

SUPPLEMENTAL INFORMATION

**MULTISCALE HABITAT FACTORS INFLUENCE THE OCCUPANCY AND
TURNOVER OF THE SUBURBAN HERPETOFAUNA OF CHICAGO,
ILLINOIS, USA**

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APPENDIX I. Directional hypotheses for covariates used to model the detection and occupancy dynamics of Blue-spotted Salamanders (*Ambystoma laterale*), Eastern Tiger Salamanders (*A. tigrinum*), Common Gartersnakes (*Thamnophis sirtalis*), Green Frogs (*Lithobates clamitans*), Northern Leopard Frogs (*L. pipiens*), Painted Turtles (*Chrysemys picta*), and Snapping Turtles (*Chelydra serpentina*) detected during April-May and July-August 2009-2012 at 27 Lake County Forest Preserve District properties in Lake County, Illinois, USA.

Variable	Description	Hypothesis						
		<i>A. laterale</i>	<i>A. tigrinum</i>	<i>T. sirtalis</i>	<i>L. clamitans</i>	<i>L. pipiens</i>	<i>C. picta</i>	<i>C. serpentina</i>
Group	Two-year group identity (binary)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Julian	Date of survey	+	+	+	+	+	+	+
Julian ²	Date of survey squared	-	-	-	-	-	-	-
Minutes	Time of day = number of minutes past 0500 hours	+	+	-	n/a	n/a	n/a	n/a
Minutes ²	Time of day ²	-	-	+	n/a	n/a	n/a	n/a
Temp	Temperature (°C) recorded at time of survey	-	-	-	+	+	+	+
Temp ²	Temperature ² (°C)	-	-	+	-	-	-	-
Rain	If raining during survey (binary)	-	-	-	n/a	n/a	n/a	n/a
Wind	If significantly windy during survey (binary)	+	+	+	n/a	n/a	n/a	n/a
Response	If a target species had been detected during a previous visit	+	+	-	n/a	n/a	-	-
Minnow	Number of traps minnow traps	+	+	+	+	+	+	+
Medium	Number of medium hoop nets	+	+	+	+	+	+	+
Large	Number of large hoop nets	+	+	+	+	+	+	+
Survey	Estimated separate detection probabilities for each survey	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Season	Estimated separate detection probabilities for each season	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Effort	Number of sites surveyed on each preserve	+	+	+	+	+	+	+
PC1 _{Aquatic}	indicative of closed canopy ephemeral ponds	n/a	n/a	n/a	+	-	-	-
PC2 _{Aquatic}	indicative of open canopy wetlands	n/a	n/a	n/a	+	+	+	+
PC1 _{Terrestrial}	indicative of closed canopy sparse understory	+	+	-	n/a	n/a	n/a	n/a

PC2	Terrestrial	indicative of tall herbaceous growth, mesic	-	+	+	n/a	n/a	n/a	n/a
PC3	Terrestrial	indicative of short herbaceous growth, old fields	-	+	+	n/a	n/a	n/a	n/a
	Bask	Presence (binary) of basking spots (logs, boulders, exposed banks with shallow slopes, etc.)	n/a	n/a	n/a	+	+	+	+
	Urban	Distance (m) to nearest urban structure	-	-	-	-	-	+	+
	Road	Distance (m) to nearest paved road	-	-	-	-	-	+	+
	Prairie	Amount (ha) of prairie habitat within a preserve	-	+	+	-	+	+	+
	Forest	Amount (ha) of forest habitat within a preserve	+	+	-	+	-	-	-
	Forest_ED	Amount (m/ha) of forest edge within a preserve	+	+	+	-	+	-	-
	Shrub	Amount (ha) of shrub habitat within a preserve	n/a	n/a	+	n/a	n/a	n/a	n/a
	Wetland	Amount (ha) of wetland	-	+	+	+	+	+	+
	Wetland_ED	Amount (m/ha) of wetland edge within a preserve	+	+	+	+	+	+	+
	Urban_Buffer	Percentage of 100-m buffer around a preserve comprised of urban structure	-	-	-	-	-	-	-
	Road_Buffer	Density (m/ha) of paved roads within a 100 m buffer around the preserve	-	-	-	-	-	-	-
	Isolation	Average distance (km) between each preserve and all other preserves	-	-	-	-	-	-	-

APPENDIX II. Complete detection (p) model sets at 2 spatial scales (local and landscape) for Blue-spotted Salamanders (*Ambystoma laterale*), Eastern Tiger Salamanders (*A. tigrinum*), Common Gartersnakes (*Thamnophis sirtalis*), Green Frogs (*Lithobates clamitans*), Northern Leopard Frogs (*L. pipiens*), Painted Turtles (*Chrysemys picta*), and Snapping Turtles (*Chelydra serpentina*) from April-May and July-August 2009-2012 on 27 Lake County Forest Preserve District properties in Lake County, Illinois, USA. While estimating p for each species at each scale, colonization and extinction were held constant (null). See Tables 2 and 3 for covariate descriptions.

