Supporting Materials

Retrospective analysis of Trumpeter Swan *Cygnus buccinator* decline in Yellowstone National Park, USA

Table S1. Model-averaged results of Bayesian reversible jump Markov chain Monte Carlo (RJMCMC) analysis, indicating covariates associated with whether swans were Successful *versus* Present on wetlands in Yellowstone National Park, USA each year during 1931–1959. "Ppn. selected" represents the proportion of MCMC samples that a given covariate was selected for inclusion in the model structure; *i.e.* the number of times the covariate was included in the structure of the models (No. included) divided by the number of times that covariate could have possibly been included (No. possible). Coefficient estimates, with corresponding standard deviations (s.d.) and 90% credible intervals (90% CrI), represent the log-odds of being classed as Successful, given the impact of all measured covariates also included in the models. See Table 1 for a description of the model parameters.

Model parameter	No. included	No. possible	Ppn. selected	Estimate (s.d.)	90% CrI
Intercept	–	–	–	–1.63 (0.41)	(–2.35, –1.03)
$\hat{\sigma}_{RE_{wetland}}$	–	–	–	1.44 (0.39)	(0.90, 2.15)
$\hat{\sigma}_{RE_{year}}$	–	–	–	0.20 (0.15)	(0.03, 0.49)
PHDI	7,029	216,000	0.03	–0.01 (0.07)	(0.00, 0.00)
SpTAVG	2,716	108,000	0.03	0.01 (0.07)	(0.00, 0.00)
Iceoff	1,129	216,000	0.01	0.00 (0.02)	(0.00, 0.00)
YRmax	1,975	216,000	0.01	0.00 (0.03)	(0.00, 0.00)
SuTAVG	1,106	108,000	0.01	0.00 (0.04)	(0.00, 0.00)
RRLtrus	543	54,000	0.01	0.00 (0.03)	(0.00, 0.00)
TRItrus	491	54,000	0.01	0.00 (0.03)	(0.00, 0.00)
Year	546	54,000	0.01	0.00 (0.03)	(0.00, 0.00)
SpPCP	554	216,000	0.00	0.00 (0.01)	(0.00, 0.00)
SuPCP	475	216,000	0.00	0.00 (0.01)	(0.00, 0.00)
YRodate	800	216,000	0.00	0.00 (0.01)	(0.00, 0.00)
Visitor	241	54,000	0.00	0.00 (0.02)	(0.00, 0.00)

Table S2. Model-averaged RJMCMC results, indicating covariates associated with whether swans were Successful *versus* Present on wetlands in Yellowstone National Park, USA each year during 1960–2011. "Ppn. selected" represents the proportion of MCMC samples that a given covariate was selected for inclusion in the model structure; *i.e.* the number of times the covariate was included in the structure of the models (No. included) divided by the number of times that covariate could have possibly been included (No. possible). Coefficient estimates, with corresponding standard deviations (s.d.) and 90% credible intervals (90% CrI), represent the log-odds of being classed as Successful, given the impact of all measured covariates also included in the models. See Table 1 for a description of the model parameters.

Model parameter	No. included	No. possible	Ppn. selected	Estimate (s.d.)	90% CrI
Intercept	–	–	–	–2.39 (0.33)	(–2.97, –1.91)
$\hat{\sigma}_{RE_{wetland}}$	–	–	–	1.04 (0.28)	(0.66, 1.55)
$\hat{\sigma}_{RE_{year}}$	–	–	–	0.20 (0.14)	(0.03, 0.48)
Year	2,004	27,000	0.07	–0.03 (0.12)	(–0.37, 0.00)
Wolf	5,197	27,000	0.06	–0.01 (0.11)	(–0.16, 0.04)
Visitor	5,868	108,000	0.05	–0.02 (0.11)	(–0.21, 0.00)
RRLtrus	3,362	81,000	0.04	0.00 (0.11)	(–0.15, 0.07)
TRItrus	1,436	54,000	0.03	0.01 (0.06)	(0.00, 0.00)
Grizzly	984	27,000	0.02	–0.01 (0.07)	(0.00, 0.00)
PHDI	213	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
Iceoff	324	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
SpPCP	319	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
SuPCP	222	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
YRmax	219	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
YRodate	222	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
SpTAVG	255	135,000	0.00	0.00 (0.01)	(0.00, 0.00)
SuTAVG	331	135,000	0.00	0.00 (0.01)	(0.00, 0.00)

