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Supplementary material

APPENDIX A. COMPLETE MODEL LIST FOR MULTISTATE CAPTURE-MARK-RECAPTURE ANALYSES IN PROGRAM MARK

Table A1. Multistate models representing hypotheses about life history patterns in Common Goldeneyes in interior Alaska from a long-term nest box study (1997–2010). Our modeling framework (Fig. 1) included three reproductive states: (1) Prebreeding, which we applied to ducklings hatched and marked in our study nest boxes; (2) Breeding which included all nest box encounters of adult females; and (3) Nonbreeding in which we assigned to all years that individuals were not encountered in the other two states. We treated Prebreeding and Nonbreeding as unobservable states and set their detection probabilities to 0.0, and constrained all biologically impossible movements for the transition probabilities (e.g., Breeding to Prebreeding, ψ^{BP}) to 0.0 as well. We modeled detection probability in the Breeding state (*p*) first, followed by first-year survival (φ^{J}), adult survival (φ^{A}), recruitment probability (ψ^{PB}), and breeding probability (ψ^{BB}); and are referred to as the "Phi models" in the main text. The probability of returning to breed (ψ^{NB}) was near the 0 boundary on the logit scale and could not be estimated, and was fixed to 0 for all models listed here. The most parsimonious structure for each parameter (bolded in each set) was retained when modeling the subsequent parameter. Refer to Table 1 in the main text for covariate descriptions. Only models in which all parameters were estimated are included in this table.

			WITHIN-SET		OVERALL	
	Number Params	Dev.	ΔAIC_C	w_i	ΔAIC_C	w_i
Detection probability (p)[a]						
***p*(Age 2, 3≤ + NS)**	**17**	**1795.57**	**0.00**	**0.28**	**22.42**	**0.00**
p(Age 2, 3≤ + NS, PDO_{yr-1})	18	1794.72	1.17	0.16	22.64	0.00

p(Age 2, 3, 4≤ * NS)	19	1793.41	1.88	0.11	24.31	0.00
p(Age 2, 3, 4, 5≤ + NS)	19	1793.77	2.25	0.09	24.67	0.00
p(Age 2, 3, 4, 5≤ * NS)	21	1790.10	2.62	0.08	25.04	0.00
p(NS)	16	1800.32	2.73	0.07	25.15	0.00
p(Age 2, 3≤)	16	1801.87	4.28	0.03	26.70	0.00
p(Age 2, 3, 4, 5≤)	18	1797.86	4.31	0.03	26.73	0.00
p(Age 2, 3≤ + PDO_{yr-1})	17	1800.83	5.26	0.02	27.68	0.00
p(Age 2, 3, 4≤)	17	1801.09	5.52	0.02	27.94	0.00
p(PDO_{yr-1})	16	1803.50	5.91	0.01	28.33	0.00
p(Age 2, 3, 4, 5≤ + ANS_{yr})	19	1797.54	6.01	0.01	28.44	0.00
p(Age 2, 3≤ + ANS_{yr})	17	1801.71	6.14	0.01	28.56	0.00
p(Age 2, 3, 4, 5, 6≤)	19	1797.79	6.26	0.01	28.68	0.00
p($pNID_{yr}$)	16	1804.30	6.71	0.01	29.13	0.00
p(T)	16	1804.49	6.90	0.01	29.32	0.00
p(.)	15	1806.64	7.03	0.01	27.45	0.00
p(ANS_{yr})	16	1804.98	7.39	0.01	29.81	0.00
p(Age 2, 3, 4≤ + ANS_{yr})	18	1800.99	7.44	0.01	29.86	0.00
p(Age 2, 3, 4, 5, 6≤ + ANS_{yr})	20	1797.50	8.00	0.01	30.42	0.00
p(hen $mass_{yr}$)	16	1806.01	8.42	0.00	30.84	0.00
p(COGO occ_{yr})	16	1806.45	8.86	0.00	31.28	0.00
p(g)	16	1806.51	8.92	0.00	32.32	0.00
Duckling survival (φ^J)[b]						
φ^J(yr + brood + dmass)	**19**	**1784.25**	**0.00**	**0.22**	**15.14**	**0.00**
φ^J(yr + dmass)	18	1786.31	0.04	0.21	15.18	0.00
φ^J(yr + brood + dmass + rhatch)	20	1782.38	0.16	0.20	15.30	0.00
φ^J(yr + dmass + rhatch)	19	1785.09	0.84	0.14	15.98	0.00
φ^J(yr+ dmass + henage)	19	1785.58	1.33	0.11	16.47	0.00
φ^J(yr + dmass * rhatch)	20	1784.21	1.98	0.08	17.12	0.00
φ^J(yr + brood + rhatch)	19	1790.44	6.19	0.01	21.33	0.00
φ^J(yr + brood)	18	1793.26	6.99	0.01	22.14	0.00
φ^J(yr)	17	1795.57	7.27	0.01	22.42	0.00
φ^J(yr + rhatch)	18	1793.57	7.29	0.01	22.44	0.00
φ^J(yr + henage)	18	1793.76	7.49	0.01	22.64	0.00
φ^J(T^2)	26	1796.24	11.98	0.00	27.13	0.00
φ^J(yr * rhatch)	19	1784.23	14.17	0.00	27.28	0.00

