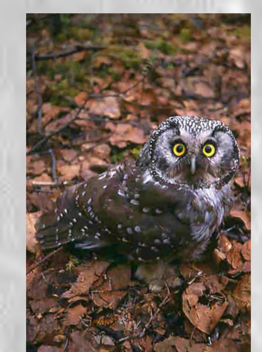
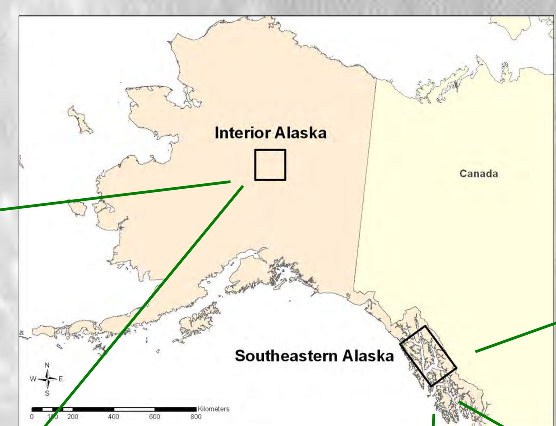
Factors Affecting Owl Detection Probability in Alaska

Grey W. Pendleton – Alaska Dept. Fish & Game
Michelle L. Kissling – U. S. Fish & Wildlife Service
Jackson S. Whitman – Alaska Dept. Fish & Game
Stephen B. Lewis – Alaska Dept. Fish & Game

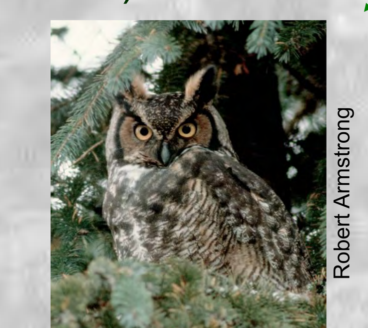
Study Areas, Species, and Methods



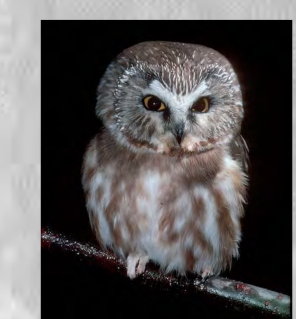
boreal owl (BOOW)



western screech owl (WESO)



great horned owl (GHOW)



northern saw-whet owl (NSWO)

barred owl (BDOW)

Interior study

-- boreal forest
-- 5 roadside transects with up to 26 points per transect, surveyed Feb.-Apr. over 4 years; effort varied among years and transects.
-- Silent listening only.
-- Other species detected: great gray owl and northern hawk owl.

Southeast study

-- temperate rain forest
-- 5 roadside transects with 10 points per transect, surveyed Feb.-June in 1 year.
-- Silent listening and broadcast calls (WESO and BDOW calls).
-- Other species: great horned owl, northern pygmy owl, and boreal owl.

Analyses

We used occupancy models (MacKenzie et al. 2006) to estimate occupancy (ψ) and detection (p) probabilities for all species. ψ was modeled as a function of route, sub area (southeastern study only), and for small owls (WESO, NSWO), the presence of large owls (BDOW, GHOW); p was modeled as a function of measured covariates. For the interior Alaska, multi-year study, we did not model occupancy changes across years, but assumed constant occupancy across years for each route. For each species, we started with each covariate singly, then fit more complex models with combinations of the more important individual variables. Model selection was based on AIC.

