Shorebird Use of Military Lands in Interior Alaska

Ellen Martin[1,2], Kim Jochum[2,3], Calvin Bagley[2], Paul F. Doherty, Jr.[1]

[1] Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado 80523
[2] Center for Environmental Management of Military Lands, Colorado State University, Fort Collins, Colorado 80523
[3] Department of Public Works Environmental Division, United States Army Garrison, Fort Wainwright, Fairbanks, Alaska 99703

Introduction

- Shorebird populations are declining globally. Approximately half of North American species have experienced population declines (e.g., Fig 1; Andres et al. 2012).

- Interior Alaska is difficult to access and very remote. As a result, no design-based surveys have been done on shorebird occupancy in the boreal forest.

- The Department of Defense uses and manages land in Interior Alaska that could be important shorebird breeding habitat.

- This is the first such study to develop a boreal forest survey protocol to determine shorebird occupancy on military lands in Interior Alaska.

Figure 1: Lesser Yellowlegs on Donnelly Training Area East plot.

Objectives & Hypotheses

- Identify shorebird species using military lands with a survey approach modified for the boreal forest.

- Estimate occupancy / use for these species and determine associated habitat covariates.

Covariates	Lowland Shorebirds	Upland Shorebirds
Distance to Wetland	–	–
Elevation	–	+
% Shrub Cover	–	+
% Water on Plot	+	+
Most occupied Viereck Classification	Wet, grassland / open mudflat	Low shrub

Table 1: Covariates hypothesized to influence shorebird use on plot. As covariate values increase, hypothesized direction of probability of shorebird use either decreases (-) or increases (+).

- Generate map of predicted shorebird use areas to inform military training locations and times.
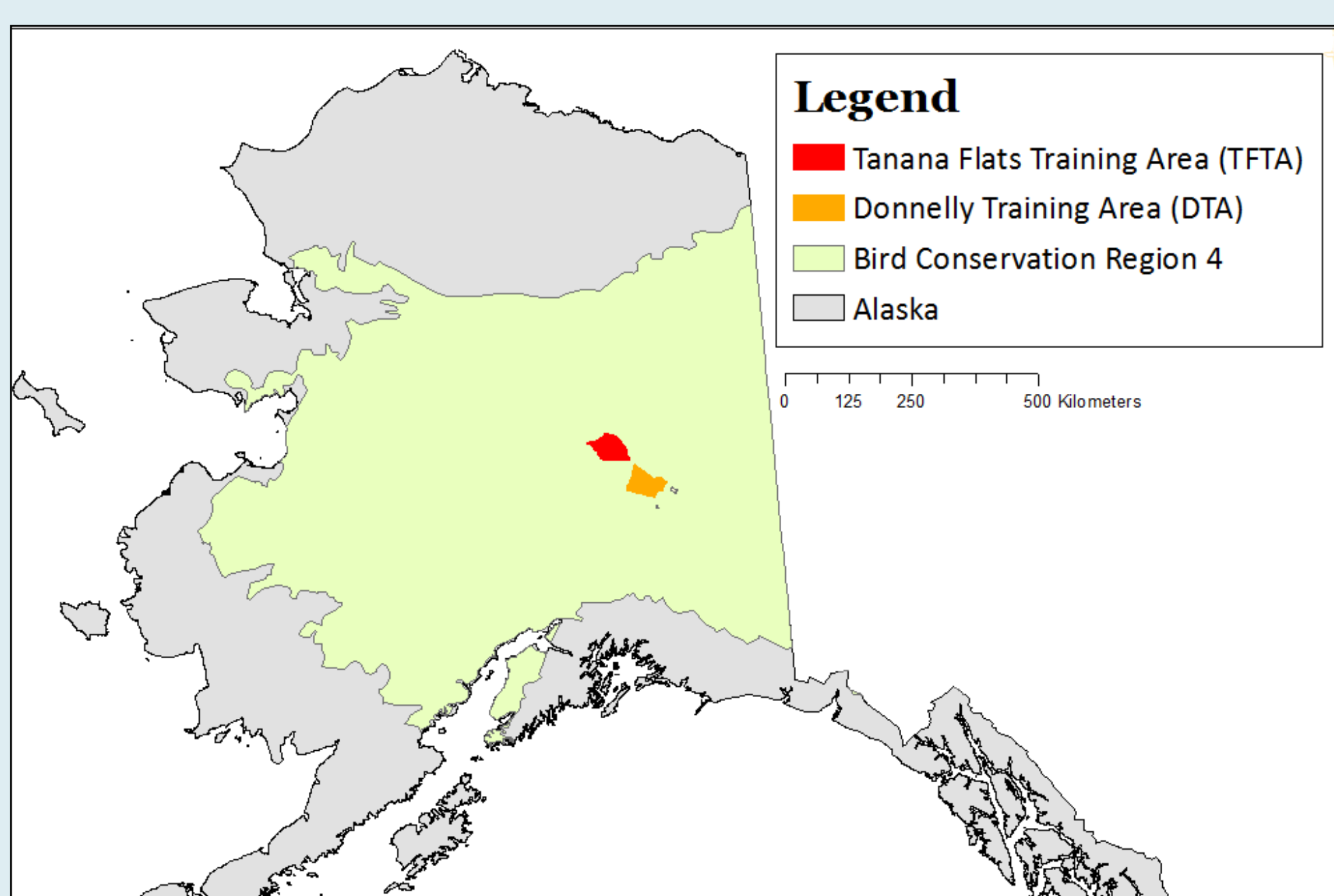