Species (scale) Model	AIC _c ^a	ΔAIC _c ^b	ω ^c	K ^d	-2Log(L) ^e
<i>A. laterale</i> (local)					
Season	666.93	0.00	0.9754	7	652.19
Survey	674.66	7.73	0.0204	11	650.86
Julian	680.44	13.51	0.0011	5	670.05
Temp + Temp ²	681.08	14.15	0.0008	6	668.53
Global	682.41	15.48	0.0004	14	651.49
Julian + Julian ²	682.42	15.49	0.0004	6	669.87
Temp	682.58	15.65	0.0004	5	672.19
Minutes + Minutes ²	682.96	16.03	0.0003	6	670.41
Minutes	683.29	16.36	0.0003	5	672.90
Response	685.00	18.07	0.0001	5	674.61
Rain	685.70	18.77	0.0001	5	675.31
Null	685.90	18.97	0.0001	4	677.64
Group	687.10	20.17	0.0000	5	676.71
Wind	687.51	20.58	0.0000	5	677.12
<i>A. laterale</i> (landscape)					
Effort	193.71	0.00	0.8691	5	180.85
Null	197.60	3.89	0.1243	4	187.78
Season	203.45	9.74	0.0067	7	183.56
Survey	221.52	27.81	0.0000	11	181.92
<i>A. tigrinum</i> (local)					
Julian	243.30	0.00	0.2084	5	232.91
Wind	243.91	0.61	0.1536	5	233.52
Null	244.11	0.81	0.1390	4	235.85
Temp	244.67	1.37	0.1051	5	234.28
Julian + Julian ²	244.80	1.50	0.0985	6	232.25
Group	245.14	1.84	0.0831	5	234.75
Rain	246.17	2.87	0.0496	5	235.78
Minutes	246.24	2.94	0.0479	5	235.85
Temp + Temp ²	246.64	3.34	0.0392	6	234.09
Season	247.04	3.74	0.0321	7	232.30
Minutes + Minutes ²	247.93	4.63	0.0206	6	235.38
Global	248.40	5.10	0.0163	14	217.48
Survey	250.22	6.92	0.0066	11	226.42
Response	265.74	22.44	0.0000	5	255.35

<i>A. tigrinum</i> (landscape)					
Effort	83.50	0.00	0.8380	5	70.64
Null	86.80	3.30	0.1609	4	76.98
Season	96.87	13.37	0.0010	7	76.98
Survey	116.58	33.08	0.0000	11	76.98
<i>T. sirtalis</i> (local)					
Group + Minutes + Minutes ²	639.36	0.00	0.9368	7	624.62
Global	647.96	8.60	0.0127	14	617.04
Group	647.99	8.63	0.0125	5	637.60
Group + Julian + Julian ²	649.59	10.23	0.0056	7	634.85
Group + Minutes	649.77	10.41	0.0051	6	637.22
Group + Julian	649.91	10.55	0.0048	6	637.36
Group + Temp + Temp ²	650.09	10.73	0.0044	7	635.35
Group + Wind	650.09	10.73	0.0044	6	637.54
Group + Response	650.11	10.75	0.0043	6	637.56
Group + Temp	650.13	10.77	0.0043	6	637.58
Group + Rain	650.14	10.78	0.0043	6	637.59
Group + Season	653.73	14.37	0.0007	8	636.77
Group + Survey	658.72	19.36	0.0001	12	632.58
Null	661.64	22.28	0.0000	4	653.38
<i>T. sirtalis</i> (landscape)					
Effort	218.20	0.00	0.9963	5	205.34
Null	229.47	11.27	0.0036	4	219.65
Season	236.48	18.28	0.0001	7	216.59
Survey	245.18	26.98	0.0000	11	205.58
<i>L. clamitans</i> (local)					
Global	965.25	0.00	0.5265	12	938.41
Group + Medium	965.55	0.30	0.4532	6	952.83
Group + Temp + Temp ²	973.43	8.18	0.0088	7	958.46
Group + Minnow	974.42	9.17	0.0054	6	961.70
Group + Julian	976.20	10.95	0.0022	6	963.48
Group	977.83	12.58	0.0010	5	967.32
Group + Julian + Julian ²	978.07	12.82	0.0009	7	963.10
Null	978.15	12.90	0.0008	4	969.81
Group + Season	979.35	14.10	0.0005	8	962.09
Group + Response	979.56	14.31	0.0004	6	966.84
Group + Temp	979.66	14.41	0.0004	6	966.94
Group + Survey	995.70	30.45	0.0000	20	947.46
<i>L. clamitans</i> (landscape)					
Effort	391.90	0.00	0.8646	5	379.04
Null	395.63	3.73	0.1339	4	385.81
Season	404.59	12.69	0.0015	7	384.70
Survey	523.74	131.84	0.0000	19	377.17
<i>L. pipiens</i> (local)					
Group + Julian + Julian ²	418.67	0.00	0.8466	7	403.70
Group + Julian	423.27	4.60	0.0849	6	410.55

