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Appendix B. Complete model set examining the effects of covariates on occupancy probability for Black Rails (*Laterallus jamaicensis coturniculus*) and Virginia Rails (*Rallus limicola*) in palustrine emergent wetlands in the northern Sierra Nevada foothills, California, USA, 2005–2006.

TABLE B1. The complete set of 108 two-species occupancy models examining interactions between Black and Virginia Rails. The cumulative Akaike weight for the top 20 model formulations were compared: (1) ψ^{BA} and ψ^{Ba} estimated separately (i.e., the presence of Black Rails was dependent on the presence of Virginia Rails); and (2) $\psi^{BA} = \psi^{Ba}$ (i.e., th Virginia Rails and a single occupancy parameter for Black Rails, termed "ψ^{B}," was estimated). Occupancy covariates included Area, Area^2, Year, and interactions by species (Are Black Rails, the interactions by species were either unconditional (U) or conditional (C) on the presence of Virginia Rails. For example, if an Area × Species interaction was unco interaction was estimated for each rail species. If the interaction was conditional, a single parameter for the Area × Species interaction was estimated for Virginia Rails and two pa Virginia Rail presence and one conditional on Virginia Rail absence. Three detection model formulations were compared: (1) $p^{B} = r^{BA} = r^{Ba}$, termed "$p^{A}p^{B}$" (i.e., Black Rail dete detection of Virginia Rails); (2) p^{B} estimated separately from r^{BA} and r^{Ba} with $r^{BA} = r^{Ba}$, termed "$p^{A}p^{B}r^{B}$" (i.e., Black Rail detection probability depended on the presence of Vir Rails); and (3) p^{B}, r^{BA} and r^{Ba} estimated separately, termed "$p^{A}p^{B}r^{BA}r^{Ba}$" (i.e., Black Rail detection probability depended on both the presence and detection of Virginia Rails). Virginia Rail detection model included visit-specific detection probabilities and Year as a covariate, while the Black Rail detection model included Julian day as a covariate. *K* is t relative to the best model, and *w* is the Akaike weight that indicates the relative support for each model.

Occupancy model	Occupancy covariates	Detection model	*K*	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C)	$p^{A}p^{B}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year	$p^{A}p^{B}$	16	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C)	$p^{A}p^{B}r^{B}$	16	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year	$p^{A}p^{B}r^{B}$	17	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year, Year × Species(U)	$p^{A}p^{B}$	17	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C)	$p^{A}p^{B}$	12	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C)	$p^{A}p^{B}r^{BA}r^{Ba}$	17	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year	$p^{A}p^{B}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	18	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	18	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C)	$p^{A}p^{B}r^{B}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U)	$p^{A}p^{B}$	11	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year	$p^{A}p^{B}r^{B}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year, Year × Species(U)	$p^{A}p^{B}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year	$p^{A}p^{B}$	12	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Area^2, Area^2 × Species(C), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	19	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U)	$p^{A}p^{B}r^{B}$	12	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C)	$p^{A}p^{B}r^{BA}r^{Ba}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}$	13	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(C), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	16	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}r^{B}$	14	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}r^{B}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	15	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	16	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	16	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	17	
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year	$p^{A}p^{B}$	12	

$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2	$p^{A}p^{B}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year	$p^{A}p^{B}r^{BA}r^{Ba}$	14
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year	$p^{A}p^{B}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area	$p^{A}p^{B}$	10
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year	$p^{A}p^{B}r^{B}$	13
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}$	13
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	15
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year	$p^{A}p^{B}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area	$p^{A}p^{B}r^{B}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	14
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	14
$\psi^{A}\psi^{BA}\psi^{Ba}$	Area, Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	13
$\psi^{A}\psi^{B}$	Area, Area^2, Year	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year	$p^{A}p^{B}$	11
$\psi^{A}\psi^{B}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	14
$\psi^{A}\psi^{B}$	Area, Area × Species(U)	$p^{A}p^{B}$	10
$\psi^{A}\psi^{B}$	Area, Area^2, Year	$p^{A}p^{B}$	11
$\psi^{A}\psi^{B}$	Area, Area^2	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{B}$	Area, Year	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}$	13
$\psi^{A}\psi^{B}$	Area, Area^2	$p^{A}p^{B}$	10
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}r^{BA}r^{Ba}$	15
$\psi^{A}\psi^{B}$	Area, Area^2, Year	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}$	12
$\psi^{A}\psi^{B}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}$	12
$\psi^{A}\psi^{B}$	Area, Area × Species(U)	$p^{A}p^{B}r^{B}$	11
$\psi^{A}\psi^{B}$	Area, Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{B}$	Area, Year	$p^{A}p^{B}$	10
$\psi^{A}\psi^{B}$	Area	$p^{A}p^{B}r^{BA}r^{Ba}$	11
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	14
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	14
$\psi^{A}\psi^{B}$	Area, Area^2	$p^{A}p^{B}r^{B}$	11
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year	$p^{A}p^{B}r^{B}$	14
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}$	14
$\psi^{A}\psi^{B}$	Area	$p^{A}p^{B}$	9
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	16
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U)	$p^{A}p^{B}r^{B}$	13
$\psi^{A}\psi^{B}$	Area, Area^2, Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	13
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	13
$\psi^{A}\psi^{B}$	Area, Year	$p^{A}p^{B}r^{B}$	11
$\psi^{A}\psi^{B}$	Area, Year, Year × Species(U)	$p^{A}p^{B}$	11
$\psi^{A}\psi^{B}$	Area, Area × Species(U), Area^2, Area^2 × Species(U), Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	15
$\psi^{A}\psi^{B}$	Area	$p^{A}p^{B}r^{B}$	10

$\psi^{A}\psi^{B}$	Area, Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	.	$p^{A}p^{B}$	9
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year	$p^{A}p^{B}$	10
$\psi^{A}\psi^{BA}\psi^{Ba}$	.	$p^{A}p^{B}r^{B}$	10
$\psi^{A}\psi^{BA}\psi^{Ba}$	.	$p^{A}p^{B}r^{BA}r^{Ba}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year	$p^{A}p^{B}r^{B}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year, Year × Species(U)	$p^{A}p^{B}$	11
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	13
$\psi^{A}\psi^{BA}\psi^{Ba}$	Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	12
$\psi^{A}\psi^{B}A$	Year	$p^{A}p^{B}r^{BA}r^{Ba}$	11
$\psi^{A}\psi^{B}$	.	$p^{A}p^{B}r^{BA}r^{Ba}$	10
$\psi^{A}\psi^{B}$	Year, Year × Species(U)	$p^{A}p^{B}r^{BA}r^{Ba}$	12
$\psi^{A}\psi^{B}$	Year	$p^{A}p^{B}$	9
$\psi^{A}\psi^{B}$	.	$p^{A}p^{B}$	8
$\psi^{A}\psi^{B}$	Year	$p^{A}p^{B}r^{B}$	10
$\psi^{A}\psi^{B}$	Year, Year × Species(U)	$p^{A}p^{B}$	10
$\psi^{A}\psi^{B}$	.	$p^{A}p^{B}r^{B}$	9
$\psi^{A}\psi^{B}$	Year, Year × Species(U)	$p^{A}p^{B}r^{B}$	11

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