Methods

- We surveyed 140 plots (400m x 400m) in 2017 and 78 plots in 2016 on Tanana Flats Training Area and Donnelly Training Areas (Fig 2 and Fig 3) twice with dependent double observers using stratified random sampling.

- We collected data on habitat covariates at these plots.

- We used occupancy / use models (MacKenzie et al. 2006) to estimate habitat use and used AIC information for model selection (Burnham and Anderson 2003).

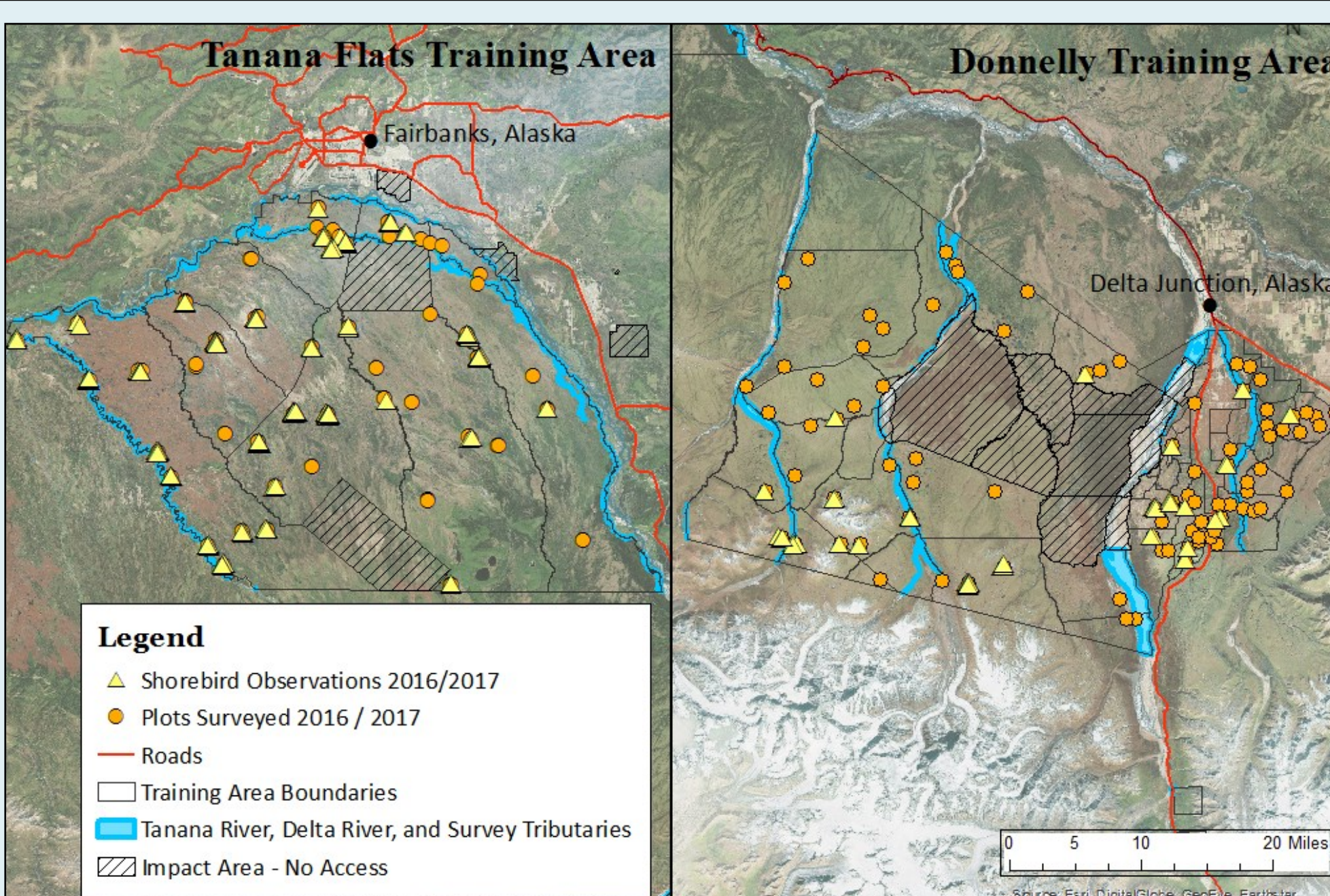- We analyzed data for all shorebirds and for species-specific habitat relationships.