Group + Temp	425.80	7.13	0.0240	6	413.08
Global	426.86	8.19	0.0141	12	400.02
Group + Temp + Temp ²	427.53	8.86	0.0101	7	412.56
Group + Season	428.33	9.66	0.0068	8	411.07
Group + Medium	429.05	10.38	0.0047	6	416.33
Group	429.92	11.25	0.0031	5	419.41
Group + Response	430.01	11.34	0.0029	6	417.29
Null	430.92	12.25	0.0019	4	422.58
Group + Minnow	432.08	13.41	0.0010	6	419.36
Group + Survey	448.84	30.17	0.0000	20	400.60
<i>L. pipiens</i> (landscape)					
Effort	248.61	0.00	0.7505	5	235.75
Null	250.89	2.28	0.2400	4	241.07
Season	257.35	8.74	0.0095	7	237.46
Survey	370.45	121.84	0.0000	19	223.88
<i>C. picta</i> (local)					
Global	994.11	0.00	0.9999	12	967.27
Group + Large	1013.23	19.12	0.0001	6	1000.51
Group + Survey	1049.27	55.16	0.0000	20	1001.03
Group + Response	1050.83	56.72	0.0000	6	1038.11
Group + Season	1052.36	58.25	0.0000	8	1035.10
Group + Medium	1054.96	60.85	0.0000	6	1042.24
Group + Temp	1055.17	61.06	0.0000	6	1042.45
Group + Temp + Temp ²	1057.12	63.01	0.0000	7	1042.15
Group	1058.00	63.89	0.0000	5	1047.49
Null	1058.18	64.07	0.0000	4	1049.84
Group + Julian	1058.99	64.88	0.0000	6	1046.27
Group + Julian + Julian ²	1060.73	66.62	0.0000	7	1045.76
<i>C. picta</i> (landscape)					
Effort	417.38	0.00	0.7955	5	404.52
Null	420.74	3.36	0.1483	4	410.92
Season	422.68	5.30	0.0562	7	402.79
Survey	529.51	112.13	0.0000	19	382.94
<i>C. serpentina</i> (local)					
Global	665.66	0.00	0.9814	12	638.82
Large	673.84	8.18	0.0164	5	663.33
Julian	679.93	14.27	0.0008	5	669.42
Julian + Julian ²	681.06	15.40	0.0004	6	668.34
Temp	681.37	15.71	0.0004	5	670.86
Temp + Temp ²	681.83	16.17	0.0003	6	669.11
Season	682.14	16.48	0.0003	7	667.17
Survey	686.38	20.72	0.0000	19	641.00
Medium	695.63	29.97	0.0000	5	685.12
Response	695.80	30.14	0.0000	5	685.29
Null	697.31	31.65	0.0000	4	688.97
Group	697.96	32.30	0.0000	5	687.45

C. serpentina (landscape)

Season	362.50	0.00	0.5795	7	342.61
Effort	364.32	1.82	0.2333	5	351.46
Null	364.76	2.26	0.1872	4	354.94
Survey	461.80	99.30	0.0000	19	315.23

^aAkaike Information Criterion adjusted for small samples. ^bDifference in current model from the top model. ^cModel weight, interpreted as the relative model likelihood. ^dNumber of model parameters estimated. ^e $-2\text{Log}(\textit{Likelihood})$, interpreted as a measure of model fit.

APPENDIX III. Complete occupancy (ψ) model sets at 2 spatial scales (local and landscape) for Blue-spotted Salamanders (*Ambystoma laterale*), Eastern Tiger Salamanders (*A. tigrinum*), Common Gartersnakes (*Thamnophis sirtalis*), Green Frogs (*Lithobates clamitans*), Northern Leopard Frogs (*L. pipiens*), Painted Turtles (*Chrysemys picta*), and Snapping Turtles (*Chelydra serpentina*) from April-May and July-August 2009-2012 on 27 Lake County Forest Preserve District properties in Lake County, Illinois, USA. While estimating ψ for each species at each scale, colonization and extinction were held constant (null) while the most parsimonious detectability models from each scale were held constant (Appendix III). See Tables 2 and 3 for covariate descriptions.

Species (scale) Model	AIC _c ^a	Δ AIC _c ^b	ω ^c	K ^d	-2Log(L) ^e
<i>A. laterale</i> (local)					
Group + PC1 + PC2	638.26	0.00	0.5231	10	616.77
Group + PC1 + PC2 + PC3	639.85	1.59	0.2362	11	616.05
Global	640.64	2.38	0.1591	13	612.13
Group + PC1 + PC3	643.30	5.04	0.0421	10	621.81
Group + PC1	643.43	5.17	0.0394	9	624.22
Group + PC2	657.93	19.67	0.0000	9	638.72
Group + PC2 + PC3	660.09	21.83	0.0000	10	638.60
Group	661.67	23.41	0.0000	8	644.71
Group + PC3	663.59	25.33	0.0000	9	644.38
Group + Road	663.67	25.41	0.0000	9	644.46
Group + Urban	663.78	25.52	0.0000	9	644.57
Group + Urban + Road	665.94	27.68	0.0000	10	644.45
Null	666.93	28.67	0.0000	7	652.19
<i>A. laterale</i> (landscape)					
Forest	188.30	0.00	0.8561	6	172.10
Null	193.71	5.41	0.0573	5	180.85
Wetland_ED	195.66	7.36	0.0216	6	179.46
Forest_ED	195.95	7.65	0.0187	6	179.75
Prairie	196.71	8.41	0.0128	6	180.51
Road_Buffer	196.87	8.57	0.0118	6	180.67
Wetland	197.01	8.71	0.0110	6	180.81
Urban_Buffer	197.05	8.75	0.0108	6	180.85
<i>A. tigrinum</i> (local)					
PC1 + PC2	237.24	0.00	0.3972	7	222.50
PC2	238.00	0.76	0.2716	6	225.45
PC1 + PC2 + PC3	239.32	2.08	0.1404	8	222.36
PC2 + PC3	240.18	2.94	0.0913	7	225.44
Global	243.23	5.99	0.0199	10	221.74
Null	243.30	6.06	0.0192	5	232.91
PC1	243.46	6.22	0.0177	6	230.91
Road	244.25	7.01	0.0119	6	231.70
PC1 + PC3	244.75	7.51	0.0093	7	230.01