φ^{J}(T)	18	1803.81	17.53	0.00	33.66	0.00
φ^{J}($PRES_{yr-1}$)	18	1805.04	18.76	0.00	33.90	0.00
φ^{J}(precip)	18	1805.82	19.54	0.00	34.69	0.00
φ^{J}(COGO occ_{yr-1})	18	1806.57	20.30	0.00	35.44	0.00
φ^{J}($WTMP_{yr-1}$)	18	1807.17	20.89	0.00	36.04	0.00
Adult survival (φ^{A})[c]						
φ^{A}(yr + NS)	**20**	**1774.45**	**0.00**	**0.32**	**7.36**	**0.00**
φ^{A}(PDO_{yr-1} + NS)	18	1778.80	0.30	0.27	7.67	0.00
φ^{A}($ATMP_{yr-1}$ + NS)	18	1779.55	1.06	0.19	8.43	0.00
φ^{A}($WTMP_{yr-1}$ + NS)	18	1780.48	2.90	0.12	9.34	0.00
φ^{A}($PRES_{yr-1}$ + NS)	18	1781.40	2.90	0.07	10.27	0.00
φ^{A}(yr)	19	1784.25	7.78	0.01	15.14	0.00
φ^{A}($ATMP_{yr-1}$)	17	1788.43	7.91	0.01	15.28	0.00
φ^{A}($WTMP_{yr-1}$)	17	1789.52	9.01	0.00	16.37	0.00
φ^{A}(yr + brdage)	20	1783.74	9.29	0.00	16.66	0.00
φ^{A}(yr + bc_{yr-1})	20	1783.96	9.51	0.00	16.87	0.00
φ^{A}(yr + rhatch)	20	1783.98	9.53	0.00	16.90	0.00
φ^{A}(Age 2, 3≤ + yr)	20	1784.25	9.80	0.00	17.17	0.00
φ^{A}($precip_{yr-1}$)	17	1790.76	10.24	0.00	17.61	0.00
φ^{A}(Age 2, 3, 4≤ + yr)	21	1783.78	11.36	0.00	18.72	0.00
φ^{A}(Age 2, 3, 4, 5≤ + yr)	22	1783.71	13.31	0.00	20.67	0.00
Probability of recruitment (ψ^{PB})[e]						
ψ^{PB}(dmass)	**21**	**1765.05**	**0.00**	**0.36**	**0.00**	**0.12**
ψ^{PB}($phatch_{yr-2}$ + dmass)	22	1763.86	0.82	0.24	0.82	0.08
ψ^{PB}(COGO occ_{yr-1} + dmass)	22	1763.87	0.84	0.24	0.84	0.07
ψ^{PB}($PRES_{yr-1}$)	21	1770.60	5.55	0.02	5.54	0.01
ψ^{PB}(COGO occ_{yr-1})	21	1771.29	6.23	0.02	6.23	0.01
ψ^{PB}(T)	21	1771.21	7.16	0.01	7.15	0.00
ψ^{PB}($WTMP_{yr-2}$)	21	1772.27	7.21	0.01	7.21	0.00
ψ^{PB}(.)	20	1774.45	7.36	0.01	7.36	0.00
ψ^{PB}(fem $mass_{yr-1}$)	21	1772.53	7.46	0.00	7.47	0.00
ψ^{PB}($PRES_{yr-2}$)	21	1772.71	7.65	0.00	7.65	0.00
ψ^{PB}($precip_{yr-2}$)	21	1772.95	7.73	0.00	7.74	0.00
ψ^{PB}($phatch_{yr-2}$)	21	1773.18	8.12	0.00	8.12	0.00
ψ^{PB}(PDO_{yr-2})	21	1773.37	8.31	0.00	8.31	0.00

