

Table A4.1. Individual species results from TITAN from bird surveys conducted in the Duck Mountain, Manitoba (DMMB) study area. Species codes, common names, scientific names, indicator scores (IndVal), change-points (Cp) and percentiles (5%, 50%, 95%), for declining (-) and increasing taxa (+) in response to agricultural conversion at the wetland (A) and landscape (B) scales. Note that all significant indicator species are shown but that only species that met significance criteria for $P (\leq 0.05)$, purity (≥ 0.95), and reliability (≥ 0.95 , and ≥ 0.9 for at 0.05, and 0.01, respectively) are included in the figures. P is the probability of getting an equal or larger IndVal using 250 random permutations. IndVal is the unstandardized indicator score, z is the standardized indicator value and N is the frequency of species occurrence among landscapes/wetlands sampled.

A4.1A. Wetland scale

Code	English Name	Scientific Name	Response	Cp	5%	50%	95%	z	IndVal	P	Purity	rel05	rel01	N
AMRE	American Redstart	<i>Setophaga ruticilla</i>	-	0.68	0.01	0.59	0.77	2.94	26.8	0.02	0.95	0.84	0.53	17
BHVI	Blue-headed Vireo	<i>Vireo solitarius</i>	-	0.01	0	0.01	0.32	6.85	34.8	0	1	0.94	0.81	5
BLBW	Blackburnian Warbler	<i>Setophaga fusca</i>	-	0.43	0	0.01	0.5	5.01	21.43	0	1	0.95	0.84	6
BLJA	Blue Jay	<i>Cyanocitta cristata</i>	-	0.7	0	0.46	0.77	3.5	24.84	0.01	1	0.95	0.79	13
CAWA	Canada Warbler	<i>Cardellina canadensis</i>	-	0.02	0	0.02	0.92	5.08	19.63	0.01	0.72	0.62	0.44	4
CEDW	Cedar Waxwing	<i>Bombycilla cedrorum</i>	-	0.24	0	0.17	0.8	6.63	35.51	0	0.94	0.93	0.85	9
CHSP	Chipping Sparrow	<i>Spizella passerina</i>	-	0.28	0.01	0.2	0.59	8.05	51.78	0	1	0.99	0.99	15
COLO	Common Loon	<i>Gavia immer</i>	-	0.02	0.01	0.06	0.42	7.68	62.61	0	0.99	0.99	0.99	21
MOWA	Mourning Warbler	<i>Geothlypis philadelphia</i>	-	0.17	0.01	0.24	0.47	11.2	60.06	0	1	1	1	14
YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	-	0.02	0	0.02	0.31	11.4	66.36	0	1	1	1	11
NAWA	Nashville Warbler	<i>Leiostyris ruficapilla</i> <i>Parquesia</i>	-	0.32	0	0.15	0.35	9.44	36.36	0	1	1	1	8
NOWA	Northern Waterthrush	<i>noveboracensis</i>	-	0.59	0.01	0.69	0.92	2.24	18.68	0.02	0.76	0.62	0.37	12
OVEN	Ovenbird	<i>Seiurus aurocapillus</i>	-	0.17	0.02	0.32	0.56	9.85	64.02	0	1	1	1	23
RCKI	Ruby-crowned Kinglet	<i>Regulus calendula</i>	-	0.01	0	0.04	0.46	9.95	72.84	0	1	1	1	12
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>	-	0.72	0.01	0.69	0.89	2.78	38.99	0.03	0.81	0.71	0.44	33