Urban	244.85	7.61	0.0088	6	232.30
PC3	244.94	7.70	0.0085	6	232.39
Urban + Road	246.39	9.15	0.0041	7	231.65
<i>A. tigrinum</i> (landscape)					
Null	86.80	0.00	0.3415	4	76.98
Road_Buffer	87.54	0.74	0.2359	5	74.68
Wetland_ED	89.35	2.55	0.0954	5	76.49
Forest_ED	89.54	2.74	0.0868	5	76.68
Wetland	89.67	2.87	0.0813	5	76.81
Forest	89.70	2.90	0.0801	5	76.84
Urban_Buffer	89.73	2.93	0.0789	5	76.87
<i>T. sirtalis</i> (local)					
PC1 + PC2	628.02	0.00	0.5078	9	608.81
PC1 + PC2 + PC3	628.66	0.64	0.3687	10	607.17
PC1	632.14	4.12	0.0647	8	615.18
PC1 + PC3	634.39	6.37	0.0210	9	615.18
Global	635.04	7.02	0.0152	13	606.53
PC2	635.48	7.46	0.0122	8	618.52
PC2 + PC3	636.98	8.96	0.0058	9	617.77
Null	639.36	11.34	0.0018	7	624.62
Urban	641.01	12.99	0.0008	8	624.05
Group	641.41	13.39	0.0006	8	624.45
PC3	641.54	13.52	0.0006	8	624.58
Road	641.55	13.53	0.0006	8	624.59
Urban + Road	642.45	14.43	0.0004	9	623.24
<i>T. sirtalis</i> (landscape)					
Null	218.20	0.00	0.2344	5	205.34
Shrub	218.55	0.35	0.1968	6	202.35
Road_Buffer	219.38	1.18	0.1299	6	203.18
Wetland_ED	219.47	1.27	0.1242	6	203.27
Forest	220.05	1.85	0.0929	6	203.85
Urban_Buffer	220.75	2.55	0.0655	6	204.55
Wetland	220.85	2.65	0.0623	6	204.65
Forest_ED	221.36	3.16	0.0483	6	205.16
Prairie	221.47	3.27	0.0457	6	205.27
<i>L. clamitans</i> (local)					
Road	963.14	0.00	0.3910	13	933.80
Urban + Road	964.43	1.29	0.2051	14	932.54
Null	965.25	2.11	0.1361	12	938.41
PC2	967.07	3.93	0.0548	13	937.73
Group	967.63	4.49	0.0414	13	938.29
PC1	967.64	4.50	0.0412	13	938.30
Bask	967.73	4.59	0.0394	13	938.39
Urban	967.75	4.61	0.0390	13	938.41
Global	968.32	5.18	0.0293	18	925.74
PC1 + PC2	969.33	6.19	0.0177	14	937.44

PC1 + PC2 + Bask	971.91	8.77	0.0049	15	937.42
<i>L. clamitans</i> (landscape)					
Forest	391.72	0.00	0.3181	6	375.52
Null	391.90	0.18	0.2907	5	379.04
Road_Buffer	394.17	2.45	0.0934	6	377.97
Wetland_ED	394.84	3.12	0.0668	6	378.64
Prairie	394.92	3.20	0.0642	6	378.72
Forest_ED	395.15	3.43	0.0572	6	378.95
Urban_Buffer	395.24	3.52	0.0547	6	379.04
Wetland	395.24	3.52	0.0547	6	379.04
<i>L. pipiens</i> (local)					
Group	413.83	0.00	0.2283	8	396.57
Group + Urban + Road	414.15	0.32	0.1945	10	392.19
Group + Urban	414.95	1.12	0.1304	9	395.36
Group + PC1	415.24	1.41	0.1128	9	395.65
Group + Road	415.26	1.43	0.1117	9	395.67
Group + PC2	416.06	2.23	0.0748	9	396.47
Group + Bask	416.15	2.32	0.0716	9	396.56
Group + PC1 + PC2	417.54	3.71	0.0357	10	395.58
Null	418.67	4.84	0.0203	7	403.70
Group + PC1 + PC2 + Bask	419.88	6.05	0.0111	11	395.50
Global	420.31	6.48	0.0089	13	390.97
<i>L. pipiens</i> (landscape)					
Prairie	243.83	0.00	0.4585	6	227.63
Wetland	243.89	0.06	0.4449	6	227.69
Null	248.61	4.78	0.0420	5	235.75
Road_Buffer	250.63	6.80	0.0153	6	234.43
Wetland_ED	250.94	7.11	0.0131	6	234.74
Forest	251.61	7.78	0.0094	6	235.41
Forest_ED	251.82	7.99	0.0084	6	235.62
Urban_Buffer	251.85	8.02	0.0083	6	235.65
Global	265.26	21.43	0.0000	12	218.97
<i>C. picta</i> (local)					
PC1 + PC2	991.09	0.00	0.2850	14	959.20
PC2	991.48	0.39	0.2345	13	962.14
PC1	992.12	1.03	0.1703	13	962.78
PC1 + PC2 + Bask	993.04	1.95	0.1075	15	958.55
Null	994.11	3.02	0.0630	12	967.27
Bask	994.20	3.11	0.0602	13	964.86
Road	996.13	5.04	0.0229	13	966.79
Group	996.23	5.14	0.0218	13	966.89
Urban	996.61	5.52	0.0180	13	967.27
Global	997.85	6.76	0.0097	18	955.27