$\psi^{PB}(WTMP_{yr-1})$	21	1773.99	8.93	0.00	8.93	0.00
ψ^{PB}(rhatch)	21	1773.99	8.94	0.00	8.94	0.00
ψ^{PB}(brood)	21	1774.00	8.94	0.00	8.94	0.00
$\psi^{PB}(pNID_{yr})$	21	1774.00	8.94	0.00	8.95	0.00
$\psi^{PB}(\text{COGO occ}_{yr})$	21	1774.06	8.99	0.00	8.99	0.00
$\psi^{PB}(temp_{yr-1})$	21	1774.17	9.10	0.00	9.10	0.00
$\psi^{PB}(T^2)$	21	1772.21	9.17	0.00	9.18	0.00
$\psi^{PB}(ATMP_{yr-1})$	21	1774.30	9.25	0.00	9.25	0.00
$\psi^{PB}(PDO_{yr-1})$	21	1774.33	9.28	0.00	9.27	0.00
$\psi^{PB}(pNID_{yr-2})$	21	1774.34	9.28	0.00	9.28	0.00
$\psi^{PB}(\text{fem mass}_{yr})$	21	1774.35	9.30	0.00	9.30	0.00
$\psi^{PB}(pNID_{yr-1})$	21	1774.43	9.37	0.00	9.37	0.00
$\psi^{PB}(\text{COGO occ}_{yr-2})$	21	1774.43	9.37	0.00	9.38	0.00
Breeding probability $(\psi^{BB})^f$						
ψ^{BB}(.)	**21**	**1765.05**	**0.00**	**0.17**	**0.00**	**0.12**
$\psi^{BB}(\text{fem mass}_{yr-1})$	22	1763.80	0.77	0.12	0.77	0.08
$\psi^{BB}(pNID_{yr-1})$	22	1763.86	0.83	0.11	0.83	0.08
ψ^{BB}(NS)	22	1764.07	1.04	0.10	1.04	0.07
$\psi^{BB}(\text{fem mass}_{yr-1} + NS)$	23	1762.12	1.12	0.10	1.12	0.07
$\psi^{BB}(ATMP_{yr-1})$	22	1764.79	1.76	0.07	1.76	0.05
$\psi^{BB}(PDO_{yr-1})$	22	1764.84	1.81	0.07	1.81	0.04
$\psi^{BB}(PRES_{yr-1})$	22	1765.00	1.97	0.06	1.97	0.04
$\psi^{BB}(\text{COGO occ}_{yr-1})$	22	1765.03	1.99	0.06	1.99	0.04
$\psi^{BB}(precip_{yr-1})$	22	1765.01	1.99	0.06	1.99	0.04
$\psi^{BB}(WTMP_{yr-1})$	22	1765.05	2.00	0.06	2.02	0.04
$\psi^{BB}(temp_{yr-1})$	23	1760.34	1.84	0.00	213.79	0.00