RNDU	Ring-necked Duck	<i>Aythya collaris</i>	-	0.69	0.01	0.4	0.77	2.97	42.88	0.01	0.91	0.87	0.53	36
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	-	0.28	0	0.17	0.67	5.03	54.71	0	0.99	0.98	0.96	39
SWTH	Swainson's Thrush	<i>Catharus ustulatus</i>	-	0.06	0	0.02	0.31	8.06	45.44	0	1	1	0.97	8
TRES	Tree Swallow	<i>Tachycineta bicolor</i>	-	0.06	0.01	0.29	0.76	4.19	32.13	0.01	0.98	0.9	0.76	13
WIWR	Winter Wren	<i>Troglodytes troglodytes</i>	-	0.01	0	0.01	0.28	9.19	48.67	0	1	0.93	0.85	5
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	-	0.56	0.35	0.5	0.69	13.5	73.13	0	1	1	1	28
ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	+	0.56	0.02	0.54	0.78	4.08	42.8	0.01	1	1	0.87	34
AMBI	American Bittern	<i>Botaurus lentiginosus</i>	+	0.79	0.02	0.78	0.87	3.5	21.93	0.02	0.7	0.54	0.35	8

AMCO	American Coot	<i>Fulica americana</i>	+	0.68	0.4	0.64	0.78	8.03	50.55	0	1	1	1	22
AMCR	American Crow	<i>Corvus brachyrhynchos</i>	+	0.89	0.72	0.88	0.92	6.81	89.23	0	1	0.98	0.9	15
BAOR	Baltimore Oriole	<i>Icterus galbula</i>	+	0.81	0.67	0.79	0.87	5.54	21.87	0.01	0.94	0.76	0.58	4
BARS	Barn Swallow	<i>Hirundo rustica</i>	+	0.92	0.5	0.88	0.92	5.64	63.35	0.01	0.99	0.92	0.66	6
BHCO	Brown-headed Cowbird	<i>Molothrus ater</i>	+	0.17	0.06	0.35	0.77	2.33	29.09	0.04	0.87	0.81	0.34	16
BUFF	Bufflehead	<i>Bucephala albeola</i>	+	0.87	0.46	0.83	0.89	3.9	54.46	0.01	0.93	0.91	0.67	25
BWTE	Blue-winged Teal	<i>Anas discors</i>	+	0.38	0.31	0.67	0.85	4.93	40.71	0	1	1	0.96	24
CANV	Canvasback	<i>Aythya valisineria</i>	+	0.68	0.49	0.73	0.87	2.54	11.76	0.05	0.98	0.71	0.38	4
CCSP	Clay-colored Sparrow	<i>Spizella pallida</i>	+	0.43	0.33	0.54	0.78	10.2	65.73	0	1	1	1	31
COSN	Wilson's Snipe	<i>Gallinago delicata</i>	+	0.83	0	0.82	0.89	2.65	39.48	0.04	0.86	0.76	0.42	23
EAKI	Eastern Kingbird	<i>Tyrannus tyrannus</i>	+	0.92	0	0.74	0.92	1.71	28.4	0.02	0.6	0.31	0.13	5
GADW	Gadwall	<i>Anas strepera</i>	+	0.88	0.43	0.85	0.89	4.02	30.56	0.03	0.93	0.71	0.32	5
GRCA	Gray Catbird	<i>Dumetella carolinensis</i>	+	0.54	0.42	0.68	0.76	5.06	25.64	0	1	0.99	0.86	10
HOWR	House Wren	<i>Troglodytes aedon</i>	+	0.17	0.06	0.4	0.77	3.39	32.73	0.01	1	0.97	0.63	18
KILL	Killdeer	<i>Charadrius vociferus</i>	+	0.5	0.29	0.62	0.83	2.38	17.56	0.04	0.97	0.71	0.37	9
LEFL	Least Flycatcher	<i>Empidonax minimus</i>	+	0.33	0.06	0.38	0.88	2.51	23.82	0.03	0.96	0.89	0.46	14
LESC	Lesser Scaup	<i>Aythya affinis</i>	+	0.32	0.28	0.43	0.89	3.38	28	0.01	0.99	0.96	0.65	14