Road + Urban	998.52	7.43	0.0069	14	966.63
<i>C. picta</i> (landscape)					
Wetland	408.62	0.00	0.7188	6	392.42
Wetland_ED	410.75	2.13	0.2478	6	394.55
Forest_ED	417.05	8.43	0.0106	6	400.85
Null	417.38	8.76	0.0090	5	404.52
Road_Buffer	418.57	9.95	0.0050	6	402.37
Prairie	418.60	9.98	0.0049	6	402.40
Urban_Buffer	420.09	11.47	0.0023	6	403.89
Forest	420.81	12.19	0.0016	6	404.61
<i>C. serpentina</i> (local)					
PC2	662.01	0.00	0.6862	13	632.67
Null	665.66	3.65	0.1106	12	638.82
PC1	665.78	3.77	0.1042	13	636.44
Urban	667.98	5.97	0.0347	13	638.64
Road	668.11	6.10	0.0325	13	638.77
Group	668.15	6.14	0.0319	13	638.81
<i>C. serpentina</i> (landscape)					
Wetland	361.02	0.00	0.5308	8	337.02
Null	362.50	1.48	0.2533	7	342.61
Forest_ED	366.02	5.00	0.0436	8	342.02
Road_Buffer	366.36	5.34	0.0368	8	342.36
Urban_Buffer	366.47	5.45	0.0348	8	342.47
Prairie	366.50	5.48	0.0343	8	342.50
Forest	366.51	5.49	0.0341	8	342.51
Wetland_ED	366.61	5.59	0.0324	8	342.61

^aAkaike Information Criterion adjusted for small samples. ^bDifference in current model from the top model. ^cModel weight, interpreted as the relative model likelihood. ^dNumber of model parameters estimated. ^e $-2\text{Log}(\text{Likelihood})$, interpreted as a measure of model fit.

APPENDIX IV. Complete colonization (γ) and extinction (ε) model sets at 2 spatial scales (local and landscape) for Blue-spotted Salamanders (*Ambystoma laterale*), Eastern Tiger Salamanders (*A. tigrinum*), Common Gartersnakes (*Thamnophis sirtalis*), Green Frogs (*Lithobates clamitans*), Northern Leopard Frogs (*L. pipiens*), Painted Turtles (*Chrysemys picta*), and Snapping Turtles (*Chelydra serpentina*) from April-May and July-August 2009-2012 on 27 Lake County Forest Preserve District properties in Lake County, Illinois, USA. While estimating γ or ε for each species at each scale, the most parsimonious local and landscape detectability (p , Appendix 3) and site occupancy (ψ , Appendix 4) models were held constant. See Tables 2 and 3 for covariate descriptions.

Species (scale, parameter) Model	AIC _c ^a	Δ AIC _c ^b	ω ^c	K ^d	$-2\text{Log}(L)$ ^e
<i>A. laterale</i> (local, $\gamma \approx \varepsilon$)	n/a	n/a	n/a	n/a	n/a
<i>A. laterale</i> (landscape, γ)					
Isolation	185.81	0.00	0.5266	7	165.92
Null	188.30	2.49	0.1516	6	172.10
Road_Buffer	189.22	3.41	0.0957	7	169.33
Prairie	190.06	4.25	0.0629	7	170.17
Wetland_ED	190.78	4.97	0.0439	7	170.89
Forest	191.03	5.22	0.0387	7	171.14
Wetland	191.42	5.61	0.0319	7	171.53
Forest_ED	191.94	6.13	0.0246	7	172.05
Urban_Buffer	191.98	6.17	0.0241	7	172.09
<i>A. tigrinum</i> (local, ε)					
PC3	229.33	0.00	0.4449	8	212.37
PC1 + PC3	230.70	1.37	0.2243	9	211.49
PC2 + PC3	231.05	1.72	0.1883	9	211.84
PC2	234.37	5.04	0.0358	8	217.41
Road	234.68	5.35	0.0307	8	217.72
Urban	235.14	5.81	0.0244	8	218.18
Urban + Road	235.30	5.97	0.0225	9	216.09
PC1 + PC2	236.38	7.05	0.0131	9	217.17
Null	237.24	7.91	0.0085	7	222.50
PC1	238.36	9.03	0.0049	8	221.40
Group	239.46	10.13	0.0028	8	222.50
<i>A. tigrinum</i> (landscape, ε)					
Urban_Buffer	81.02	0.00	0.4575	5	68.16
Forest	81.21	0.19	0.4160	5	68.35
Forest_ED	85.05	4.03	0.0610	5	72.19
Null	86.80	5.78	0.0254	4	76.98
Isolation	88.14	7.12	0.0130	5	75.28
Prairie	88.80	7.78	0.0094	5	75.94
Road_Buffer	89.62	8.60	0.0062	5	76.76
Wetland	89.77	8.75	0.0058	5	76.91

