**Conkling, T.J., J. L. Belant,T. L. DeVault, and J. A. Martin. 2018. Impacts of biomass production at civil airports on grassland bird conservation and aviation strike risk. *Ecological Applications***

Appendix S1. Supplemental Information

Table S1. Mean individuals/10 ha surveyed by species across all treatments by season in Clay Co., Mississippi, USA (2011–2013).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Treatment Type | | | | | | | | | | | | | | | | | | |
|  |  | IBP Alpha Codea |  |  | |  | NWSG-Multiple | | |  | NWSG-Single | | |  | Switchgrass-Multiple | | | |  | | Switchgrass-Single | | |
|  |  | Scientific Name | RHb | | PIFc | 2011 | 2012 | 2013 |  | 2011 | 2012 | 2013 |  | 2011 | 2012 | 2013 |  | | 2011 | | 2012 | 2013 |
| Late Winter | |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  | |  |  |
|  | All species combined | - | *-* | - | | - | 103.05 | 432.00 | 148.00 |  | 463.16 | 289.33 | 86.67 |  | 485.33 | 654.22 | 270.22 |  | | 753.78 | | 513.78 | 216.89 |
|  | American Bittern | AMBI | *Botaurus lentiginosus* |  | |  | 0 | 0 | 1.33 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | American Pipit | AMPI | *Anthus rubescens* |  | |  | 1.36 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Eastern Meadowlark | EAME | *Sturnella magna* | 8 | | 3 | 0 | 1.33 | 0 |  | 11.23 | 0 | 4.00 |  | 0 | 0 | 0 |  | | 0 | | 8.89 | 0 |
|  | Field Sparrow | FISP | *Spizella pusilla* |  | |  | 0 | 0 | 0 |  | 7.02 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Grasshopper Sparrow | GRSP | *Ammodramus savannarum* |  | |  | 1.36 | 0 | 0 |  | 2.81 | 0 | 0 |  | 1.78 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Le Conte's Sparrow | LCSP | *Ammodramus leconteii* | 7 | | 3 | 2.71 | 45.33 | 74.67 |  | 0 | 13.33 | 17.33 |  | 1.78 | 120.89 | 37.33 |  | | 0 | | 129.78 | 7.11 |
|  | Lincoln's Sparrow | LISP | *Melospiza lincolnii* |  | |  | 0 | 0 | 0 |  | 2.81 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Northern Cardinal | NOCA | *Cardinalis cardinalis* |  | |  | 0 | 0 | 0 |  | 4.21 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Northern Harrier | NOHA | *Circus cyaneus* |  | |  | 0 | 1.33 | 1.33 |  | 0 | 1.33 | 1.33 |  | 0 | 1.78 | 0 |  | | 0 | | 0 | 0 |
|  | Red-winged Blackbird | RWBL | *Agelaius phoeniceus* |  | |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 26.67 |  | | 0 | | 0 | 0 |
|  | Savannah Sparrow | SAVS | *Passerculus sandwichensis* | 7 | | 1 | 90.85 | 274.67 | 56.00 |  | 400.00 | 144.00 | 45.33 |  | 481.78 | 487.11 | 11.33 |  | | 752.00 | | 282.67 | 72.89 |
|  | Sedge Wren | SEDW | *Cistothorus platensis* |  | |  | 0 | 1.33 | 0 |  | 0 | 2.67 | 0 |  | 0 | 1.78 | 0 |  | | 0 | | 0 | 1.78 |
|  | Song Sparrow | SOSP | *Melospiza melodia* | 7 | | 1 | 4.07 | 1.33 | 0 |  | 2.81 | 16.00 | 1.33 |  | 0 | 0 | 0 |  | | 0 | | 0 | 3.56 |
|  | Swamp Sparrow | SWSP | *Melospiza georgiana* | 7 | | 1 | 0 | 97.33 | 12.00 |  | 0 | 84.00 | 13.33 |  | 0 | 4.89 | 103.11 |  | | 1.78 | | 83.56 | 126.22 |
|  | Unknown Sparrow | UNSP | *Emberizidae* | 7 | | 1 | 2.71 | 9.33 | 1.33 |  | 0 | 28.00 | 2.67 |  | 0 | 1.78 | 1.78 |  | | 0 | | 5.33 | 5.33 |
|  | Unknown species (songbird-sized) | UNBI | *Passeriforimes* |  | |  | 0 | 0 | 1.33 |  | 2.81 | 0 | 1.33 |  | 0 | 0 | 0 |  | | 0 | | 3.56 | 0 |
|  | Vesper Sparrow | VESP | *Pooecetes gramineus* |  | |  | 0 | 0 | 0 |  | 26.67 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | White-throated Sparrow | WTSP | *Zonotrichia albicollis* |  | |  | 0 | 0 | 0 |  | 1.40 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |
|  | Wilson's Snipe | WISN | *Gallinago delicata* |  | |  | 0 | 0 | 0 |  | 1.40 | 0 | 0 |  | 0 | 0 | 0 |  | | 0 | | 0 | 0 |

