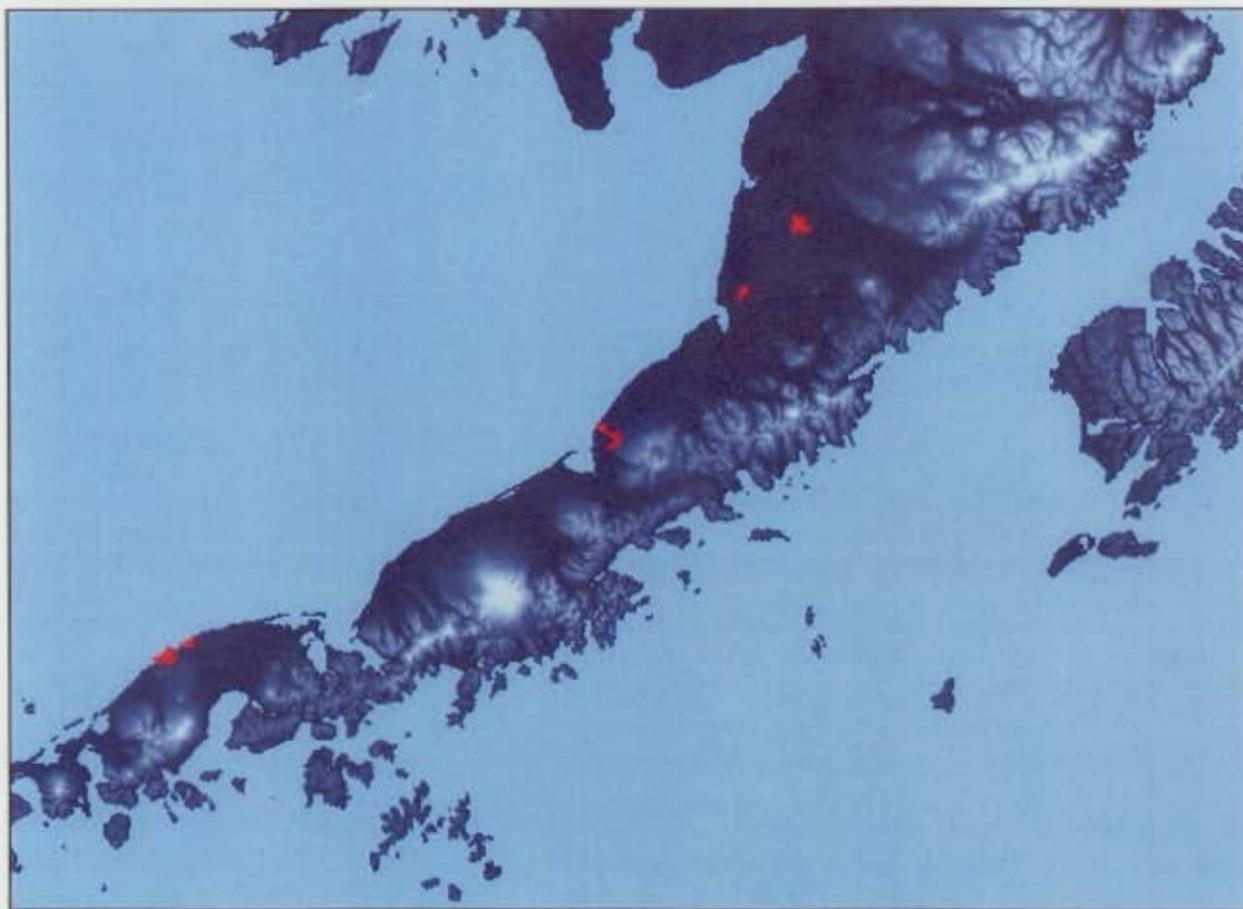


ABIGINA

Status of the Marbled Godwit (*Limosa fedoa*) on BLM lands on the Alaska Peninsula, May 2004

(with observations of large plovers and other avifauna)



ORIGINAL

Robert Gill¹, Lee Tibbitts¹, Maksim Dementyev², & Robb Kaler³

¹ Alaska Science Center, U.S. Geological Survey, 1011 East Tudor Road, Anchorage, AK 99503