Wetland_ED	89.77	8.75	0.0058	5	76.91
<i>T. sirtalis</i> (local, ε)					
PC1	619.06	0.00	0.4102	10	597.57
PC1 + PC2 + PC3	620.34	1.28	0.2163	12	594.20
PC1 + PC2	620.54	1.48	0.1957	11	596.74
PC1 + PC3	621.05	1.99	0.1517	11	597.25
Global	626.36	7.30	0.0107	15	593.00
Null	628.02	8.96	0.0046	9	608.81
PC2	629.65	10.59	0.0021	10	608.16
PC2 + PC3	629.84	10.78	0.0019	11	606.04
Group	629.99	10.93	0.0017	10	608.50
Urban	630.01	10.95	0.0017	10	608.52
Road	630.02	10.96	0.0017	10	608.53
PC3	630.09	11.03	0.0017	10	608.60
<i>T. sirtalis</i> (landscape, γ)					
Prairie	215.30	0.00	0.4508	6	199.10
Isolation	217.15	1.85	0.1787	6	200.95
Null	218.20	2.90	0.1057	5	205.34
Wetland_ED	218.59	3.29	0.0870	6	202.39
Forest_ED	219.14	3.84	0.0661	6	202.94
Forest	219.92	4.62	0.0447	6	203.72
Wetland	221.04	5.74	0.0256	6	204.84
Road_Buffer	221.39	6.09	0.0215	6	205.19
Urban_Buffer	221.54	6.24	0.0199	6	205.34
<i>L. clamitans</i> (local, ε)					
Group + PC1	958.00	0.00	0.2035	15	928.00
Group	958.03	0.03	0.2005	14	930.03
Group + PC2	959.39	1.39	0.1016	15	929.39
Group + Road	959.57	1.57	0.0928	15	929.57
Group + PC1 + PC2	959.73	1.73	0.0857	16	927.73
Group + Bask	959.74	1.74	0.0853	15	929.74
Null	959.80	1.80	0.0828	13	933.80
Group + Urban	960.02	2.02	0.0741	15	930.02
Group + PC1 + PC2 + Bask	961.25	3.25	0.0401	17	927.25
Group + Urban + Road	961.94	3.94	0.0284	16	929.94
Global	965.35	7.35	0.0052	19	927.35
<i>L. clamitans</i> (landscape, γ)					
Forest_ED	388.42	0.00	0.4620	7	368.53
Wetland	390.04	1.62	0.2055	7	370.15
Null	391.72	3.30	0.0887	6	375.52
Forest	392.20	3.78	0.0698	7	372.31
Wetland_ED	392.27	3.85	0.0674	7	372.38
Urban_Buffer	393.29	4.87	0.0405	7	373.40

Prairie	393.62	5.20	0.0343	7	373.73
Isolation	395.06	6.64	0.0167	7	375.17
Road_Buffer	395.26	6.84	0.0151	7	375.37
<i>L. pipiens</i> (local, ϵ)					
PC2	408.25	0.00	0.4150	9	390.25
PC1 + PC2	409.95	1.70	0.1774	10	389.95
PC1	410.91	2.66	0.1098	9	392.91
PC1 + PC2 + Bask	411.38	3.13	0.0868	11	389.38
Urban	412.45	4.20	0.0508	9	394.45
Null	412.57	4.32	0.0479	8	396.57
Urban + Road	413.03	4.78	0.0380	10	393.03
Group	413.17	4.92	0.0355	9	395.17
Road	414.21	5.96	0.0211	9	396.21
Bask	414.55	6.30	0.0178	9	396.55
<i>L. pipiens</i> (landscape, γ)					
Forest_ED	240.49	0.00	0.5797	7	220.60
Null	243.83	3.34	0.1091	6	227.63
Isolation	244.19	3.70	0.0912	7	224.30
Urban_Buffer	244.86	4.37	0.0652	7	224.97
Wetland	245.79	5.30	0.0410	7	225.90
Prairie	246.08	5.59	0.0354	7	226.19
Wetland_ED	246.29	5.80	0.0319	7	226.40
Road_Buffer	246.64	6.15	0.0268	7	226.75
Forest	247.25	6.76	0.0197	7	227.36
<i>C. picta</i> (local, γ)					
Group + Bask	985.14	0.00	0.3334	16	948.01
Group + PC1 + PC2 + Bask	986.27	1.13	0.1895	18	943.69
Group + PC2	986.32	1.18	0.1848	16	949.19
Group + PC1	988.07	2.93	0.0770	16	950.94
Group + PC1 + PC2	988.08	2.94	0.0766	17	948.25
Global	989.14	4.00	0.0451	20	940.90
Group	989.36	4.22	0.0404	15	954.87
Group + Road	990.97	5.83	0.0181	16	953.84
Null	991.09	5.95	0.0170	14	959.20
Group + Urban	991.86	6.72	0.0116	16	954.73
Group + Urban + Road	993.02	7.88	0.0065	17	953.19
<i>C. picta</i> (landscape, γ)					
Forest_ED	415.35	0.00	0.4225	6	399.15
Prairie	415.74	0.39	0.3477	6	399.54
Road_Buffer	418.65	3.30	0.0811	6	402.45
Null	418.68	3.33	0.0799	5	405.82
Isolation	420.54	5.19	0.0315	6	404.34
Urban_Buffer	421.32	5.97	0.0214	6	405.12