Table S1. (Continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spring Migration | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | All species combined | - | *-* |  |  | - | 46.13 | 13.57 |  | - | 36.45 | 18.18 |  | - | 43.28 | 16.15 |  | - | 27.46 | 12.3 |
|  | American Bittern | AMBI | *Botaurus lentiginosus* |  |  | - | 0.26 | 0 |  | - | 0 | 0 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Chipping Sparrow | CHSP | *Spizella passerina* |  |  | - | 1.03 | 0 |  | - | 0.27 | 0 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Eastern Meadowlark | EAME | *Sturnella magna* | 8 | 3 | - | 0.26 | 1.20 |  | - | 0.27 | 3.06 |  | - | 3.57 | 0.53 |  | - | 1.64 | 0 |
|  | Field Sparrow | FISP | *Spizella pusilla* |  |  | - | 0 | 0 |  | - | 0 | 0.18 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Le Conte's Sparrow | LCSP | *Ammodramus leconteii* | 7 | 3 | - | 1.80 | 1.37 |  | - | 0.27 | 0.54 |  | - | 3.97 | 1.59 |  | - | 4.10 | 0 |
|  | Mourning Dove | MODO | *Zenaida macroura* |  |  | - | 0 | 0 |  | - | 0 | 0 |  | - | 0 | 0 |  | - | 0 | 0.55 |
|  | Northern Harrier | NOHA | *Circus cyaneus* | 8 | 3 | - | 0.52 | 0.69 |  | - | 0 | 0.90 |  | - | 0 | 0 |  | - | 0.82 | 0.27 |
|  | Red-tailed Hawk | RTHA | *Buteo jamaicensis* |  |  | - | 0 | 0.17 |  | - | 0 | 0 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Red-winged Blackbird | RWBL | *Agelaius phoeniceus* |  |  | - | 0.26 | 0 |  | - | 0.81 | 0.18 |  | - | 1.19 | 0 |  | - | 0 | 0 |
|  | Savannah Sparrow | SAVS | *Passerculus sandwichensis* | 7 | 1 | - | 23.45 | 8.42 |  | - | 22.68 | 11.52 |  | - | 30.58 | 11.12 |  | - | 14.76 | 3.01 |
|  | Sedge Wren | SEDW | *Cistothorus platensis* |  |  | - | 0.77 | 0 |  | - | 0.81 | 0.18 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Song Sparrow | SOSP | *Melospiza melodia* |  |  | - | 0.52 | 0.17 |  | - | 0 | 0.18 |  | - | 0 | 0 |  | - | 0 | 0 |
|  | Swamp Sparrow | SWSP | *Melospiza georgiana* | 7 | 1 | - | 13.14 | 0.69 |  | - | 8.37 | 0.54 |  | - | 0.79 | 2.12 |  | - | 0.41 | 7.38 |
|  | Unknown Sparrow | UNSP | *Emberizidae* | 7 | 1 | - | 4.12 | 0.17 |  | - | 2.97 | 0.36 |  | - | 3.18 | 0.79 |  | - | 3.28 | 0.82 |
|  | Wilson's Snipe | WISN | *Gallinago delicata* | 1 | 1 | - | 0 | 0.69 |  | - | 0 | 0.54 |  | - | 0 | 0 |  | - | 2.46 | 0.27 |
| Summer | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | All species combined | - | *-* |  |  | 28.68 | 16.29 | 14.97 |  | 38.07 | 18.94 | 15.94 |  | 5.52 | 3.63 | 4.67 |  | 9.65 | 7.59 | 3.03 |
|  | Barn Swallow | BARS | *Hirundo rustica* | 3 | 1 | 0.21 | 0 | 0.38 |  | 0 | 0.56 | 0.19 |  | 0 | 0 | 0 |  | 0.26 | 0.51 | 0 |
|  | Blue Grosbeak | BLGR | *Passerina caerulea* |  |  | 0.21 | 0 | 0 |  | 0 | 0.56 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Bobolink | BOBO | *Dolichonyx oryzivorus* |  |  | 0 | 0 | 0 |  | 1.13 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Brown-headed Cowbird | BHCO | *Molothrus ater* |  |  | 0 | 0 | 0 |  | 0 | 0.19 | 0 |  | 0.55 | 0 | 0 |  | 0.52 | 0.56 | 0 |
|  | Cedar Waxwing | CEDW | *Bombycilla cedrorum* |  |  | 0 | 0 | 0 |  | 9.38 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Cliff Swallow | CLSW | *Petrochelidon pyrrhonota* |  |  | 0 | 0 | 0 |  | 0 | 1.13 | 0 |  | 0 | 0 | 0 |  | 0.27 | 0.25 | 0 |
|  | Common Yellowthroat | COYE | *Geothlypis trichas* |  |  | 0 | 0 | 0 |  | 0 | 0.19 | 0 |  | 0 | 0 | 0.26 |  | 0 | 0.25 | 1.26 |
|  | Dickcissel | DICK | *Spiza americana* | 1 | 1 | 18.71 | 10.61 | 8.15 |  | 14.25 | 11.63 | 10.69 |  | 0 | 0.78 | 1.30 |  | 1.56 | 1.52 | 0.76 |