² Biological Dept., Moscow State Univ., Vorovjovy Gory, Bldg. 1, Moscow, Russia 119899

³ Alaska Peninsula/Becharof National Wildlife Refuge Complex, P. O. Box 277, King Salmon, AK 99613

Introduction

Between 9 and 14 May 2004, personnel of USGS's Alaska Science Center and Alaska Peninsula/Becharof National Wildlife Refuge conducted an avifaunal inventory of birds on selected Bureau of Land Management (BLM) lands on the north side of the Alaska Peninsula. The investigation was funded by BLM as part of its evaluation of critical natural resources—particularly special-status species—occurring on BLM lands for which title might be conveyed to other federal, state, or Native interests.

The lands inventoried in this investigation occur within or just outside the suspected breeding range of the Marbled Godwit (*Limosa fedoa*), a large shorebird listed as a species of special concern in both the United States and Canadian shorebird conservation plans (Brown et al. 2001, Donaldson et al. 2001). The population nesting in Alaska (*L. f. beringiae*) is both geographically isolated and morphologically distinct from the main population (Gibson and Kessel 1989) that occurs in two relatively restricted areas of central North America (Gratto-Trevor 2000). Further, the *beringiae* population is thought to number only a few thousand individuals (Alaska Shorebird Group 2004) and to date has been confirmed nesting from a single, relatively small area of wetlands inland from Ugashik Bay (Mehall-Niswander 1997). Additional evidence, collected mostly outside the core nesting period, suggests the breeding range of *beringiae* may extend north to the Egegik Bay-Becharof Lake region and south to at least Port Heiden and possibly Nelson Lagoon (Maley et al. 2003, Morse and Powell 2004).

Study areas

BLM identified four specific land-holdings on the Alaska Peninsula for evaluation (Figure 1). Logistic constraints during 2004 precluded an evaluation of the most westerly plot in the Caribou Hills northeast of Izembek Lagoon; see cover. The three central-peninsula plots were distributed over a 160-km-long portion of the peninsula, occurred between 0.4 and 35.0 km of the Bristol Bay coast, and ranged in size between 20 and 60 km² (Figure 1, Table 1).

Methods

The primary focus of this effort was to assess the occurrence and status of Marbled Godwits on BLM lands and secondarily to gather similar information about other shorebird species. In addition, we were requested to inventory all other birds encountered on the surveyed areas. To accomplish this we used two survey techniques, each tailored to specific land cover types and/or the complexity of bird assemblages encountered in a particular area. To obtain general information such as presence/absence and relative numbers we laid out walking transects over each plot such that all major land cover types would be sampled. Then, while walking at a moderate but steady pace, observers noted numbers of each species of bird seen—regardless of distance from the observer but usually within 200 m either side of the observers—and behaviors indicative of nesting, e.g., flight displays, singing males, territorial interactions, and nests or nest building. In portions of plots more suitable for godwits, other shorebirds, and potential shorebird predators, we used line transect sampling with distance estimation (Buckland et al. 2001, Borchers et al. 2002) to obtain estimated density. Transect routes were selected to cover representative features within specific land cover types within each plot. Observers walked a

straight line and noted all shorebird and shorebird predators as well as the perpendicular distance of each bird from the transect centerline at time of detection. The latter was determined with optical range finders. Birds noted beyond the limits of the range finder (about 500 m) and those that were flying were assigned distances usually based on intervals of 100 m. For each detection, we also recorded a GPS waypoint, the type of initial detection (audio or visual), the bird's behavior and vocalization, associated vegetation type (after Viereck et al. 1992), and whether or not the observer felt the bird was responding to her or his presence. During these transects we also recorded numbers of all other species within a fixed distance of centerline (usually 50–100 m), but did not record the other data parameters we noted for shorebirds.