[a]Model selection notation follows Burnham and Anderson (2002); yr denotes annual variation, (T) denotes a linear trend across years, (.) indicates that a parameter was held constant, a + sign indicates an additive effect between two variables, whereas a * denotes an interaction. The following covariates were applied to known-age individuals only: dmass = individual duckling mass recorded at hatch, standardized across years; femage = minimum age of maternal female;

rhatch = hatch date relative to peak (modal) hatch date each year; brdage = age at first breeding; brood = the number of ducklings (all species) leaving the nest. Other individual covariates included NS = nesting outcome of an individual in year *yr-1*; and bc = individual mean annual body condition , based on residuals from a mixed effects model with mass as a response variable and structural size, day of nesting^2, individual (random effect), and year (fixed effect) as explanatory variables. Time-varying covariates were applied to parameters with multiple lag effects in which yr subscript reflects conditions in the current year (i.e., the end of interval yr-1 to yr), yr-1 subscript reflects conditions the previous year (i.e., the beginning of the current interval), and yr-2 subscript reflects conditions two-years prior (i.e., the beginning of the previous interval_. fem mass = annual average hen mass during mid-incubation derived from a mixed effects model with mass as a response variable and structural size, day of nesting^2, individual (random effect), and year (fixed effect) as explanatory variables; COGO occ = annual proportion of nest boxes occupied by goldeneyes; ANS = annual apparent nest success; pNID = annual modal goldeneye nest initiation date; phatch = annual modal goldeneye hatch date; temp = average of monthly mean temperatures on the study area from April to September; precip = total precipitation on the study area from April to September; PRES = sea level pressure (hPa) from October$_{yr-1}$ to March$_{yr}$ in purported wintering region; ATMP = air temperature (Celsius) from October$_{yr-1}$ to March$_{yr}$ in purported wintering region; WTMP = sea surface temperature (Celsius) from October$_{yr-1}$ to April$_{yr}$ in purported wintering region; PDO = Annual Pacific Decadal Oscillation index, averaged monthly mean values from October$_{yr-1}$ to March$_{yr}$

[b]Bold indicates the parameter being modeled, while other model parameters held constant with structure: φ^{J}(yr), φ^{A}(yr), $\boldsymbol{p}$, ψ^{PB}(.), ψ^{BB}(.), ψ^{NB}(0)

[c]— $\boldsymbol{\varphi^{J}}$, φ^{A}(yr), p(Age 2, 3≤ + NS), ψ^{PB}(.), ψ^{BB}(.), ψ^{NB}(0)

[d]— φ^{J}(yr + brood + dmass), $\boldsymbol{\varphi^{A}}$, *p*(Age 2, 3≤ + NS), ψ^{PB}(.), ψ^{BB}(.), ψ^{NB}(0)

[e]— φ^{J}(yr + brood + dmass), φ^{A}(yr + NS), *p*(Age 2, 3≤ + NS), $\boldsymbol{\psi^{PB}}$, ψ^{BB}(NS), ψ^{NB}(0)

[f]— φ^{J}(yr + brood + dmass), φ^{A}(yr + NS), *p*(Age 2, 3≤ + NS), ψ^{PB}(dmass), $\boldsymbol{\psi^{BB}}$, ψ^{NB}(0)

Table A2. Multistate models representing hypotheses about life history patterns in Common Goldeneyes in interior Alaska from a long-term nest box study (1997–2010). Our modeling framework (Fig. 1) included three reproductive states: (1) Prebreeding, which we applied to ducklings hatched and marked in our study nest boxes; (2) Breeding which included all nest box encounters of adult females; and (3) Nonbreeding in which we assigned to all years that individuals were not encountered in the other two states. We treated Prebreeding and Nonbreeding as unobservable states and set their detection probabilities to 0.0, and constrained all biologically impossible movements for the transition probabilities (e.g., Breeding to Prebreeding, ψ^{BP}) to 0.0 as well. We retained the best-supported detection probability (p) structure identified in the Phi model set (Table A1) and then modeled breeding probability (ψ^{BB}) first, followed by recruitment probability (ψ^{PB}), adult survival (φ^{A}), and first-year survival (φ^{J}); and are referred to as the "Psi models" in the main article. The probability of returning to breed (ψ^{NB}) was near the 0 boundary on the logit scale and could not be estimated, and was fixed to 0 for all models listed here. The most parsimonious structure for each parameter (bolded in each set) was retained when modeling the subsequent parameter. Refer to Table 1 in the main article for covariate descriptions. Only models in which all parameters were estimated are included in this table.