Table S1. (Continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Eastern Meadowlark | EAME | *Sturnella magna* | 8 | 3 | 3.12 | 3.50 | 2.46 |  | 3.38 | 1.52 | 0.76 |  | 3.86 | 1.38 | 1.56 |  | 4.69 | 1.12 | 0 |
|  | Eastern Towhee | EATO | *Pipilo erythrophthalmus* |  |  | 0.21 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.56 | 0 |
|  | Field Sparrow | FISP | *Spizella pusilla* |  |  | 0.62 | 0.19 | 0 |  | 1.13 | 0.19 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Grasshopper Sparrow | GRSP | *Ammodramus savannarum* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.78 | 0 | 0 |
|  | Great Crested Flycatcher | GCFL | *Myiarchus crinitus* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0.26 |  | 0 | 0 | 0 |
|  | Indigo Bunting | INBU | *Passerina cyanea* | 1 | 1 | 0.21 | 0 | 0 |  | 0.75 | 0 | 0.56 |  | 0.28 | 0.52 | 0 |  | 0 | 0.76 | 0 |
|  | Killdeer | KILL | *Charadrius vociferus* |  |  | 0 | 0 | 0 |  | 0.19 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Mourning Dove | MODO | *Zenaida macroura* |  |  | 1.87 | 0 | 0 |  | 0.56 | 0 | 0.19 |  | 0 | 0 | 0 |  | 0.26 | 0 | 0 |
|  | Northern Bobwhite | NOBO | *Colinus virginianus* |  |  | 0.83 | 0.19 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 1.01 | 0 |
|  | Northern Cardinal | NOCA | *Cardinalis cardinalis* |  |  | 0 | 0 | 0 |  | 0 | 0.38 | 0 |  | 0.55 | 0 | 0 |  | 0 | 0.25 | 0 |
|  | Orchard Oriole | OROR | *Icterus spurius* |  |  | 0 | 0 | 0 |  | 0 | 0.19 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Red-bellied Woodpecker | RBWO | *Melanerpes carolinus* |  |  | 0 | 0 | 0 |  | 0.19 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Red-winged Blackbird | RWBL | *Agelaius phoeniceus* | 1 | 1 | 2.29 | 1.89 | 3.60 |  | 6.38 | 2.63 | 3.56 |  | 0.28 | 0.52 | 1.30 |  | 0.78 | 0.25 | 1.01 |
|  | Ruby-throated Hummingbird | RTHU | *Archilochus colubris* |  |  | 0 | 0 | 0.38 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Savannah Sparrow | SAVS | *Passerculus sandwichensis* |  |  | 0.28 | 0 | 0 |  | 0.19 | 0 | 0 |  | 0 | 0 | 0 |  | 0.52 | 0 | 0 |
|  | White-eyed vireo | WEVI | *Vireo griseus* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.52 | 0 |  | 0 | 0 | 0 |
|  | Yellow-billed Cuckoo | YBCU | *Coccyzus americanus* |  |  | 0.21 | 0 | 0 |  | 0.19 | 0.19 | 0 |  | 0 | 0 | 0 |  | 0 | 0.25 | 0 |
|  | Yellow-breasted Chat | YBCH | *Icteria virens* |  |  | 0 | 0 | 0 |  | 0.38 | 0.19 | 0 |  | 0 | 0.26 | 0 |  | 0 | 0.51 | 0 |
| Fall Migration | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | All species combined | - | *-* |  |  | 29.55 | 9.96 | 12.71 |  | 28.8 | 12.78 | 17.64 |  | 32.83 | 9.27 | 5.82 |  | 34.98 | 25.69 | 21.86 |
|  | American Crow | AMCR | *Corvus brachyrhynchos* |  |  | 0 | 0 | 0 |  | 0 | 0.18 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Barn Swallow | BARS | *Hirundo rustica* | 3 | 1 | 0 | 0.52 | 1.20 |  | 0 | 0.90 | 1.98 |  | 0 | 0.26 | 0.26 |  | 0 | 1.09 | 0.55 |
|  | Blue Grosbeak | BLGR | *Passerina caerulea* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0.82 |
|  | Brown-headed Cowbird | BHCO | *Molothrus ater* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.27 | 0 |
|  | Carolina Wren | CARW | *Thryothorus ludovicianus* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.26 | 0 | 0 |  | 0.27 | 0 | 0 |
|  | Cliff Swallow | CLSW | *Petrochelidon pyrrhonota* | 2 | 1 | 0.34 | 4.64 | 1.89 |  | 4.68 | 4.50 | 0 |  | 2.12 | 4.24 | 0.26 |  | 0.55 | 10.38 | 4.37 |
|  | Common Yellowthroat | COYE | *Geothlypis trichas* | 1 | 1 | 4.98 | 0.52 | 0.69 |  | 6.12 | 0.36 | 0.36 |  | 0.53 | 0.53 | 0.53 |  | 0.55 | 0.55 | 2.46 |

