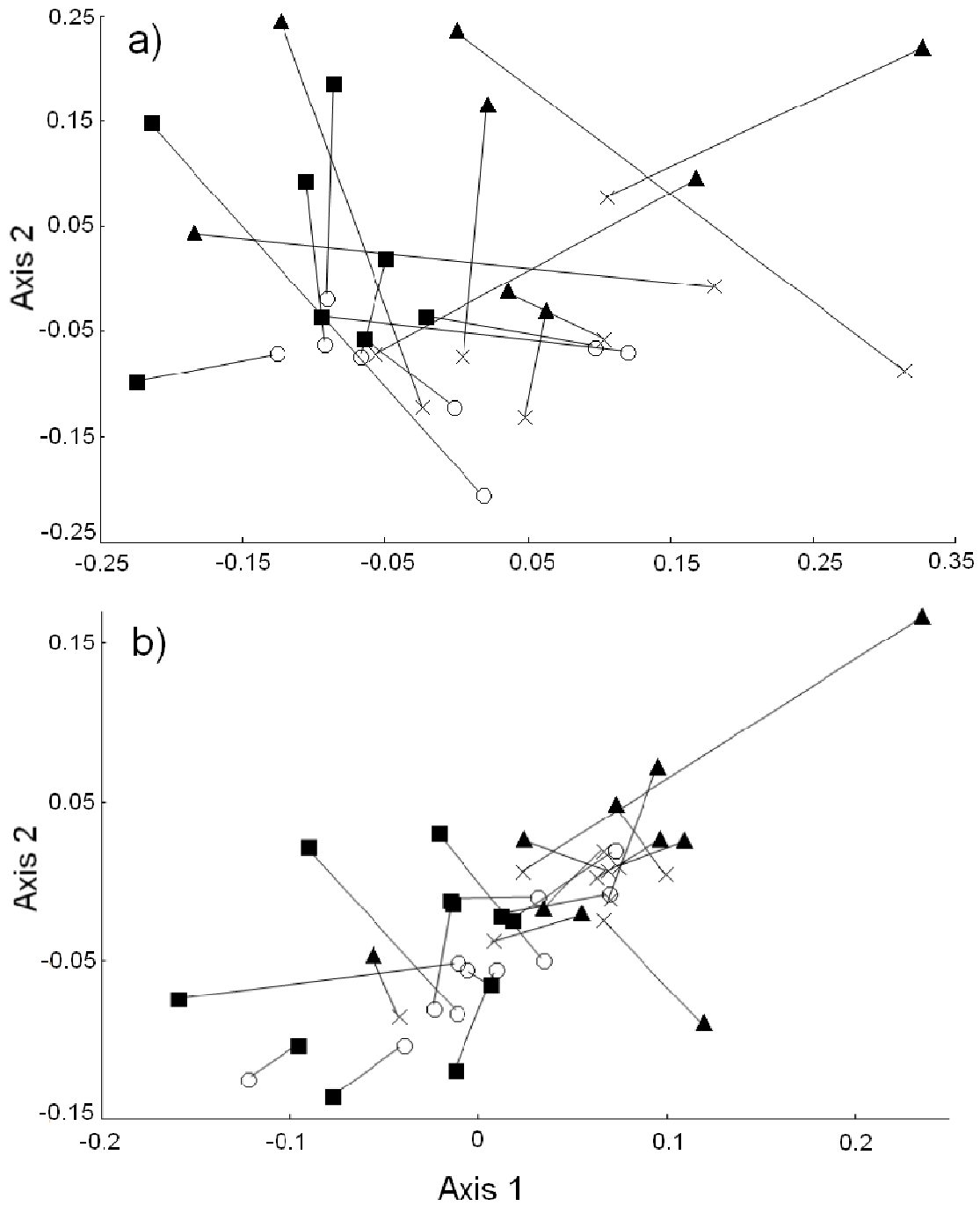| | Species | Relative abundance | Relative frequency | Maximum IndVal | *p* |
|---|---|---|---|---|---|
| Untreated | Black chinned Hummingbird | 77 | 19 | 15 | 0.1956 |
| | Black-tailed Gnatcatcher | 84 | 33 | 28 | 0.0592 |
| | Black-throated Sparrow | 49 | 100 | 49 | **0.0052** |
| | Blue Grosbeak | 60 | 29 | 17 | 0.4175 |
| | Brown-headed Cowbird | 65 | 48 | 31 | 0.1144 |
| | Verdin | 53 | 29 | 15 | 0.4813 |
| | | | | | |
| Treated | Ash-Throated Flycatcher | 52 | 71 | 37 | 0.1814 |
| | Cactus Wren | 45 | 54 | 24 | 0.4601 |
| | Cassin's Sparrow | 52 | 60 | 28 | 0.2657 |
| | Chihuahuan Raven | 45 | 54 | 18 | 0.9844 |
| | Common Nighthawk | 53 | 29 | 15 | 0.5717 |
| | Curve-billed Thrasher | 53 | 21 | 11 | 0.4801 |
| | House Finch | 72 | 25 | 18 | 0.3817 |
| | Northern Mockingbird | 36 | 68 | 22 | 0.9736 |
| | Scaled Quail | 77 | 50 | 39 | 0.0586 |
| | Western Kingbird | 51 | 75 | 31 | 0.6353 |
| | | | | | |
| Grassland | Barn Swallow | 58 | 20 | 12 | 0.4937 |
| | Eastern Meadowlark | 86 | 100 | 86 | **0.0004** |
| | Grey Flycatcher | 53 | 20 | 11 | 0.4839 |
| | Horned Lark | 93 | 100 | 93 | **0.0002** |
| | Loggerhead Shrike | 47 | 40 | 19 | 0.3375 |
| | Mourning Dove | 60 | 60 | 36 | 0.1454 |
| | Scott's Oriole | 48 | 60 | 29 | 0.2893 |
| | Swainson's Hawk | 44 | 60 | 26 | 0.3183 |