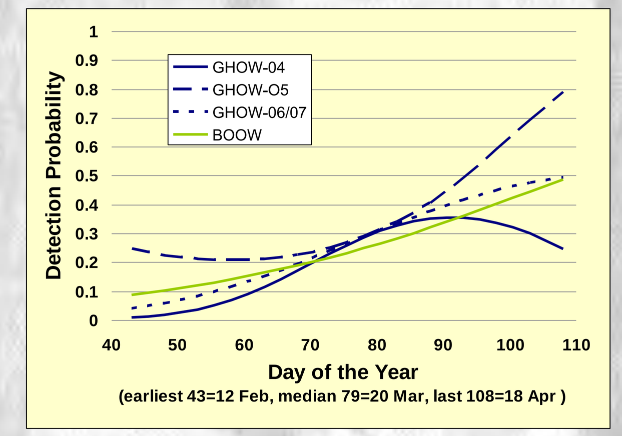
Results

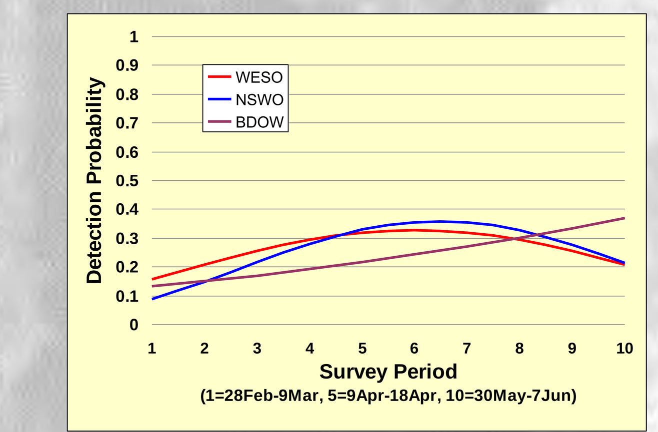
Variable	GHOW	BOOW	WESO	NSWO	BDOW
date	yr[c]	1[d]	2[e]	2	1
time	1	2	1		
temp. °C	1	1			
humidity		1	--	--	--
barom.		1	--	--	--
precip.	--	--		x[f]	x
snow (%)	--	--			
cloud (%)	1				
moon	1				
light[a]	--	--		1	
wind	--	--	1	1	
noise	--	--	x		
car[b]	--	--			

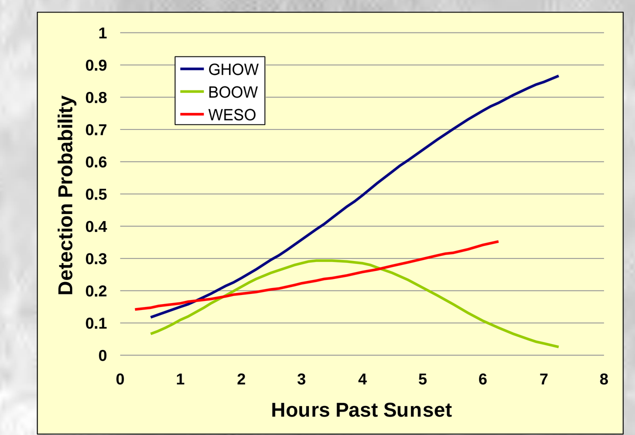
a light = (1-cloud)*moon
b car = # cars passing point during survey
c year*date interaction
d linear pattern
e quadratic pattern
f categorical reponse

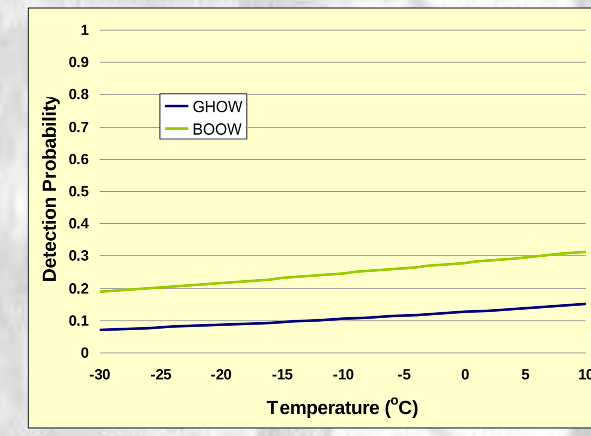
Occupancy

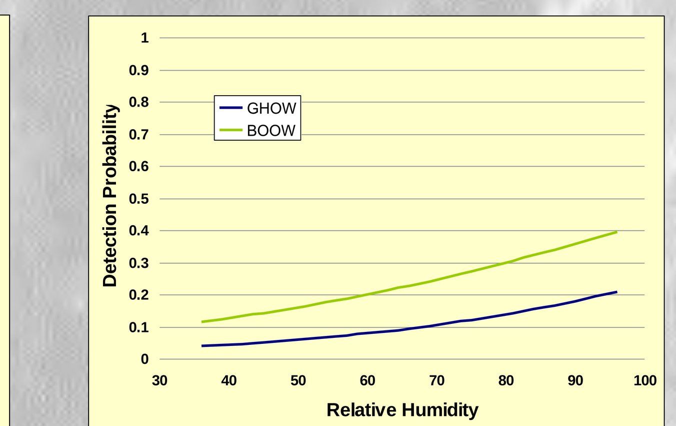
-- occupancy probability varied among survey routes for both interior species (GHOW, BOOW).
-- occupancy did not vary among survey routes or sub-areas for southeastern species (WESO, NSWO, BDOW)
-- occupancy probability for WESO was reduced 66% when large owls (BDOW or GHOW) had been detected at that point.