Table S1. (Continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Cooper's Hawk | COHA | *Accipiter cooperii* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0.27 |
|  | Dickcissel | DICK | *Spiza americana* | 1 | 1 | 1.72 | 0.17 | 0.86 |  | 1.44 | 0.90 | 3.06 |  | 0 | 0 | 0.26 |  | 0.27 | 0.27 | 0.27 |
|  | Eastern Meadowlark | EAME | *Sturnella magna* | 8 | 3 | 0.34 | 0 | 2.41 |  | 0.18 | 1.26 | 0.36 |  | 1.06 | 0.79 | 0.53 |  | 2.19 | 0 | 0 |
|  | Grasshopper Sparrow | GRSP | *Ammodramus savannarum* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.26 | 0 | 0 |  | 0 | 0 | 0 |
|  | Great Blue Heron | GBHE | *Ardea herodias* |  |  | 0.17 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Indigo Bunting | INBU | *Passerina cyanea* |  |  | 1.20 | 0 | 0 |  | 0.18 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Le Conte's Sparrow | LCSP | *Ammodramus leconteii* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |
|  | Lincoln's Sparrow | LISP | *Melospiza lincolnii* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.82 | 0 | 0 |
|  | Northern Harrier | NOHA | *Circus cyaneus* |  |  | 0 | 0 | 0.17 |  | 0.18 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Red-winged Blackbird | RWBL | *Agelaius phoeniceus* |  |  | 0 | 0 | 0 |  | 0 | 0 | 3.78 |  | 0 | 0 | 0 |  | 0 | 0 | 0.55 |
|  | Ruby-throated Hummingbird | RTHU | *Archilochus colubris* |  |  | 0 | 0.17 | 0 |  | 0.18 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Savannah Sparrow | SAVS | *Passerculus sandwichensis* | 7 | 1 | 3.78 | 1.37 | 1.37 |  | 5.22 | 1.98 | 0.72 |  | 16.15 | 1.85 | 1.32 |  | 10.66 | 9.02 | 2.46 |
|  | Sedge Wren | SEDW | *Cistothorus platensis* | 7 | 1 | 0 | 0 | 2.41 |  | 0 | 0.18 | 1.44 |  | 0 | 0.26 | 1.59 |  | 0 | 0.27 | 0.82 |
|  | Song Sparrow | SOSP | *Melospiza melodia* | 7 | 1 | 0.52 | 0 | 0.17 |  | 1.08 | 0 | 0 |  | 1.06 | 0 | 0 |  | 1.64 | 0 | 0 |
|  | Sora | SORA | *Porzana carolina* |  |  | 0.17 | 0.17 | 0 |  | 0 | 0 | 0 |  | 0.26 | 0.53 | 0 |  | 0.27 | 0 | 0.27 |
|  | Swamp Sparrow | SWSP | *Melospiza georgiana* | 7 | 1 | 7.22 | 0 | 0 |  | 3.06 | 0 | 0.72 |  | 7.15 | 0 | 0.53 |  | 6.01 | 0 | 2.73 |
|  | Unknown Sparrow | UNSP | *Emberizidae* | 7 | 1 | 8.25 | 0.86 | 1.37 |  | 5.76 | 0.18 | 5.22 |  | 4.24 | 0.26 | 0.53 |  | 10.93 | 0.27 | 6.29 |
|  | Unknown species (songbird-sized) | UNBI | *Passeriforimes* |  |  | 0 | 0.34 | 0 |  | 0 | 0.36 | 0 |  | 0 | 0.53 | 0 |  | 0 | 0.27 | 0 |
|  | Unknown swallow | UNSW | *Hirudinidae* |  |  | 0 | 0.69 | 0 |  | 0 | 0.54 | 0 |  | 0 | 0 | 0 |  | 0 | 1.37 | 0 |
|  | Unknown Warbler | UNWA | *Parulidae* | 7 | 1 | 0.69 | 0.52 | 0.17 |  | 0.72 | 1.44 | 0 |  | 0 | 0 | 0 |  | 0 | 1.91 | 0 |
|  | Winter Wren | WIWR | *Troglodytes hiemalis* |  |  | 0.17 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |
| Early Winter | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | All species combined | - | *-* |  |  | 88.39 | 22.33 | 35.91 |  | 92.34 | 20.88 | 16.74 |  | 144.54 | 45.00 | 23.83 |  | 170.93 | 41.26 | 22.41 |
|  | American Bittern | AMBI | *Botaurus lentiginosus* |  |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0.41 | 0 | 0 |
|  | American Crow | AMCR | *Corvus brachyrhynchos* |  |  | 0 | 0 | 0 |  | 0 | 0.90 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Black Vulture | BLVU | *Coragyps atratus* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Chipping Sparrow | CHSP | *Spizella passerina* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Cooper's Hawk | COHA | *Accipiter cooperii* |  |  | 0 | 0 | 0.17 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |

Table S1. (Continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Eastern Meadowlark | EAME | *Sturnella magna* | 8 | 3 | 0.26 | 0.52 | 0.86 |  | 0 | 0 | 2.52 |  | 0.40 | 3.18 | 0.26 |  | 9.84 | 0 | 0.27 |
|  | Lark Sparrow | LASP | *Chondestes grammacus* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Le Conte's Sparrow | LCSP | *Ammodramus leconteii* | 7 | 3 | 11.34 | 2.58 | 0 |  | 2.16 | 1.98 | 0 |  | 21.05 | 5.03 | 0 |  | 20.09 | 2.73 | 0 |
|  | Northern Bobwhite | NOBO | *Colinus virginianus* |  |  | 0 | 0 | 0 |  | 0.54 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Northern Harrier | NOHA | *Circus cyaneus* | 8 | 3 | 1.55 | 1.20 | 0.86 |  | 0.54 | 0.72 | 0.54 |  | 1.99 | 1.32 | 0.53 |  | 0.41 | 1.64 | 0.27 |
|  | Red-tailed Hawk | RTHA | *Buteo jamaicensis* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.27 | 0.27 |
|  | Red-winged Blackbird | RWBL | *Agelaius phoeniceus* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Savannah Sparrow | SAVS | *Passerculus sandwichensis* | 7 | 1 | 49.99 | 8.76 | 26.8 |  | 41.04 | 9.72 | 8.28 |  | 96.09 | 21.97 | 15.35 |  | 113.14 | 12.02 | 12.57 |
|  | Sedge Wren | SEDW | *Cistothorus platensis* | 6 | 1 | 0.77 | 0.17 | 0.86 |  | 1.35 | 0.18 | 0.72 |  | 0 | 0 | 0.26 |  | 0 | 0.27 | 0.27 |
|  | Song Sparrow | SOSP | *Melospiza melodia* | 7 | 1 | 8.25 | 0.17 | 0.34 |  | 25.38 | 0.18 | 0 |  | 5.56 | 0.26 | 0 |  | 6.97 | 1.91 | 0 |
|  | Swamp Sparrow | SWSP | *Melospiza georgiana* | 7 | 1 | 11.34 | 0.86 | 4.29 |  | 11.88 | 1.08 | 3.60 |  | 11.12 | 1.32 | 5.56 |  | 2.46 | 7.65 | 8.20 |
|  | Turkey Vulture | TUVU | *Cathartes aura* |  |  | 0 | 0 | 0 |  | 0.27 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |
|  | Unknown Sparrow | UNSP | *Emberizidae* | 7 | 1 | 4.64 | 7.90 | 1.72 |  | 7.56 | 6.12 | 1.08 |  | 8.34 | 11.91 | 1.85 |  | 17.63 | 14.21 | 0.55 |
|  | Unknown species (songbird-sized) | UNBI | *Passeriforimes* |  |  | 0.26 | 0.17 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.27 | 0 |
|  | Wilson's Snipe | WISN | *Gallinago delicata* |  |  | 0 | 0.17 | 0 |  | 0 | 0 | 0 |  | 0 | 0 | 0 |  | 0 | 0.27 | 0 |