MAWR	Marsh Wren	<i>Cistothorus palustris</i>	+	0.88	0.78	0.83	0.88	6.78	40.93	0.01	0.98	0.91	0.79	5
NOFL	Northern Flicker	<i>Colaptes auratus</i>	+	0.74	0.43	0.75	0.83	2.84	16.31	0.02	0.99	0.67	0.49	6
PBGR	Pied-billed Grebe	<i>Podilymbus podiceps</i>	+	0.44	0.28	0.54	0.79	3.16	33.05	0.01	0.98	0.96	0.73	21
PHVI	Philadelphia Vireo	<i>Vireo philadelphicus</i>	+	0.78	0.29	0.77	0.87	2.92	21.11	0.04	0.93	0.73	0.39	8
REDH	Redhead	<i>Aythya americana</i>	+	0.74	0.69	0.76	0.88	5.44	23.08	0	1	0.96	0.79	6
RNGR	Red-necked Grebe	<i>Podiceps grisegena</i>	+	0.06	0.01	0.28	0.77	4.89	56.55	0	1	1	0.97	37
RUDU	Ruddy Duck	<i>Oxyura jamaicensis</i>	+	0.44	0.32	0.46	0.76	5.62	41.86	0	1	1	1	18
RWBL	Red-winged Blackbird	<i>Agelaius phoeniceus</i> <i>Passerculus</i>	+	0.42	0.28	0.42	0.6	7.68	68.94	0	0.99	0.99	0.99	52
SAVS	Savannah Sparrow	<i>sandwichensis</i>	+	0.43	0.32	0.48	0.87	5.06	33.89	0	1	0.99	0.9	17
SORA	Sora	<i>Porzana carolina</i>	+	0.17	0.02	0.31	0.83	4.09	54.27	0.01	1	0.99	0.91	38
SOSP	Song Sparrow	<i>Melospiza melodia</i>	+	0.24	0.02	0.28	0.7	8.49	76.66	0	1	1	1	53
VESP	Vesper Sparrow	<i>Pooecetes gramineus</i>	+	0.67	0.46	0.7	0.77	4.92	20	0	1	0.93	0.69	7
WEME	Western Meadowlark	<i>Sturnella neglecta</i> <i>Xanthocephalus</i>	+	0.44	0.4	0.73	0.92	2.42	13.95	0.02	0.96	0.63	0.38	6
YHBL	Yellow-headed Blackbird	<i>xanthocephalus</i>	+	0.78	0.75	0.77	0.83	7.63	33.33	0	0.99	0.97	0.91	6
YEWA	Yellow Warbler	<i>Setophaga petechia</i>	+	0.69	0.06	0.64	0.77	4.4	45.23	0	0.99	0.99	0.89	32

A4.1B. Landscape scale

Code	Common Name	Scientific Name	Response	Cp	5%	50%	95%	z	IndVal	P	Purity	rel05	rel01	N
ALFL	Alder Flycatcher	<i>Empidonax alnorum</i>	-	0.78	0.13	0.60	0.83	2.25	35.89	0.04	0.91	0.84	0.50	41
BOCH	Boreal Chickadee	<i>Poecile hudsonicus</i>	-	0.13	0.03	0.12	0.15	7.22	22.73	0.00	1.00	0.97	0.82	5
BOGU	Bonaparte's Gull	<i>Larus philadelphia</i>	-	0.41	0.03	0.34	0.52	3.72	19.53	0.01	1.00	0.95	0.72	13
CHSP	Chipping Sparrow	<i>Spizella passerina</i>	-	0.65	0.08	0.19	0.73	2.85	28.37	0.02	0.97	0.89	0.54	26
COLO	Common Loon	<i>Gavia immer</i>	-	0.11	0.06	0.12	0.30	8.48	57.83	0.00	1.00	1.00	1.00	29
CONW	Connecticut Warbler	<i>Oporornis agilis</i>	-	0.35	0.15	0.34	0.42	4.18	22.20	0.00	0.93	0.91	0.78	16
GRAJ	Gray Jay	<i>Perisoreus canadensis</i>	-	0.06	0.03	0.07	0.29	6.93	27.03	0.01	1.00	0.94	0.77	6
HETH	Hermit Thrush	<i>Catharus guttatus</i> <i>Ammodramus</i>	-	0.42	0.11	0.37	0.51	6.66	37.58	0.00	1.00	1.00	0.98	27