Forest	421.92	6.57	0.0158	6	405.72
<i>C. serpentina</i> (local, γ)					
Road	660.01	0.00	0.4058	14	628.12
Urban + Road	661.80	1.79	0.1658	15	627.31
Null	662.01	2.00	0.1493	13	632.67
PC1	663.41	3.40	0.0741	14	631.52
Group	664.39	4.38	0.0454	14	632.50
PC2	664.44	4.43	0.0443	14	632.55
Urban	664.49	4.48	0.0432	14	632.60
Bask	664.56	4.55	0.0417	14	632.67
PC1 + PC2	665.82	5.81	0.0222	15	631.33
PC1 + PC2 + Bask	668.18	8.17	0.0068	16	631.05
Global	671.34	11.33	0.0014	19	625.96
<i>C. serpentina</i> (landscape, $\gamma \approx \varepsilon$)	n/a	n/a	n/a	n/a	n/a

^aAkaike Information Criterion adjusted for small samples. ^dDifference in current model from the top model. ^cModel weight, interpreted as the relative model likelihood. ^dNumber of model parameters estimated. ^e $-2\text{Log}(\text{Likelihood})$, interpreted as a measure of model fit.

APPENDIX V. Beta values and standard errors for significant covariates used in dynamic occupancy modeling for Blue-spotted Salamanders (*Ambystoma laterale*), Eastern Tiger Salamanders (*A. tigrinum*), Common Gartersnakes (*Thamnophis sirtalis*), Green Frogs (*Lithobates clamitans*), Northern Leopard Frogs (*L. pipiens*), Painted Turtles (*Chrysemys picta*), and Snapping Turtles (*Chelydra serpentina*) from April-May and July-August 2009-2012 on 27 Lake County Forest Preserve District properties in Lake County, Illinois, USA.

Species	Scale	Parameter	Covariate	β	SE
<i>A. laterale</i>	Landscape	Colonization	Forest	0.80	0.03
<i>A. laterale</i>	Landscape	Colonization	Isolation	-1.18	0.33
<i>A. laterale</i>	Landscape	Colonization	Prairie	0.60	0.03
<i>A. laterale</i>	Landscape	Colonization	Road Buffer	0.68	0.04
<i>A. laterale</i>	Landscape	Colonization	Wetland	0.37	0.02
<i>A. laterale</i>	Landscape	Detection	Effort	1.30	0.45
<i>A. laterale</i>	Landscape	Occupancy	Forest	1.63	0.63
<i>A. laterale</i>	Local	Occupancy	PC1 _{Terrestrial}	1.42	0.32
<i>A. laterale</i>	Local	Occupancy	PC3 _{Terrestrial}	-0.27	0.13
<i>A. tigrinum</i>	Landscape	Extinction	Forest	10.36	3.05
<i>A. tigrinum</i>	Landscape	Extinction	Forest_ED	-2.68	0.12
<i>A. tigrinum</i>	Landscape	Occupancy	Forest_ED	0.40	0.06
<i>A. tigrinum</i>	Landscape	Occupancy	Wetland	0.29	0.05
<i>A. tigrinum</i>	Landscape	Occupancy	Wetland_ED	-0.92	0.15
<i>A. tigrinum</i>	Local	Extinction	PC1 _{Terrestrial}	0.94	0.24
<i>A. tigrinum</i>	Local	Extinction	PC2 _{Terrestrial}	-0.62	0.17
<i>A. tigrinum</i>	Local	Extinction	PC3 _{Terrestrial}	5.15	2.47
<i>A. tigrinum</i>	Local	Extinction	Road	-2.85	0.05
<i>A. tigrinum</i>	Local	Occupancy	PC1 _{Terrestrial}	1.23	0.41
<i>A. tigrinum</i>	Local	Occupancy	PC2 _{Terrestrial}	1.96	0.78
<i>C. serpentina</i>	Landscape	Occupancy	Forest_ED	-0.76	0.07
<i>C. serpentina</i>	Landscape	Occupancy	Prairie	-0.22	0.02
<i>C. serpentina</i>	Landscape	Occupancy	Road Buffer	-0.36	0.03
<i>C. serpentina</i>	Landscape	Occupancy	Urban buffer	-0.22	0.02
<i>C. serpentina</i>	Landscape	Occupancy	Wetland	10.56	3.90
<i>C. serpentina</i>	Local	Colonization	PC1 _{Terrestrial}	-0.41	0.03
<i>C. serpentina</i>	Local	Colonization	PC2 _{Aquatic}	-0.23	0.03
<i>C. serpentina</i>	Local	Colonization	Road	-0.88	0.29
<i>C. serpentina</i>	Local	Colonization	Urban	0.31	0.09
<i>C. serpentina</i>	Local	Detection	Large	0.60	0.14
<i>C. serpentina</i>	Local	Occupancy	PC1 _{Terrestrial}	-0.75	0.06