Model[a]	Number Params	Dev.	WITHIN-SET ΔAIC_C	WITHIN-SET w_i	OVERALL ΔAIC_C	OVERALL w_i
Probability of breeding (ψ^{BB})[b]						
ψ^{BB}(NS)	**18**	**1784.83**	**0.00**	**0.93**	**14.64**	**0.00**
ψ^{BB}(.)	17	1795.57	8.72	0.01	23.36	0.00
$\psi^{BB}(pNID_{yr-1})$	18	1793.99	9.16	0.01	23.80	0.00
$\psi^{BB}(\text{fem mass}_{yr-1})$	18	1794.79	9.96	0.01	24.60	0.00
$\psi^{BB}(bc_{yr-1})$	18	1795.41	10.58	0.00	25.22	0.00

ψ^{BB}(PDO $_{yr-1}$)	18	1795.48	10.65	0.00	25.28	0.00
ψ^{BB}(COGO occ$_{yr-1}$)	18	1795.49	10.66	0.00	25.30	0.00
ψ^{BB}(ATMP$_{yr-1}$)	18	1795.50	10.68	0.00	25.32	0.00
ψ^{BB}(ANS$_{yr-1}$)	18	1795.52	10.70	0.00	25.34	0.00
ψ^{BB}(temp$_{yr-1}$)	18	1795.53	10.70	0.00	25.34	0.00
ψ^{BB}(precip$_{yr-1}$)	18	1795.54	10.71	0.00	25.35	0.00
ψ^{BB}(WTMP$_{yr-1}$)	18	1795.54	10.72	0.00	25.36	0.00
ψ^{BB}(PRES$_{yr-1}$)	18	1795.55	10.74	0.00	25.38	0.00
Probability of recruitment (ψ^{PB})^{c}						
ψ^{PB}(dmass)	**19**	**1777.71**	**0.00**	**0.22**	**9.54**	**0.00**
ψ^{PB}(COGO occ$_{yr-1}$ + dmass)	20	1776.25	0.56	0.17	10.10	0.00
ψ^{PB}(T + dmass)	20	1777.59	1.91	0.09	11.45	0.00
ψ^{PB}(fem mass$_{yr-1}$ + dmass)	20	1777.71	2.02	0.08	11.57	0.00
ψ^{PB}(PRES$_{yr-1}$)	19	1780.95	3.24	0.04	12.78	0.00
ψ^{PB}(COGO occ$_{yr-1}$)	19	1781.24	3.53	0.04	13.07	0.00
ψ^{PB}(T)	19	1781.70	3.99	0.03	13.53	0.00
ψ^{PB}(fem mass$_{yr-1}$)	19	1781.97	4.26	0.03	13.81	0.00
ψ^{PB}(PRES$_{yr-2}$)	19	1782.17	4.46	0.02	14.00	0.00
ψ^{PB}(fem mass$_{yr-2}$)	19	1782.429	4.72	0.02	14.26	0.00
ψ^{PB}(phatch$_{yr}$)	19	1782.50	4.79	0.02	14.34	0.00
ψ^{PB}(WTMP$_{yr-2}$)	19	1782.72	5.01	0.02	14.56	0.00
ψ^{PB}(.)	18	1784.82	5.09	0.02	14.64	0.00
ψ^{PB}(precip$_{yr-2}$)	19	1782.82	5.11	0.02	14.66	0.00
ψ^{PB}(phatch$_{yr-2}$)	19	1783.70	5.99	0.01	15.53	0.00
ψ^{PB}(PDO$_{yr-2}$)	19	1783.84	6.13	0.01	15.67	0.00
ψ^{PB}(rhatch)	19	1783.86	6.16	0.01	15.70	0.00
ψ^{PB}(brood)	19	1783.98	6.27	0.01	15.82	0.00
ψ^{PB}(COGO occ$_{yr}$)	19	1784.17	6.46	0.01	15.99	0.00
ψ^{PB}(temp$_{yr-1}$)	19	1784.24	6.52	0.01	16.07	0.00
ψ^{PB}(phatch$_{yr-1}$)	19	1784.24	6.53	0.01	16.07	0.00
ψ^{PB}(WTMP$_{yr-1}$)	19	1784.34	6.63	0.01	16.17	0.00
ψ^{PB}(pNID$_{yr}$)	19	1784.35	6.64	0.01	16.19	0.00
ψ^{PB}(temp$_{yr-1}$)	19	1784.38	6.66	0.01	16.21	0.00
ψ^{PB}(ATMP$_{yr-1}$)	19	1784.68	6.96	0.01	16.51	0.00
ψ^{PB}(PDO$_{yr-1}$)	19	1784.70	6.98	0.01	16.53	0.00