a4-letter Alpha Codes for bird species provided by the Institute for Bird Populations

bRelative Hazard Score obtained from DeVault et al. 2011

cConservation Rank based off of Partners in Flight (PIF) Scores

Table S2. Correlation (r2) of treatment (Native Warm-Season Grass vs Switchgrass) and vegetation visual obstruction (VOR) with avian ordination axes from nonmetric multi-dimensional scaling (NMDS) in Clay Co., Mississippi, 2011–2013.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Treatment | | | | |  | VOR | | | | |
| Parameter | Year | NMDS1 | NMDS2 | r2 | *P*-value |  | Year | NMDS1 | NMDS2 | r2 | *P*-value |
| Late Winter |  |  |  |  |  |  |  |  |  |  |  |
|  | 2012 | -0.96 | -0.29 | 0.24 | 0.22 |  | 2012 | -0.95 | -0.31 | 0.52 | 0.02 |
|  | 2013 | -0.56 | -0.83 | 0.71 | <0.01 |  | 2013 | -0.29 | -0.96 | 0.71 | <0.01 |
| Spring Migration |  |  |  |  |  |  |  |  |  |  |  |
|  | 2012 | 0.09 | -1.00 | 0.79 | <0.01 |  | 2012 | 0.53 | -0.85 | 0.48 | 0.03 |
|  | 2013 | -0.87 | -0.49 | 0.48 | 0.03 |  | 2013 | -1.00 | -0.05 | 0.46 | 0.04 |
| Fall Migration |  |  |  |  |  |  |  |  |  |  |  |
|  | 2011 | -0.47 | 0.88 | 0.45 | 0.04 |  | 2011 | -0.84 | 0.54 | 0.20 | 0.29 |
|  | 2012 | 0.32 | 0.95 | 0.34 | 0.10 |  | 2012 | 0.28 | 0.96 | 0.28 | 0.17 |
|  | 2013 | 0.02 | -1.00 | 0.41 | 0.06 |  | 2013 | 0.03 | -1.00 | 0.35 | 0.09 |
| Early Winter |  |  |  |  |  |  |  |  |  |  |  |
|  | 2011 | -0.82 | 0.57 | 0.47 | 0.03 |  | 2011 | -0.99 | 0.14 | 0.09 | 0.59 |
|  | 2012 | -0.44 | 0.90 | 0.54 | 0.01 |  | 2012 | -0.38 | 0.92 | 0.59 | 0.01 |
|  | 2013 | 0.34 | 0.94 | 0.03 | 0.84 |  | 2013 | 0.27 | 0.96 | 0.11 | 0.51 |

Table S3. Model parameters, random effects, and variance structures from the best-fit models and Pseudo R2 values to identify best-fit models from nested candidate models for avian relative density, aviation risk, and conservation value by survey period in Clay Co., Mississippi,   
2011–2013.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Best-fit Model | | |  | | Pseudo R2 | | |
| Survey Period | | Parameters | Random Effects |  | Variance Structure |  | Marginal | Conditional | McFadden's |
| Relative Density | |  |  |  |  |  |  |  |  |
|  | Late Winter | Treatment × Year | - |  | - |  | - | - | 0.11 |
|  | Spring | Year | Block |  | - |  | 0.62 | 0.89 | - |
|  | Summer | Treatment + Year | Block |  | - |  | 0.66 | 0.94 | - |
|  | Fall | Treatment + Year | - |  | - |  | - | - | 0.06 |
|  | Early Winter | Treatment × Year | - |  | - |  | - | - | 0.17 |
|  |  |  |  |  |  |  |  |  |  |
| Aviation Risk | |  |  |  |  |  |  |  |  |
|  | Late Winter | Treatment + Year | - |  | Year |  | - | - | 0.15 |
|  | Spring | Year | Block |  | Treatment +Year |  | 0.26 | 0.38 | - |
|  | Summer | Treatment + Year | Block |  | - |  | 0.35 | 0.62 | - |
|  | Fall | Year | - |  | - |  | - | - | 0.09 |
|  | Early Winter | Treatment × Year | - |  | Treatment × Year |  | - | - | 0.32 |
|  |  |  |  |  |  |  |  |  |  |
| Conservation Value | | |  |  |  |  |  |  |  |
|  | Late Winter | Treatment × Year | - |  | Treatment × Year |  | - | - | 0.30 |
|  | Spring | Year | Block |  | Year |  | 0.21 | 0.37 | - |
|  | Summer | Treatment + Year | Block |  | - |  | 0.48 | 0.73 | - |
|  | Fall | Year | Block |  | - |  | 0.21 | 0.36 | - |
|  | Early Winter | Treatment × Year | - |  | Year |  | - | - | 0.31 |