Figure 2: Study areas in Interior Alaska.

Figure 3: Shorebird observations and plots surveyed.

Results

- We observed 12 species of shorebirds during plot surveys in 2016 and 2017 (484 total observations; Table 2). Timing of surveys was an important determinant in number of shorebirds observed (e.g., May vs July).

- Average occupancy of shorebirds was 0.419 (SE=0.066), (from Ψ.,p. models).

- Average detection for shorebirds was 0.652 (SE=0.081), (from Ψ.,p. models).

- The most important variables for occupancy were distance to wetlands, elevation, scrub canopy percent, scrub presence, and forest absence (Table 3).

- Distance to wetlands and elevation were included in final top model (Fig 4).

- Results of preliminary occupancy model analysis are consistent with hypotheses (Table 3).

Table 2: Shorebird raw count and conservation status.

Species	Upland vs Lowland	2016 Count	2017 Count	AK Shorebird Cons. Plan (High Concern List)	USFWS (High Concern List)
Lesser Yellowlegs (*Tringa flavipes*)	Lowland	43	144	✓	✓
Wilson's Snipe (*Gallinago delicata*)	Lowland	41	153		
Spotted Sandpiper (*Actitis macularius*)	Lowland	10	21		
Solitary Sandpiper (*Tringa solitaria*)	Lowland	4	5	✓	✓
Dunlin (*Calidris alpina*)	Lowland	1	0	✓	
Least Sandpiper (*Calidris minutilla*)	Lowland	0	1		
Whimbrel (*Numenius phaeopus*)	Upland	5	11	✓	✓
Black-bellied Plover (*Pluvialis squatarola*)	Upland	2	3		
Upland Sandpiper (*Bartramia longicauda*)	Upland	1	3	✓	✓
American Golden-Plover (*Pluvialis dominica*)	Upland	0	1	✓	
Baird's Sandpiper (*Calidris bairdii*)	Upland	0	1		
Pectoral Sandpiper (*Calidris melanotos*)	Upland	0	1		
Total	- -	120	364		

Table 3: Importance values (cumulative variable weights) for shorebirds found on plot. Habitat codes (Viereck et. al. 1992) separated into 4 categories: Barren/Open Water, Forest, Forb/Lichen, and Scrub. Variables with weight greater than 0.5 in bold, variables in top model highlighted.

Variable	All Shorebirds
Distance to Wetland	**0.949**
Elevation	**0.810**
Scrub Canopy Percent	**0.775**
Scrub Habitat	**0.711**
Forest Habitat	**0.635**
Forb / Lichen Habitat	0.438
Barren / Open Water Habitat	0.342
Percent Water on Plot	0.261

Discussion

- We documented species of high concern on military lands in Interior Alaska. We conclude military lands in Interior Alaska provide important breeding habitat for these species.