$\psi^{PB}(PRES_{yr-1})$	19	1784.71	7.00	0.01	16.54	0.00
ψ^{PB}(fem $mass_{yr}$)	19	1784.71	7.01	0.01	16.55	0.00
$\psi^{PB}(precip_{yr-1})$	19	1784.78	7.07	0.01	16.62	0.00
$\psi^{PB}(pNID_{yr-2})$	19	1784.81	7.09	0.01	16.64	0.00
$\psi^{PB}(pNID_{yr-1})$	19	1784.82	7.12	0.01	16.65	0.00
ψ^{PB}(COGO occ_{yr-2})	19	1784.82	7.11	0.01	16.66	0.00
Adult survival (φ^{A})[d]						
φ^{A}(yr)	**19**	**1777.71**	**0.00**	**0.32**	**9.54**	**0.00**
φ^{A}(yr + bc_{yr-1})	20	1777.24	1.55	0.15	11.05	0.00
φ^{A}(yr + rhatch)	20	1777.25	1.56	0.15	11.10	0.00
φ^{A}(yr + brdage)	20	1774.42	1.74	0.14	11.28	0.00
φ^{A}(yr+ Age 2, ≥3+)	20	1777.67	1.98	0.12	11.53	0.00
φ^{A}(yr+ NS)	20	1777.69	1.99	0.12	11.54	0.00
φ^{A}(yr * bc_{yr-1})	29	1769.20	11.78	0.00	21.33	0.00
First-year survival (φ^{J})[e]						
φ^{J}(yr + dmass)	**20**	**1766.14**	**0.00**	**0.25**	**0.00**	**0.25**
φ^{J}(yr + brood + dmass)	21	1764.16	0.04	0.24	0.04	0.24
φ^{J}(yr + brood + dmass + rhatch)	22	1762.32	0.23	0.23	0.23	0.22
φ^{J}(yr + dmass + rhatch)	21	1764.95	0.82	0.16	0.82	0.16
φ^{J}(yr + brood * dmass)	22	1764.07	1.98	0.09	1.98	0.09
φ^{J}(yr + brood)	20	1774.98	8.84	0.00	8.84	0.00
φ^{J}(yr + rhatch)	20	1775.02	8.87	0.00	8.88	0.00
φ^{J}(yr + henage)	20	1775.37	9.22	0.00	9.23	0.00
φ^{J}(yr)	19	1777.71	9.54	0.00	9.54	0.00
$\varphi^{J}(ANS_{yr-1})$	20	1785.56	19.43	0.00	19.43	0.00
φ^{J}(.)	19	1788.18	20.01	0.00	20.01	0.00
$\varphi^{J}(PDO_{yr-1})$	20	1787.55	21.41	0.00	20.74	0.00
$\varphi^{J}(ATMP_{yr-1})$	20	1788.01	20.87	0.00	20.87	0.00
φ^{J}(fem $mass_{yr-1}$)	20	1787.56	21.41	0.00	21.41	0.00
$\varphi^{J}(COGOocc_{yr-1})$	20	1787.58	21.44	0.00	21.45	0.00
$\varphi^{J}(PRES_{yr-1})$	20	1787.62	21.47	0.00	21.48	0.00
$\varphi^{J}(precip_{yr-1})$	20	1787.70	21.56	0.00	21.56	0.00
$\varphi^{J}(pNID_{yr-1})$	20	1787.73	21.58	0.00	21.58	0.00
$\varphi^{J}(temp_{yr-1})$	20	1787.86	21.71	0.00	21.71	0.00
$\varphi^{J}(WTMP_{yr-1})$	20	1787.94	21.80	0.00	21.80	0.00
$\varphi^{J}(phatch_{yr-1})$	20	1788.06	21.91	0.00	21.91	0.00