Table S4. Model coefficients (± SE) and 95% confidence limits for parameters in the best-fit models for avian relative density by survey period in Clay Co., Mississippi, 2011–2013.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | 95% Confidence Limits | |
| Parameter | Estimate | SE | Lower | Upper |
| Late Winter |  |  |  |  |
| (Intercept) | 4.60 | 0.26 | 4.12 | 5.13 |
| NWSG (single harvest) a | 1.46 | 0.35 | 0.78 | 2.15 |
| Switchgrass (multiple harvest) a | 1.58 | 0.37 | 0.86 | 2.33 |
| Switchgrass (single harvest) a | 2.03 | 0.37 | 1.31 | 2.77 |
| 2012b | 1.46 | 0.35 | 0.78 | 2.15 |
| 2013b | 0.37 | 0.36 | -0.33 | 1.07 |
| NWSG (single harvest) × 2012 b | -1.87 | 0.48 | -2.82 | -0.93 |
| Switchgrass (multiple harvest)×2012 b | -1.17 | 0.51 | -2.18 | -0.16 |
| Switchgrass (single harvest)×2012 b | -1.85 | 0.51 | -2.87 | -0.85 |
| NWSG (single harvest)×2013 b | -2.00 | 0.50 | -2.98 | -1.02 |
| Switchgrass (multiple harvest)×2013 b | -0.95 | 0.52 | -1.98 | 0.08 |
| Switchgrass (single harvest)×2013 b | -1.63 | 0.52 | -2.66 | -0.60 |
|  |  |  |  |  |
| Spring Migration |  |  |  |  |
| (Intercept) | 3.60 | 0.19 | 3.22 | 3.98 |
| 2013c | -0.92 | 0.16 | -1.24 | -0.60 |
|  |  |  |  |  |
| Summer |  |  |  |  |
| (Intercept) | 3.20 | 0.30 | 2.62 | 3.79 |
| NWSG (single harvest) a | 0.08 | 0.16 | -0.24 | 0.34 |
| Switchgrass (multiple harvest) a | -1.54 | 0.23 | -1.99 | -1.08 |
| Switchgrass (single harvest) a | -1.38 | 0.22 | -1.82 | -0.94 |
| 2012 b | -0.55 | 0.17 | -0.88 | -0.21 |
| 2013 b | -0.67 | 0.17 | -1.01 | -0.33 |
|  |  |  |  |  |
| Fall Migration |  |  |  |  |
| (Intercept) | 3.30 | 0.21 | 2.89 | 3.73 |
| NWSG (single harvest) a | 0.12 | 0.25 | -0.36 | 0.61 |
| Switchgrass (multiple harvest) a | -0.19 | 0.27 | -0.72 | 0.34 |
| Switchgrass (single harvest) a | 0.56 | 0.26 | 0.04 | 1.08 |
| 2012 b | -0.98 | 0.23 | -1.42 | -0.53 |
| 2013 b | -0.88 | 0.23 | -1.33 | -0.43 |
|  |  |  |  |  |
| Early Winter |  |  |  |  |
| (Intercept) | 4.47 | 0.17 | 4.15 | 4.83 |
| NWSG (single harvest) a | 0.02 | 0.25 | -0.46 | 0.51 |
| Switchgrass (multiple harvest) a | 0.50 | 0.26 | -0.02 | 1.02 |
| Switchgrass (single harvest) a | 0.66 | 0.26 | 0.15 | 1.19 |
| 2012b | -1.37 | 0.26 | -1.88 | -0.87 |
| 2013b | -0.89 | 0.25 | -1.38 | -0.40 |
| NWSG (single harvest) × 2012b | -0.13 | 0.36 | -0.84 | 0.59 |
| Switchgrass (multiple harvest) × 2012b | 0.19 | 0.38 | -0.56 | 0.94 |
| Switchgrass (single harvest) × 2012b | -0.10 | 0.38 | -0.85 | 0.66 |
| NWSG (single harvest) × 2013b | -0.79 | 0.36 | -1.50 | -0.08 |
| Switchgrass (multiple harvest) × 2013b | -0.95 | 0.39 | -1.71 | -0.19 |
| Switchgrass (single harvest) × 2013b | -1.15 | 0.39 | -1.91 | -0.39 |

a Native warm-season grassland-multiple harvest (NWSG-M) is the reference condition. Coefficient refers to change in relative density for given treatment relative to NWSG-M

b 2011 is the reference year. Coefficient refers to change in relative density for given year relative to 2011

c 2012 in the reference year. Coefficient refers to change in relative density for given year relative to 2012

(no Spring Migration surveys in 2011)