Appendix D – Community structure metrics between treated (TRT) and untreated areas (UNT)

| | | UNT Mean | UNT SE | TRT Mean | TRT SE | F | $p$ |
|---|---|---|---|---|---|---|---|
| 2010 ($n = 16$) | Avg Total Abundance | 24.47 | 3.94 | 23.81 | 3.55 | 4.0889 | 0.053 |
| | Richness | 9.5 | 1.45 | 8.69 | 1.04 | 2.7275 | 0.109 |
| | Fisher's Alpha | 6.399 | 1.78 | 0.95 | 2.09 | 0.5432 | 0.467 |
| 2011 ($n = 21$) | Avg Total Abundance | 23.91 | 3.195 | 27.90 | 3.94 | 0.606 | 0.441 |
| | Richness | 9.38 | 1.15 | 9.52 | 0.96 | 0.009 | 0.925 |
| | Fisher's Alpha | 6.42 | 1.06 | 6.99 | 1.60 | 0.093 | 0.762 |

Appendix E – Student's t test results for magnitude differences in community structure metrics (2010 and 2011) and four environmental variables (2011 only) for old and young treatments (Δ = Treated – Untreated)

| | Old Mean | Old SE | Young Mean | Young SE | t | p |
|---|---|---|---|---|---|---|
| **2010** | | | | | | |
| (*n* = 16) Δ Avg Total Abundance | 5.396 | 5.674 | 15.625 | 7.585 | 1.080 | 0.300 |
| Δ Richness | 1.625 | 1.322 | 2.250 | 1.398 | 0.325 | 0.750 |
| Δ Fisher's Alpha | 0.948 | 1.257 | 0.399 | 1.470 | 0.284 | 0.781 |
| Δ Bray - Curtis Distance | 0.635 | 0.033 | 0.695 | 0.029 | 1.370 | 0.193 |
| Δ Turnover | -0.090 | 0.033 | -0.041 | 0.319 | 1.066 | 0.305 |
| **2011** | | | | | | |
| (*n* = 21) Δ Avg Total Abundance | -0.750 | 2.166 | 8.318 | 4.950 | 1.620 | 0.122 |
| Δ Richness | 0.700 | 1.116 | -0.364 | 1.941 | 0.462 | 0.649 |
| Δ Fisher's Alpha | 3.798 | 3.558 | -2.357 | 2.147 | 1.513 | 0.147 |
| Δ Bray - Curtis Distance | 0.622 | 0.041 | 0.637 | 0.022 | 0.351 | 0.730 |
| Δ Turnover | -0.061 | 0.037 | -0.082 | 0.025 | 0.483 | 0.634 |
| **2011** | | | | | | |
| Δ% Grass Cover | 21.95 | 2.007 | 26.568 | 4.032 | 1.025 | 0.322 |
| Δ% Shrub Cover | 5.317 | 1.487 | 5.416667 | 0.902 | 0.058 | 0.955 |
| Δ% Basal Cover | 2.825 | 0.684 | 2.939 | 0.786 | 0.11 | 0.914 |
| Δ% Open Canopy | 70.133 | 2.638 | 65.97 | 3.776 | -0.09 | 0.378 |

Appendix F – Non-metric multidimensional scaling of breeding bird communities sampled in 2010 in 16 treated-untreated pairs (a) and in 2011 in the 21 pairs (b).  Old treatments (1982 – 1989) are symbolized with filled triangles and connected with lines to paired untreated areas (open circles). Young treatments (1995 – 2004) are symbolized with filled squares and connected to the paired untreated area (X).

Appendix G - Non-metric multidimensional scaling of breeding bird communities sampled in 2011 including paired treatments (old treatment are filled triangles and young treatments are filled squares) and unpaired treatments (filled circles), untreated shrub-dominated areas (open circles paired with young and X's paired with old treatments), and remnant grassland areas (filled diamonds).