

Orien M. W. Richmond, James E. Hines, and Steven R. Beissinger. 2010. Two-species occupancy models: a new parameterization applied to co-occurrence of secretive rails. *Ecological Applications* 20:2036–2046.

Appendix A. Evaluation of the effect of covariates on detection 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.

We fit 16 single-season, single-species occupancy models for Virginia Rails to test the effects of Julian day, time of day, year, and visit on detection probability (Table A1). We fit 8 similar models for Black Rails with the same detection covariates, except we did not fit models with visit since Black Rail occupancy data was collected using a removal model design whereby no visits were conducted after the first Black Rail detection (Table A2). For all models we held the occupancy model, $\psi(\cdot)$, constant.

TABLE A1. Model selection results for 16 single species, single season occupancy models testing detection covariates for Virginia Rails. K is the number of parameters, ΔAIC is the difference in AIC relative to the best model, and AIC weight (wt) indicates the relative support for each model. All models assumed that Black Rail detection probability was independent of Virginia Rail occupancy or detection and that Black Rail occupancy was independent of Virginia Rail occupancy.

Model	Deviance	K	ΔAIC	AIC wt
$\psi(\cdot)$, p(Visit, Year)	655.5	5	0.00	0.23
$\psi(\cdot)$, p(Year)	660.8	3	1.28	0.12
$\psi(\cdot)$, p(Year, Julian day)	659.0	4	1.44	0.11
$\psi(\cdot)$, p(Visit, Year, Julian day)	655.5	6	1.97	0.085
$\psi(\cdot)$, p(Visit, Year, Time of day)	655.5	6	1.99	0.084
$\psi(\cdot)$, p(Visit)	659.7	4	2.22	0.075
$\psi(\cdot)$, p(Julian day)	662.5	3	2.98	0.051
$\psi(\cdot)$, p(Year, Time of day)	660.7	4	3.17	0.047
$\psi(\cdot)$, p(Year, Julian day, Time of day)	659.0	5	3.43	0.041
$\psi(\cdot)$, p(Visit, Year, Julian day, Time of day)	655.5	7	3.95	0.032
$\psi(\cdot)$, p(\cdot)	665.6	2	4.08	0.030
$\psi(\cdot)$, p(Visit, Julian day)	659.7	5	4.14	0.030
$\psi(\cdot)$, p(Visit, Time of day)	659.7	5	4.19	0.028
$\psi(\cdot)$, p(Julian day, Time of day)	662.5	4	4.96	0.019
$\psi(\cdot)$, p(Time of day)	665.5	3	5.93	0.012
$\psi(\cdot)$, p(Visit, Julian day, Time of day)	659.7	6	6.13	0.011

TABLE A2. Model selection results for 8 single species, single season occupancy models testing detection covariates for Black Rails. K is the number of parameters, ΔAIC is the difference in AIC relative to the best model, and AIC weight (wt) indicates the relative support for each model. All models assumed that Black Rail detection probability was independent of Virginia Rail occupancy or detection and that Black Rail occupancy was independent of Virginia Rail occupancy.

Model	Deviance	K	ΔAIC	AIC wt
$\psi(\cdot)$, p(Julian day)	695.6	3	0.00	0.29
$\psi(\cdot)$, p(\cdot).	698.4	2	0.84	0.19
$\psi(\cdot)$, p(Julian day, Year)	695.0	4	1.40	0.14
$\psi(\cdot)$, p(Julian day, Time of day)	695.6	4	2.00	0.11
$\psi(\cdot)$, p(Year)	697.7	3	2.09	0.10
$\psi(\cdot)$, p(Time of day)	698.4	3	2.84	0.07

$\psi(\cdot)$, p(Julian day, Year, Time of day)	695.0	5	3.40	0.05
$\psi(\cdot)$, p(Year, Time of day)	697.7	4	4.09	0.038

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