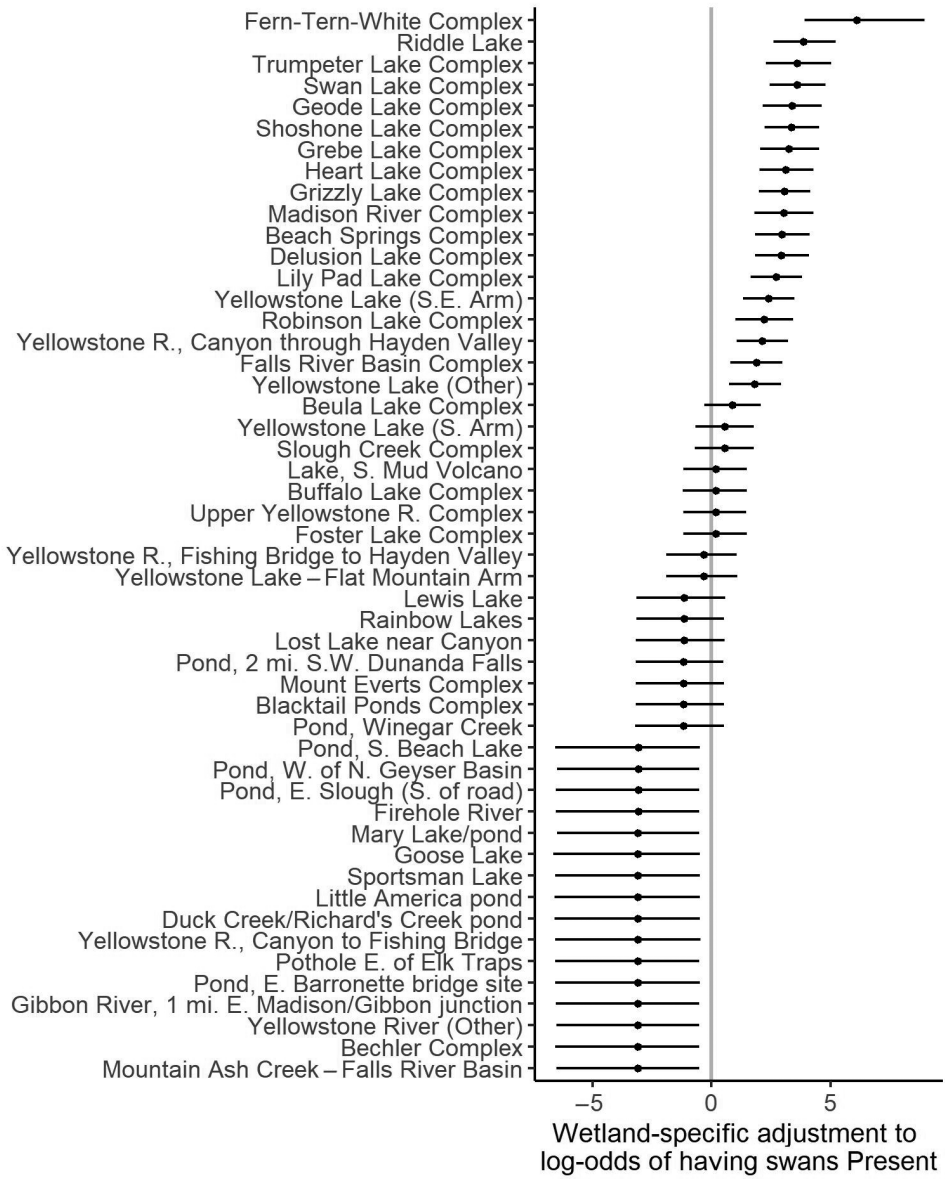

Figure S1. Caterpillar plot of wetland random effects for a model investigating whether Trumpeter Swans were Present *versus* Absent on wetlands in Yellowstone National Park, USA during 1931–1959. Wetlands are listed along the y-axis. The x-axis represents wetland-specific intercept adjustments to the log-odds of wetlands having swans Successful during an average year under average covariate conditions, and whiskers represent 90% credible intervals. The grey vertical line represents an average wetland, or an intercept adjustment of zero. Note: see main paper for Present *versus* Absent during 1960–2011.