- Our results provide the Department of Defense with habitat relationships that can be used to refine shorebird occupancy maps and inform military use of habitat.

- Habitats identified as high use by shorebirds are susceptible to climate change and predicted to dramatically change as permafrost melts, water tables change, and temperatures rise.
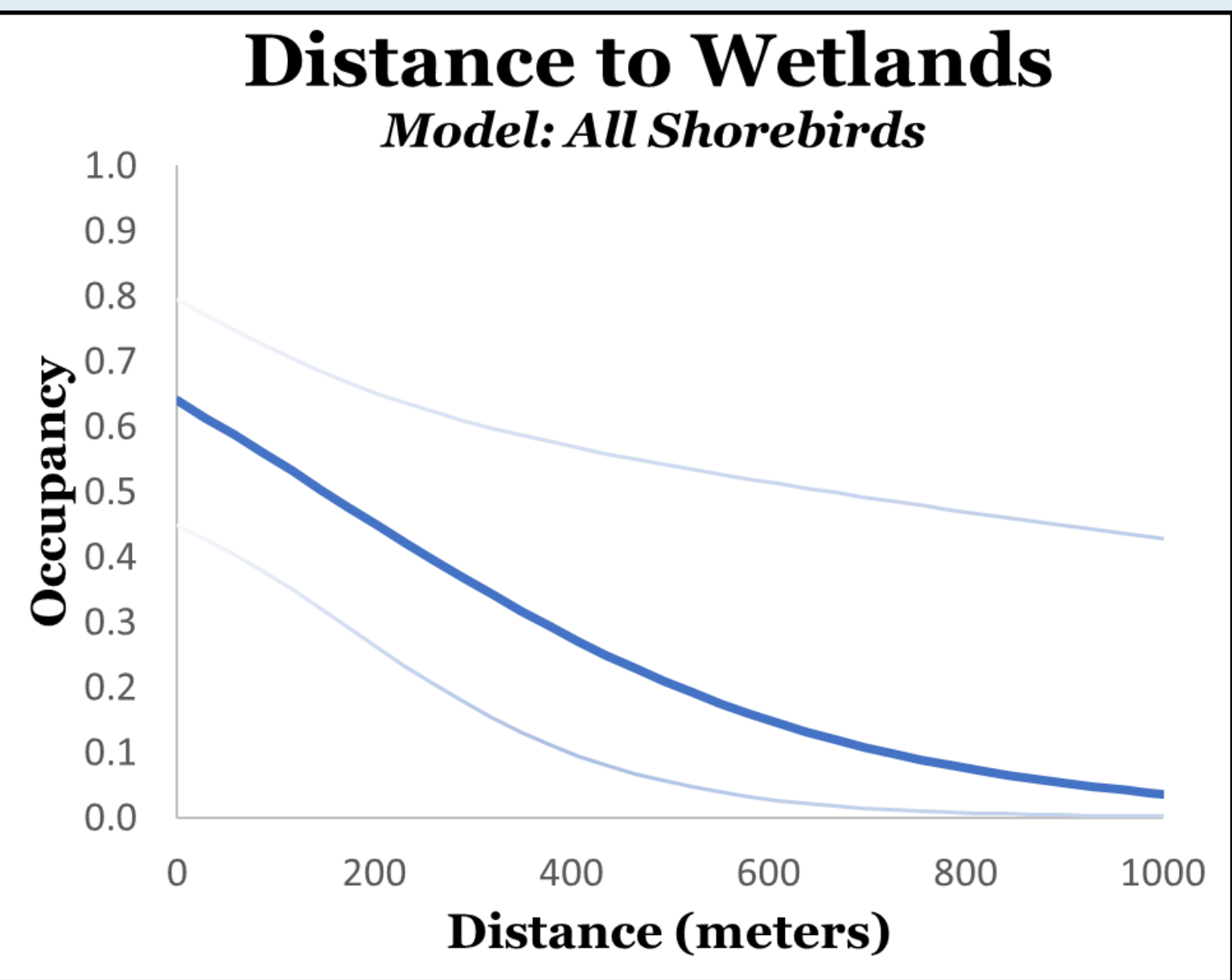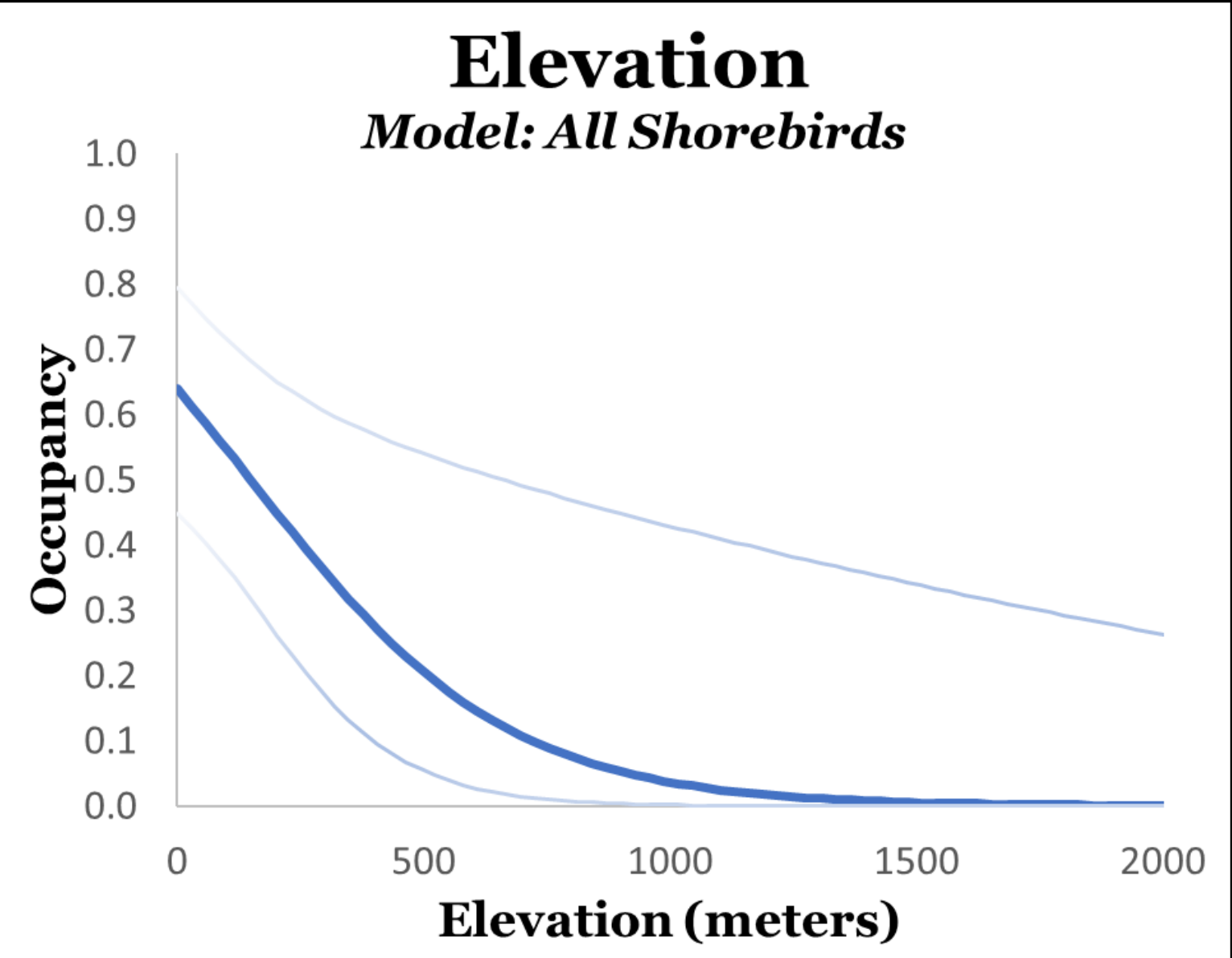

Figure 4: Top predictor variables of occupancy. Both variables found in top model (95% CI).

Future Directions

- Estimate species-specific occupancy.

- Estimate abundance for all species of conservation concern (AK Shorebird Plan) found during surveys.

- Generate map for US Army of shorebird areas of use to inform military training timing and location.

- Results and methods useful to inform future boreal shorebird surveys.

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