Table S5. Model coefficients (± SE) and 95% confidence limits for parameters in the best-fit models for avian aviation hazard score by survey period in Clay Co., Mississippi, 2011–2013.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | 95% Confidence Limits | |
| Parameter | Estimate | SE | Lower | Upper |
| Late Winter |  |  |  |  |
| (Intercept) | 2733.31 | 714.65 | 1332.63 | 4134.00 |
| NWSG (single harvest)a | -450.54 | 235.68 | -912.46 | 11.38 |
| Switchgrass (multiple harvest)a | 864.69 | 254.56 | 365.75 | 1363.62 |
| Switchgrass (single harvest)a | 573.90 | 254.56 | 74.97 | 1072.84 |
| 2012b | 260.10 | 742.12 | -1194.43 | 1714.62 |
| 2013b | -1762.00 | 707.26 | -3148.19 | -375.81 |
|  |  |  |  |  |
| Spring Migration |  |  |  |  |
| (Intercept) | 253.37 | 37.98 | 174.80 | 331.93 |
| 2013c | -152.24 | 27.39 | -208.90 | -95.58 |
|  |  |  |  |  |
| Summer |  |  |  |  |
| (Intercept) | 58.28 | 8.68 | 40.63 | 75.94 |
| NWSG (single harvest)a | -5.96 | 6.30 | -18.78 | 6.86 |
| Switchgrass (multiple harvest) a | -18.77 | 6.95 | -32.91 | -4.63 |
| Switchgrass (single harvest) a | -23.25 | 6.95 | -37.40 | -9.11 |
| 2012b | -22.16 | 5.83 | -34.02 | -10.29 |
| 2013b | -27.33 | 5.83 | -39.19 | -15.46 |
|  |  |  |  |  |
| Fall Migration |  |  |  |  |
| (Intercept) | 170.35 | 16.72 | 137.57 | 203.12 |
| 2012b | -126.35 | 23.65 | -172.69 | -80.00 |
| 2013b | -106.20 | 23.65 | -152.55 | -59.86 |
|  |  |  |  |  |
| Early Winter | 615.05 | 110.55 | 398.38 | 831.73 |
| (Intercept) | 11.61 | 152.92 | -288.11 | 311.33 |
| NWSG (single harvest) a | 396.39 | 251.00 | -95.55 | 888.33 |
| Switchgrass (single harvest) a | 592.64 | 123.12 | 351.33 | 833.94 |
| Switchgrass (multiple harvest) a | -457.57 | 113.28 | -679.60 | -235.55 |
| 2012b | -361.65 | 145.11 | -646.05 | -77.25 |
| 2013b | 615.05 | 110.55 | 398.38 | 831.73 |
| NWSG (single harvest) × 2012b | -28.38 | 156.42 | -334.96 | 278.21 |
| Switchgrass (multiple harvest) × 2012b | -240.04 | 261.34 | -752.25 | 272.18 |
| Switchgrass (single harvest) × 2012b | -476.65 | 136.10 | -743.39 | -209.90 |
| NWSG (single harvest) × 2013b | -146.27 | 182.74 | -504.43 | 211.90 |
| Switchgrass (multiple harvest) × 2013b | -491.18 | 273.44 | -1027.11 | 44.75 |
| Switchgrass (single harvest) × 2013b | -690.68 | 155.94 | -996.30 | -385.05 |

a Native warm-season grassland-multiple harvest (NWSG-M) is the reference condition. Coefficient refers to change in relative density for given treatment relative to NWSG-M.

b 2011 is the reference year. Coefficient refers to change in relative density for given year relative to 2011.

c 2012 in the reference year. Coefficient refers to change in relative density for given year relative to 2012 (no Spring Migration surveys in 2011)

Table S6. Model coefficients (± SE) and 95% confidence limits for parameters in the best-fit models for avian conservation value by survey period in Clay Co., Mississippi, 2011–2013.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | 95% Confidence Limits | |
| Parameter | Estimate | SE | Lower | Upper |
| Late Winter |  |  |  |  |
| (Intercept) | 101.62 | 33.28 | 36.40 | 166.84 |
| NWSG (single harvest) | 400.38 | 305.78 | -198.93 | 999.70 |
| Switchgrass (multiple harvest) | 385.49 | 190.34 | 12.44 | 758.55 |
| Switchgrass (single harvest) | 652.16 | 89.57 | 476.61 | 827.71 |
| 2012b | 411.71 | 74.79 | 265.12 | 558.30 |
| 2013b | 190.38 | 79.33 | 34.89 | 345.87 |
| NWSG (single harvest) × 2012b | -629.71 | 321.21 | -1259.27 | -0.16 |
| Switchgrass (multiple harvest) × 2012b | -8.16 | 218.24 | -435.91 | 419.59 |
| Switchgrass (single harvest) × 2012b | -383.27 | 152.59 | -682.34 | -84.20 |
| NWSG (single harvest) × 2013b | -568.38 | 315.34 | -1186.43 | 49.67 |
| Switchgrass (multiple harvest) × 2013b | -334.38 | 205.28 | -736.72 | 67.95 |
| Switchgrass (single harvest) × 2013b | -720.16 | 141.86 | -998.20 | -442.12 |
|  |  |  |  |  |
| Spring Migration |  |  |  |  |
| (Intercept) | 41.78 | 7.02 | 27.25 | 56.30 |
| 2013b | -21.38 | 5.59 | -32.94 | -9.83 |
|  |  |  |  |  |
| Summer |  |  |  |  |
| (Intercept) | 33.42 | 4.38 | 24.50 | 42.33 |
| NWSG (single harvest) | -1.09 | 2.92 | -7.03 | 4.86 |
| Switchgrass (multiple harvest) | -15.39 | 3.23 | -21.96 | -8.83 |
| Switchgrass (single harvest) | -16.25 | 3.23 | -22.82 | -9.69 |
| 2012b | -10.90 | 2.71 | -16.41 | -5.39 |
| 2013b | -12.89 | 2.71 | -18.39 | -7.38 |
|  |  |  |  |  |
| Fall Migration |  |  |  |  |
| (Intercept) | 23.93 | 3.58 | 16.66 | 31.20 |
| 2012b | -11.87 | 3.75 | -19.48 | -4.26 |
| 2013b | -12.14 | 3.75 | -19.75 | -4.53 |
|  |  |  |  |  |
| Early Winter |  |  |  |  |
| (Intercept) | 109.25 | 24.55 | 61.13 | 157.37 |
| NWSG (single harvest) a | -21.87 | 34.72 | -89.92 | 46.19 |
| Switchgrass (multiple harvest) a | 72.73 | 37.50 | -0.78 | 146.24 |
| Switchgrass (single harvest) a | 114.03 | 37.50 | 40.52 | 187.54 |
| 2012b | -86.27 | 25.06 | -135.37 | -37.16 |
| 2013b | -71.41 | 26.35 | -123.06 | -19.76 |
| NWSG (single harvest) a × 2012b | 18.18 | 35.43 | -51.27 | 87.63 |
| Switchgrass (multiple harvest) a × 2012b | -43.04 | 38.27 | -118.05 | 31.98 |
| Switchgrass (single harvest) a × 2012b | -103.35 | 38.27 | -178.36 | -28.33 |
| NWSG (single harvest)a × 2013b | 5.65 | 37.27 | -67.40 | 78.69 |
| Switchgrass (multiple harvest)a × 2013b | -88.27 | 40.25 | -167.16 | -9.37 |
| Switchgrass (single harvest)a × 2013b | -129.12 | 40.25 | -208.01 | -50.22 |