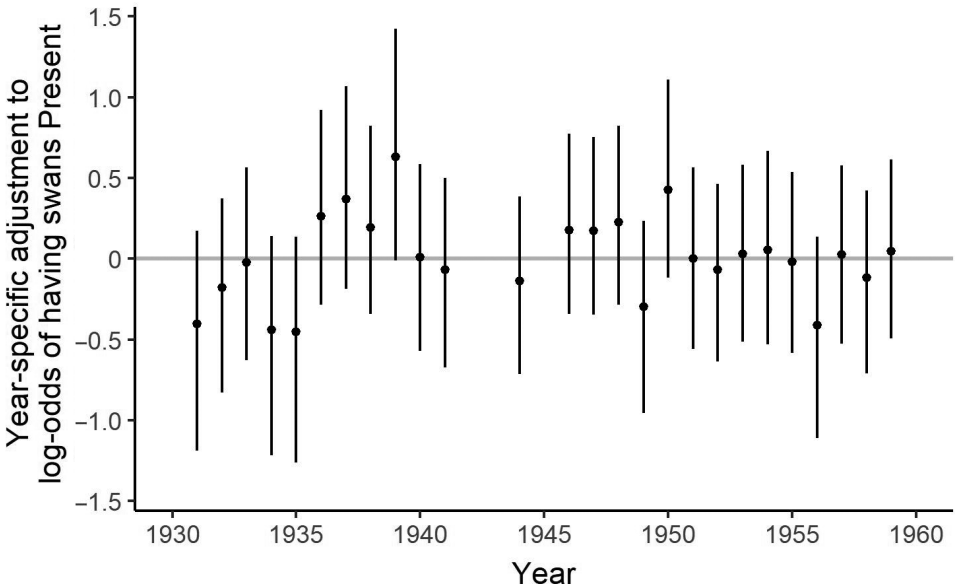

Figure S2. Plot of year random effects for a model investigating whether Trumpeter Swans were Present *versus* Absent on wetlands in Yellowstone National Park, USA during 1931–1959. The y-axis represents year-specific intercept adjustments to the log-odds of an average wetland having swans Present under average covariate conditions, and whiskers represent 90% credible intervals. The grey horizontal line represents an average year, or an intercept adjustment of zero. Note: see main paper for Present *versus* Absent during 1960–2011.