<i>C. serpentina</i>	Local	Occupancy	PC2 _{Aquatic}	3.39	1.28
<i>C. picta</i>	Landscape	Colonization	Forest_ED	-1.43	0.32
<i>C. picta</i>	Landscape	Colonization	Prairie	13.06	2.58
<i>C. picta</i>	Landscape	Colonization	Road Buffer	-1.04	0.05
<i>C. picta</i>	Landscape	Detection	Effort	0.58	0.11
<i>C. picta</i>	Landscape	Occupancy	Wetland	9.83	4.70
<i>C. picta</i>	Landscape	Occupancy	Wetland_ED	4.02	0.47
<i>C. picta</i>	Local	Colonization	PC2 _{Aquatic}	1.22	0.52
<i>C. picta</i>	Local	Colonization	Road	-1.04	0.05
<i>C. picta</i>	Local	Colonization	Urban	-1.43	0.32
<i>C. picta</i>	Local	Detection	Large	1.08	0.13
<i>C. picta</i>	Local	Detection	Medium	0.48	0.10
<i>C. picta</i>	Local	Detection	Temp	0.45	0.16
<i>C. picta</i>	Local	Occupancy	PC1 _{Terrestrial}	-0.62	0.21
<i>C. picta</i>	Local	Occupancy	PC2 _{Aquatic}	0.80	0.24
<i>L. clamitans</i>	Landscape	Colonization	Forest	0.84	0.04
<i>L. clamitans</i>	Landscape	Colonization	Forest_ED	-1.64	0.46
<i>L. clamitans</i>	Landscape	Colonization	Urban buffer	-0.64	0.02
<i>L. clamitans</i>	Landscape	Colonization	Wetland	1.20	0.13
<i>L. clamitans</i>	Landscape	Colonization	Wetland_ED	1.97	0.12
<i>L. clamitans</i>	Landscape	Detection	Effort	0.43	0.15
<i>L. clamitans</i>	Landscape	Occupancy	Forest	0.94	0.19
<i>L. clamitans</i>	Landscape	Occupancy	Forest_ED	-0.13	0.02
<i>L. clamitans</i>	Landscape	Occupancy	Prairie	-0.23	0.03
<i>L. clamitans</i>	Landscape	Occupancy	Road Buffer	0.50	0.05
<i>L. clamitans</i>	Landscape	Occupancy	Wetland_ED	0.29	0.03
<i>L. clamitans</i>	Local	Detection	Julian	0.24	0.11
<i>L. clamitans</i>	Local	Detection	Medium	0.36	0.12
<i>L. clamitans</i>	Local	Extinction	Bask	0.67	0.11
<i>L. clamitans</i>	Local	Extinction	PC1 _{Terrestrial}	0.66	0.15
<i>L. clamitans</i>	Local	Extinction	PC2 _{Aquatic}	-0.22	0.06
<i>L. clamitans</i>	Local	Extinction	Urban	-1.31	0.06
<i>L. clamitans</i>	Local	Occupancy	PC2 _{Aquatic}	0.24	0.02
<i>L. clamitans</i>	Local	Occupancy	Road	-0.94	0.40
<i>L. clamitans</i>	Local	Occupancy	Urban	1.39	0.23
<i>L. pipiens</i>	Landscape	Colonization	Forest_ED	-1.26	0.33
<i>L. pipiens</i>	Landscape	Colonization	Isolation	-0.95	0.06
<i>L. pipiens</i>	Landscape	Colonization	Urban buffer	-0.66	0.03
<i>L. pipiens</i>	Landscape	Colonization	Wetland	0.78	0.02

<i>L. pipiens</i>	Landscape	Detection	Effort	0.49	0.16
<i>L. pipiens</i>	Landscape	Occupancy	Prairie	3.05	0.95
<i>L. pipiens</i>	Landscape	Occupancy	Wetland	1.90	0.41
<i>L. pipiens</i>	Local	Detection	Julian	0.89	0.23
<i>L. pipiens</i>	Local	Extinction	Bask	1.37	0.17
<i>L. pipiens</i>	Local	Extinction	Forest	-2.71	1.31
<i>L. pipiens</i>	Local	Extinction	Road	0.93	0.06
<i>L. pipiens</i>	Local	Occupancy	Group	0.32	0.13
<i>L. pipiens</i>	Local	Occupancy	Julian ²	-0.69	0.27
<i>L. pipiens</i>	Local	Occupancy	PC2 _{Aquatic}	0.14	0.03
<i>L. pipiens</i>	Local	Occupancy	Urban	0.03	0.03
<i>T. sirtalis</i>	Landscape	Colonization	Forest	-0.66	0.03
<i>T. sirtalis</i>	Landscape	Colonization	Forest_ED	-1.14	0.06
<i>T. sirtalis</i>	Landscape	Colonization	Prairie	2.54	0.73
<i>T. sirtalis</i>	Landscape	Colonization	Wetland_ED	1.37	0.09
<i>T. sirtalis</i>	Landscape	Detection	Effort	0.99	0.24
<i>T. sirtalis</i>	Landscape	Occupancy	Forest_ED	-0.69	0.06
<i>T. sirtalis</i>	Landscape	Occupancy	Wetland	0.41	0.03
<i>T. sirtalis</i>	Landscape	Occupancy	Wetland_ED	1.38	0.14
<i>T. sirtalis</i>	Local	Detection	Group	-1.23	0.36
<i>T. sirtalis</i>	Local	Detection	Minutes ²	0.51	0.15
<i>T. sirtalis</i>	Local	Extinction	PC1 _{Terrestrial}	1.63	0.60
<i>T. sirtalis</i>	Local	Extinction	PC2 _{Terrestrial}	-0.86	0.32
<i>T. sirtalis</i>	Local	Extinction	PC3 _{Terrestrial}	-0.46	0.17
<i>T. sirtalis</i>	Local	Occupancy	PC1 _{Terrestrial}	-1.50	0.54
<i>T. sirtalis</i>	Local	Occupancy	PC2 _{Terrestrial}	1.22	0.55
<i>T. sirtalis</i>	Local	Occupancy	PC3 _{Terrestrial}	0.68	0.21