LCSP	LeConte's Sparrow	<i>leconteii</i>	-	0.21	0.12	0.27	0.91	3.64	31.04	0.01	0.81	0.76	0.61	29
LISP	Lincoln's Sparrow	<i>Melospiza lincolnii</i>	-	0.58	0.10	0.53	0.83	3.11	41.05	0.02	1.00	0.95	0.72	45
YRWA	Yellow-rumped Warbler	<i>Setophaga coronata</i>	-	0.19	0.05	0.24	0.87	2.92	38.46	0.02	0.88	0.84	0.63	47
NOFL	Northern Flicker	<i>Colaptes auratus</i>	-	0.34	0.09	0.31	0.87	1.97	8.96	0.02	0.77	0.49	0.26	6
OVEN	Ovenbird	<i>Seiurus aurocapillus</i>	-	0.21	0.13	0.27	0.56	7.14	42.53	0.00	1.00	1.00	0.99	28
RBGR	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	-	0.45	0.13	0.42	0.54	4.51	20.63	0.00	1.00	0.97	0.86	13
RCKI	Ruby-crowned Kinglet	<i>Regulus calendula</i>	-	0.47	0.15	0.54	0.76	4.21	30.51	0.00	1.00	1.00	0.83	29
RNDU	Ring-necked Duck	<i>Aythya collaris</i>	-	0.10	0.07	0.35	0.64	3.92	50.11	0.00	1.00	0.99	0.87	42
RNGR	Red-necked Grebe	<i>Podiceps grisegena</i>	-	0.64	0.36	0.62	0.73	5.17	45.77	0.00	0.97	0.97	0.91	40
SACR	Sandhill Crane	<i>Grus canadensis</i>	-	0.11	0.04	0.11	0.30	4.70	20.50	0.00	1.00	0.88	0.67	6
DEJU	Dark-eyed Junco	<i>Junco hyemalis</i>	-	0.34	0.17	0.31	0.47	7.28	40.20	0.00	1.00	1.00	1.00	31
SWSP	Swamp Sparrow	<i>Melospiza georgiana</i>	-	0.10	0.06	0.24	0.64	2.82	35.42	0.03	0.95	0.90	0.66	29
SWTH	Swainson's Thrush	<i>Catharus ustulatus</i>	-	0.30	0.13	0.31	0.47	5.87	27.44	0.00	0.97	0.97	0.95	17
TEWA	Tennessee Warbler	<i>Oreothlypis peregrina</i>	-	0.35	0.12	0.36	0.68	4.73	34.57	0.00	0.95	0.94	0.83	31
PAWA	Palm Warbler	<i>Setophaga palmarum</i>	-	0.03	0.03	0.20	0.38	4.11	33.22	0.03	0.99	0.92	0.79	11
WTSP	White-throated Sparrow	<i>Zonotrichia albicollis</i>	-	0.34	0.03	0.34	0.69	5.38	52.71	0.00	0.99	0.99	0.89	63
YBSA	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	-	0.05	0.03	0.06	0.87	4.32	27.88	0.02	0.86	0.63	0.40	9
AGWT	Green-winged Teal	<i>Anas crecca</i>	+	0.69	0.03	0.54	0.81	2.03	16.37	0.03	0.69	0.55	0.32	10
AMCO	American Coot	<i>Fulica americana</i>	+	0.15	0.12	0.30	0.56	4.90	43.49	0.01	1.00	1.00	0.96	39
AMCR	American Crow	<i>Corvus brachyrhynchos</i>	+	0.89	0.27	0.73	0.91	5.58	65.21	0.01	0.98	0.96	0.79	15

BAOR	Baltimore Oriole	<i>Icterus galbula</i>	+	0.47	0.22	0.50	0.73	4.38	16.97	0.01	1.00	0.94	0.67	9
BBMA	Black-billed Magpie	<i>Pica pica</i>	+	0.67	0.41	0.64	0.87	4.45	21.32	0.00	0.95	0.89	0.75	8
BHCO	Brown-headed Cowbird	<i>Molothrus ater</i>	+	0.14	0.14	0.34	0.83	3.78	25.00	0.00	1.00	1.00	0.79	19
BWTE	Blue-winged Teal	<i>Anas discors</i>	+	0.55	0.22	0.48	0.62	6.34	56.66	0.00	1.00	0.98	0.95	61