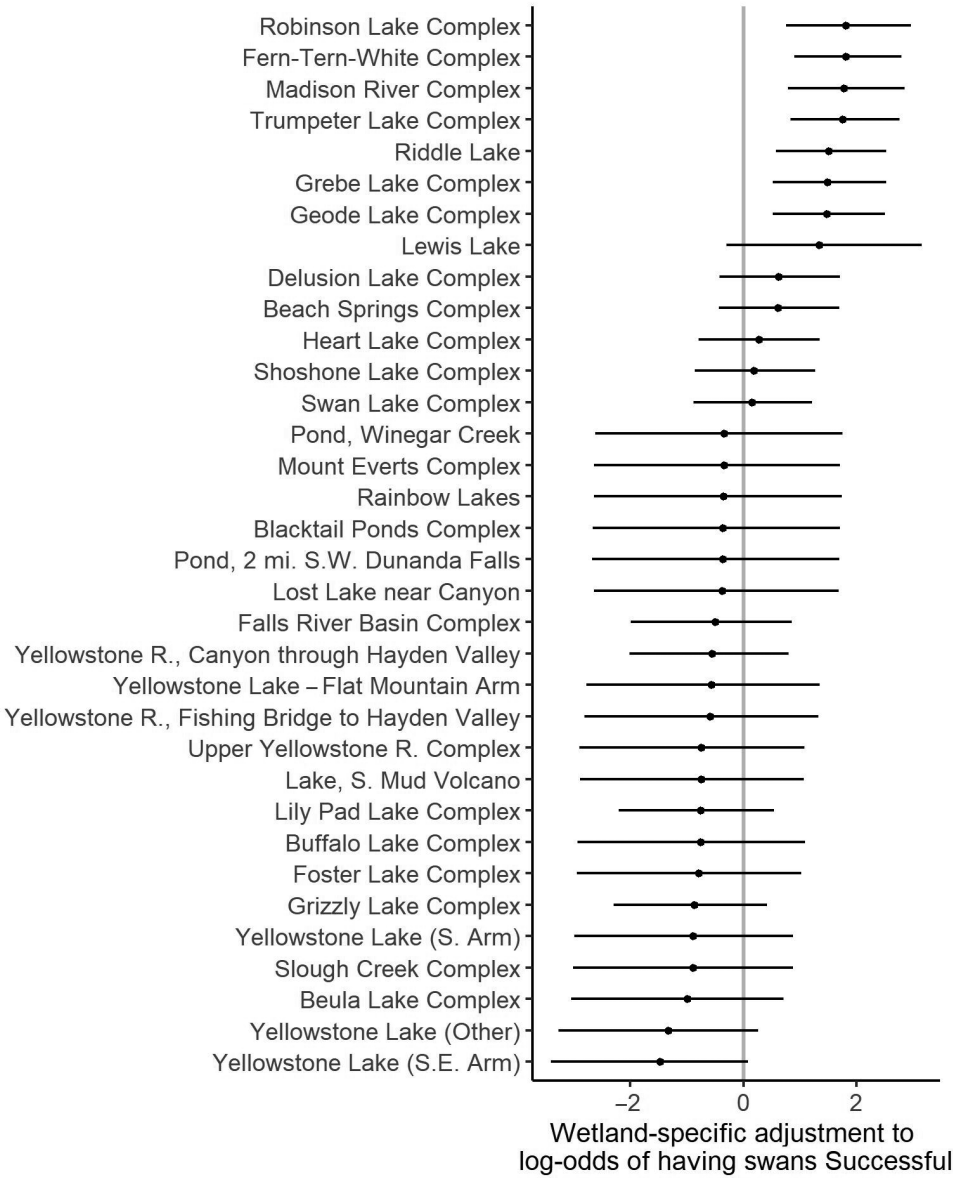

Figure S3. Caterpillar plot of wetland random effects for a model investigating whether Trumpeter Swans were Successful *versus* Present on wetlands in Yellowstone National Park, USA during 1931–1959. Wetlands are listed along the y-axis. The x-axis represents wetland-specific intercept adjustments to the log-odds of wetlands having swans Successful during an average year under average covariate conditions, and whiskers represent 90% credible intervals. The grey vertical line represents an average wetland, or an intercept adjustment of zero.