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[a]Model selection notation follows Burnham and Anderson (2002); yr denotes annual variation, (T) denotes a linear trend across years, (.) indicates that a parameter was held constant, a + sign indicates an additive effect between two variables, whereas a * denotes an interaction. The following covariates were applied to known-age individuals only: dmass = individual duckling mass recorded at hatch, standardized across years; femage = minimum age of maternal female; rhatch = hatch date relative to peak (modal) hatch date each year; brdage = age at first breeding; brood = the number of ducklings (all species) leaving the nest Other individual covariates included NS = nesting outcome of an individual in year *yr-1*;and bc = individual mean annual body condition , based on residuals from a mixed effects model with mass as a response variable and structural size, day of nesting^2, individual (random effect), and year (fixed effect) as explanatory variables. Time-varying covariates were applied to parameters with multiple lag effects in which yr subscript reflects conditions in the current year (i.e., the end of interval yr-1 to yr), yr-1 subscript reflects conditions the previous year (i.e., the beginning of the current interval), and yr-2 subscript reflects conditions two-years prior (i.e., the beginning of the previous interval_. fem mass = annual average hen mass during mid-incubation derived from a mixed effects model with mass as a response variable and structural size, day of nesting^2, individual (random effect), and year (fixed effect) as explanatory variables; COGO occ = annual proportion of nest boxes occupied by goldeneyes; ANS = annual apparent nest success; pNID = annual modal goldeneye nest initiation date; phatch = annual modal goldeneye hatch date; temp = average of monthly mean temperatures on the study area from April to September; precip = total precipitation on the study area from April to September; PRES = sea level pressure (hPa) from October$_{yr-1}$ to March$_{yr}$ in purported wintering region; ATMP = air temperature (Celsius)

from October$_{yr-1}$ to March$_{yr}$ in purported wintering region; WTMP = sea surface temperature (Celsius) from October$_{yr-1}$ to April$_{yr}$ in purported wintering region; PDO = Annual Pacific Decadal Oscillation index, averaged monthly mean values from October$_{yr-1}$ to March$_{yr}$

[b]Bold indicates the parameter being modeled, while other model parameters held constant with structure: φ^{A}(yr), φ^{J}(yr), *p*(Age 2, 3≤ + NS), ψ^{PB}(.), $\boldsymbol{\psi}^{\mathbf{BB}}$, ψ^{NB}(0)

[c]— φ^{J}(yr), φ^{A}(yr), *p*(Age 2, 3≤ + NS), $\boldsymbol{\psi}^{\mathbf{PB}}$, ψ^{BB}(NS), ψ^{NB}(0)

[d]— φ^{J}(yr), $\boldsymbol{\varphi}^{\boldsymbol{A}}$, *p*(Age 2, 3≤ + NS), ψ^{PB}(dmass), ψ^{BB}(NS), ψ^{NB}(0)

