APPENDIX

Symbols and Acronyms

Glossary of terms, symbols, and notation (adapted from Burnham et al. 1987). Although appropriate for general applications, definitions are placed in the context of the studies presented in this volume. Additional descriptions and citations are in the text.

Symbols for Parameters

The following symbols are generally subscripted.

b fecundity; the number of female young fledged per territorial female owl.

λ annual rate of population change; $\lambda = 1$ indicates a stationary population; $\lambda < 1$, a declining population; and $\lambda > 1$, an increasing population; and $\lambda - 1$, the annual magnitude of change.

E permanent emigration rate; for an owl in a study area at the start of a year, the annual probability of it leaving the area where surveys occur and never returning.

F fidelity rate ($= 1 - E$); annual probability of an owl remaining on a study area.

ϕ apparent survival ($= 1 - [$mortality rate $+ [S \times E]$]); the probability that an owl alive in year t survives and remains within a study area to year $t+1$.

p recapture probability; the probability that an owl alive in year t is recaptured or resighted in year t.

q $1 - p$; the probability that an owl alive in year t is not recaptured in year t.

S true survival rate ($= 1 - $ mortality rate); the probability that an owl alive in year t survives to year $t+1$.

θ a generic parameter, e.g., ϕ, S, λ, or p. Used when discussing parameters in general terms.

Subscripts for Parameters

A   owls that are ≥ 3 years old.

i capture occasion for which parameter is estimated.

J   juvenile age-class; includes fledged young of the year that are <1 year old.

t year for which parameter is estimated.

S1   owls that are ≥ 1 and <2 years old.

S2   owls that are ≥ 2 and <3 years old.

x age-class; a generic symbol to denote either juvenile (J), 1-year old (S1), 2-year old (S2), or ≥ 3-year old (A) age-classes.

Statistical Symbols and Acronyms

AIC   Akaike's Information Criterion; AIC $= -2\ln(L) + 2K$.

$E(\hat{\theta})$ expected value of the estimator $\hat{\theta}$.

^   placed above a symbol denotes an estimate or estimator.

H_O Null hypothesis.

H_A Alternate hypothesis.

k number of capture occasions; in this case, the number of years where owls were captured.

K number of estimable parameters in a mark-recapture model.

L   likelihood function.

$\ln(\ )$ natural logarithm (base 2.718).

$\ln(L)$ natural logarithm of the likelihood function.

$\widehat{SE}(\hat{\theta})$ estimated standard error of a parameter estimate where $\widehat{SE}(\hat{\theta}) = \sqrt{\widehat{var}(\hat{\theta})}$.

X   capture history matrix where columns are years (capture occasions), rows represent individual owls, and cells represent whether an owl was captured (1) or not captured (0).

z a test statistic distributed normally with mean $= 0$ and standard error $= 1$ under the null hypothesis.

χ^2 a test statistic distributed as chi-square with n degrees of freedom under the null hypothesis.

Symbols Used in Model Notation

a categorical age effects for four age classes.

an categorical age effects for n age classes where n ≤ 4.

an' categorical age effects for birds initially banded as juveniles where n is the number of age classes over which restrictions apply, e.g., $p_{a2'}$ indicates recapture probabilities for juveniles

that differ over the 2 next age-classes in which juveniles are recaptured.

g categorical study area effects.

s categorical sex effect.

t categorical time effects.

T time effects are modeled as being linear over time.

+ when used between effect subscripts indicates that effects are additive (no interactions), e.g., s + t indicates rates modeled by sex which vary similarly over time.

* when used between effect subscripts indicates that interaction between effects are included, e.g., s*t indicates rates are modeled by sex and time and the interaction between the two.

Specific Terms

DSA Density Study Area—A defined area within which the objective is to estimate the total number of resident owls present each year. The entire area is systematically searched 3-6 times each year, using calling stations spaced at close intervals.

fecundity the number of female young fledged per territorial female owl per year.

floater an unpaired, nonbreeding owl which does not exhibit territorial behavior.

GSA General Study Area—A geographic region within which information on owl demographic performance is collected. Entire area is not necessarily searched for owls. Rather, the focus is on specific areas with a history of occupancy by Spotted Owls.

juvenile a fledged young of the year; an owl <1 year of age.

non-juvenile any owl ≥1 year of age.

mousing method in which observers place live mice in front of owls and then watch to see if the owls eat, cache, or take the mice to nests or fledged young. Used to determine reproductive output in owls.

permanent emigration owls leave a study area and do not return; denoted by E.

reproductive output the total number of young fledged per territorial female owl per year.

site area where Spotted Owls exhibited territorial behavior on ≥2 separate occasions ≥ one week apart within a given year.

stable demographic parameters (such as survival and fecundity) which do not change over time.

stationary a population whose numbers remain constant over time ($\lambda = 1$).

temporary emigration owls leave a study area for at least one year and then return to the study area.