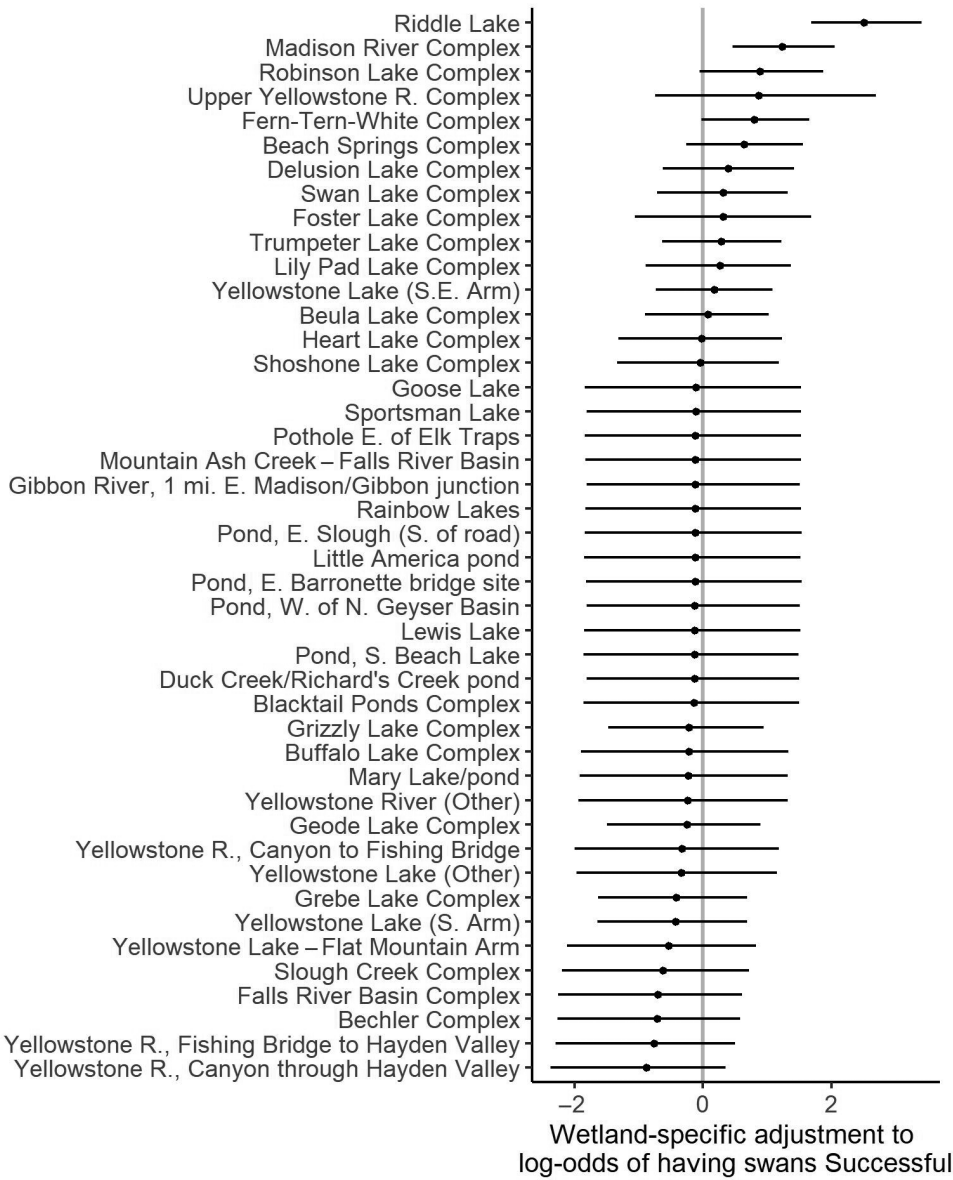

Figure S4. Caterpillar plot of wetland random effects for a model investigating whether Trumpeter Swans were Successful *versus* Present on wetlands in Yellowstone National Park, USA during 1960–2011. Wetlands are listed along the y-axis. The x-axis represents wetland-specific intercept adjustments to the log-odds of wetlands having swans Successful during an average year under average covariate conditions, and whiskers represent 90% credible intervals. The grey vertical line represents an average wetland, or an intercept adjustment of zero.