[e]— $\boldsymbol{\varphi}^{\boldsymbol{J}}$, φ^{A}(yr), *p*(Age 2, 3≤ + NS), ψ^{PB}(dmass), ψ^{BB}(NS), ψ^{NB}(0)

APPENDIX 2. COMPLETE MODEL BETA COEFFICIENT LIST FOR MULTISTATE CAPTURE-MARK-RECAPTURE ANALYSES IN PROGRAM MARK

Table B1. Multistate models representing hypotheses about life history patterns in Common Goldeneyes in interior Alaska from a long-term nest box study (1997–2010). Our modeling framework included three reproductive states (Fig. 1)— Prebreeding, Breeding, and Nonbreeding. We treated Prebreeding and Nonbreeding as unobservable states and set their detection probabilities to 0.0, and constrained all biologically impossible movements for the transition probabilities (e.g., Breeding to Prebreeding, ψ^{BP}) to 0.0 as well. We created two model sets, Phi- and Psi-first that differed by the sequence in which parameters were modeled (Tables A1, A2). We used a third model set (Table 2) that included the best supported model from each set, and intermediates between the two, we then obtained model-averaged beta coefficients using all models within 4 ΔAIC_C units of the best-supported model (Burnham and Anderson 2002). We used the 'modavgCustom' function in the *AICcmodavg* package (Mazerolle 2016) in R (R Core Team 2016) to obtain the model-averaged beta coefficients.

	Estimate	SE	85% LCI	85% UCI
Detection probability (p)[a]				
$\beta_{Intercept}$	3.09	0.30	2.65	3.52
$\beta_{Age\ 2}$*	-2.32	0.47	-2.99	-1.64
β_{NS}*	0.43	0.28	0.03	0.83
Survival Probabilities (φ^J, φ^A)				
$\beta_{Intercept}$	2.51	1.57	0.25	4.77
$\beta_{Prebreeding}$*	-4.82	0.94	-6.16	-3.46
$\beta_{1997\text{-}1998}$	-0.56	1.07	-2.10	0.98
$\beta_{1998\text{-}1999}$	-1.05	1.07	-2.59	0.49
$\beta_{1999\text{-}2000}$	-0.94	1.06	-2.46	0.57

$\beta_{2000\text{-}2001}$	0.21	1.08	-1.35	1.77
$\beta_{2001\text{-}2002}$	0.00	1.04	-1.51	1.50
$\beta_{2002\text{-}2003}$	-0.70	1.05	-2.20	0.81
$\beta_{2004\text{-}2005}$	-0.81	1.06	-2.34	0.72
$\beta_{2004\text{-}2005}$	-0.44	1.16	-2.12	1.24
$\beta_{2008\text{-}2009}$	0.31	3.42	-4.61	5.24
$\beta_{2009\text{-}2010}$	-1.47	1.20	-3.20	0.27
$\beta_{\text{Duckling Mass}}$*	0.52	0.17	0.27	0.76
$\beta_{\text{Duckling Brood Size}}$	-0.16	0.12	-0.33	0.01
$\beta_{\text{Adult NS}}$	0.54	0.48	-0.15	1.23
Transition Probabilities (ψ^{PB}, ψ^{BB})				
$\beta_{\text{Recruitment Intercept}}$	3.16	1.40	1.14	5.18
$\beta_{\text{Recruitment Duckling Mass*}}$	-1.36	0.54	-2.13	-0.58
$\beta_{\text{Breeding Probability Intercept}}$	1.67	0.86	0.43	2.90
$\beta_{\text{Breeding Probability NS}}$	0.54	0.39	-0.01	1.10

[a]A * denotes a significant effect in which the 85% confidence intervals do not overlap zero (Arnold 2010), excluding intercept terms; The model-averaged beta coefficients included the following covariates: NS = nesting outcome of an individual in year *yr-1*, only applied to individuals three and older; Duckling Mass = individual duckling mass recorded at hatch, standardized across years and only applied to known-age individuals; and Duckling Brood Size = the number of ducklings (all species) leaving the nest box.