a Native warm-season grassland-multiple harvest (NWSG-M) is the reference condition. Coefficient refers to change in relative density for given treatment relative to NWSG-M

b 2011 is the reference year. Coefficient refers to change in relative density for given year relative to 2011

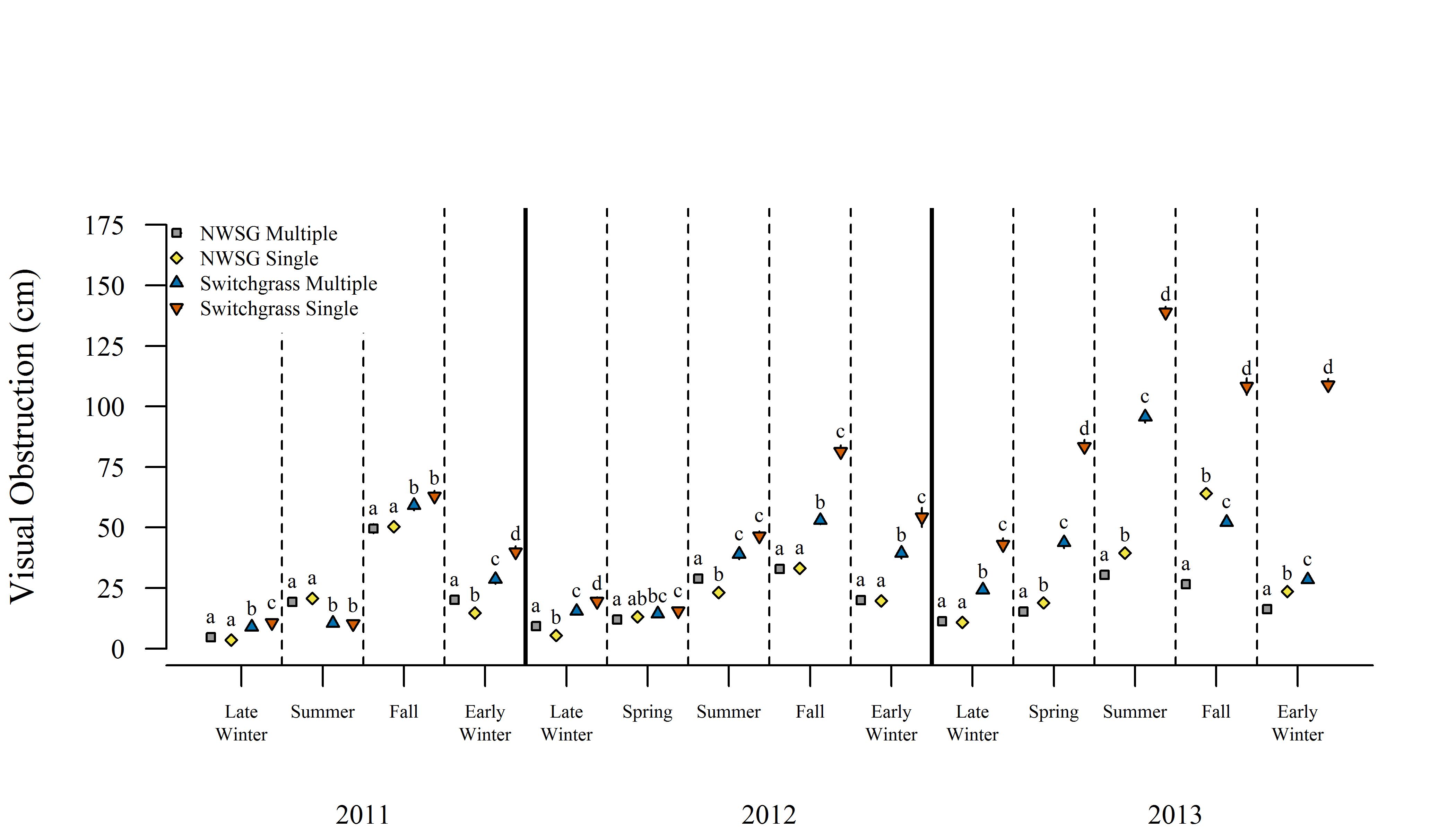


Fig. S1. Mean and 95% CI visual obstruction by survey period native warm-season grass (NWSG) multiple harvest (□), NWSG single harvest (◇), switchgrass multiple harvest (△), and switchgrass single harvest (▽) treatment types in Clay Co., Mississippi, 2011–2013.

Treatments within a season sharing the same letter (e.g. “a”) were not significantly different (Tukey’s HSD: p-value ≤ 0.05).