CCSP	Clay-colored Sparrow	<i>Spizella pallida</i>	+	0.55	0.12	0.56	0.79	3.80	42.57	0.00	0.99	0.97	0.74	44
EAGR	Eared Grebe	<i>Podiceps nigricollis</i>	+	0.60	0.52	0.62	0.83	4.62	12.00	0.02	0.96	0.74	0.52	3
GADW	Gadwall	<i>Anas strepera</i>	+	0.76	0.03	0.67	0.84	3.47	15.15	0.03	0.67	0.52	0.35	5
HOWR	House Wren	<i>Troglodytes aedon</i>	+	0.55	0.23	0.55	0.83	3.33	13.91	0.01	1.00	0.88	0.56	7
KILL	Killdeer	<i>Charadrius vociferus</i>	+	0.56	0.15	0.54	0.81	4.36	26.27	0.00	0.94	0.91	0.72	18
LEFL	Least Flycatcher	<i>Empidonax minimus</i>	+	0.30	0.06	0.29	0.88	2.32	27.81	0.05	0.79	0.68	0.39	32
MALL	Mallard	<i>Anas platyrhynchos</i>	+	0.14	0.04	0.15	0.86	2.15	39.91	0.04	0.98	0.86	0.46	52
MOWA	Mourning Warbler	<i>Oporornis philadelphia</i>	+	0.73	0.29	0.69	0.91	3.60	17.51	0.02	0.96	0.86	0.55	7
NOPI	Northern Pintail	<i>Anas acuta</i>	+	0.55	0.17	0.54	0.78	2.76	11.24	0.01	0.87	0.51	0.25	6
NSHO	Northern Shoveler	<i>Anas clypeata</i>	+	0.54	0.33	0.52	0.60	7.79	45.82	0.00	1.00	1.00	0.96	27
NSTS	Nelson's Sparrow	<i>Ammodramus nelsoni</i>	+	0.30	0.21	0.31	0.57	2.24	8.77	0.05	0.91	0.43	0.18	5
PBGR	Pied-billed Grebe	<i>Podilymbus podiceps</i>	+	0.51	0.09	0.47	0.91	3.25	25.87	0.01	0.91	0.84	0.58	23
RBNU	Red-breasted Nuthatch	<i>Sitta canadensis</i>	+	0.35	0.14	0.38	0.56	1.61	8.59	0.04	0.80	0.48	0.23	6
REDH	Redhead	<i>Aythya americana</i>	+	0.55	0.17	0.52	0.65	5.91	33.02	0.00	0.99	0.98	0.90	21
REVI	Red-eyed Vireo	<i>Vireo olivaceus</i>	+	0.13	0.11	0.16	0.88	2.06	35.88	0.04	0.73	0.58	0.33	42
RUDU	Ruddy Duck	<i>Oxyura jamaicensis</i>	+	0.36	0.13	0.37	0.52	6.50	38.98	0.00	1.00	1.00	1.00	32
RWBL	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	+	0.38	0.23	0.36	0.43	10.54	67.10	0.00	1.00	1.00	1.00	66
SAVS	Savannah Sparrow	<i>Passerculus sandwichensis</i>	+	0.65	0.25	0.54	0.69	7.96	45.15	0.00	1.00	1.00	1.00	23
SORA	Sora	<i>Porzana carolina</i>	+	0.35	0.07	0.33	0.47	4.64	52.68	0.00	1.00	1.00	0.91	70
SOSA	Solitary Sandpiper	<i>Tringa solitaria</i>	+	0.89	0.21	0.88	0.91	3.84	42.99	0.04	0.88	0.65	0.40	8
SOSP	Song Sparrow	<i>Melospiza melodia</i>	+	0.69	0.21	0.56	0.81	9.35	67.42	0.00	1.00	1.00	1.00	42
VESP	Vesper Sparrow	<i>Pooecetes gramineus</i>	+	0.76	0.42	0.67	0.81	10.38	45.70	0.00	1.00	1.00	0.99	13
YHBL	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	+	0.45	0.42	0.49	0.67	5.88	18.92	0.00	1.00	0.99	0.89	7
YEWA	Yellow Warbler	<i>Setophaga petechia</i>	+	0.30	0.10	0.29	0.57	4.72	42.96	0.00	1.00	0.98	0.86	44