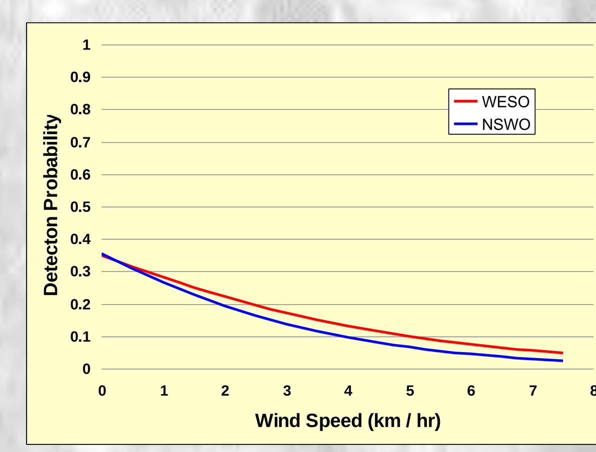


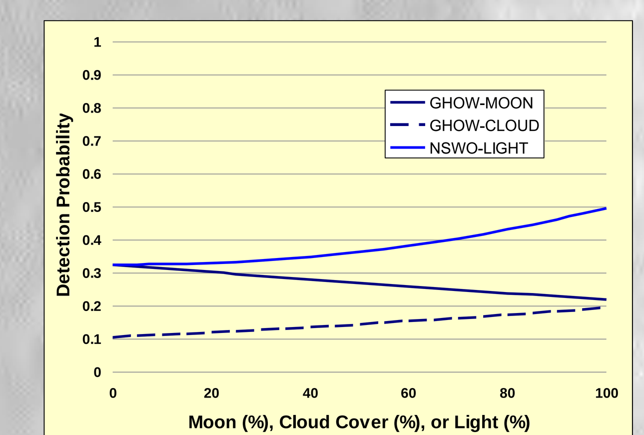




NSWO detected

		yes	no
precipitation	yes	0	62
	no	57	363

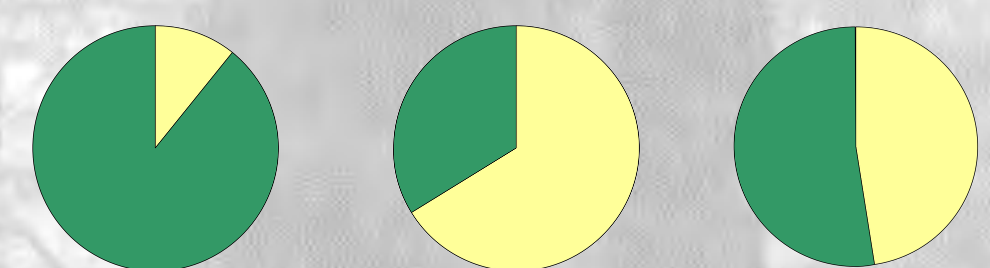




WESO detected

		yes	no
noise	≤2	35	373
	≥3	2	72

Detection Method



silent
broadcast

Conclusions

-- For all species in both study areas, peak detectability was in late April and May.
-- Detection of species in interior Alaska (GHOW, BOOW) was more affected by temperature and relative humidity, likely because these varied much more in interior Alaska than in coastal southeastern Alaska.
-- NSWO were never detected during non-snow precipitation.
-- Maximum detectability of GHOW was under dark conditions (i.e., long after sunset, little moonlight, higher cloud cover). In contrast, NSWO were more detectable with increasing moonlight (adjusted for cloud cover).
-- For WESO and NSWO, it is not clear whether wind and precipitation (NSWO only) affected cue production, cue detection, or both.
-- WESO were often found near streams, which likely were the source of noise that affected detectability.
-- Use of broadcast calls was very important for detecting WESO in dense, temperate rain forest.