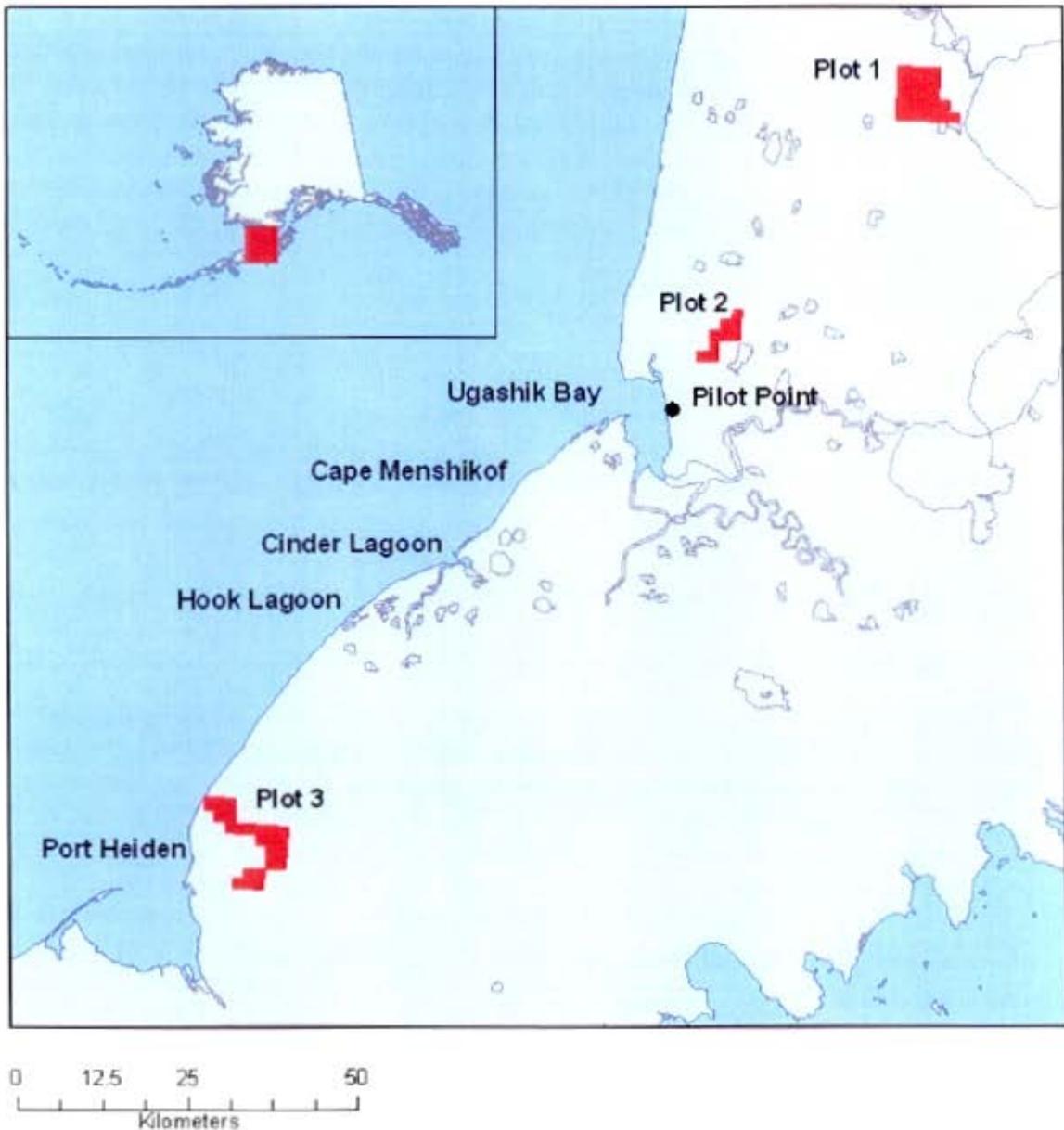


Figure 1. Location (in red) of BLM lands visited during the 9–14 May 2004 survey.

A helicopter (Hughes 500) was used to access all plots and move personnel within plots. We also used the helicopter to conduct low level aerial transects over suspected godwit nesting areas between Port Heiden and Pilot Point. These were flown at 50-m elevation above ground level (AGL) and at an air speed of 100–120 km/h. The pilot, right front observer, and right rear observer recorded birds and estimated a perpendicular distance between a bird and the helicopter when the bird was first observed. A GPS waypoint was taken for all sightings.

The land cover composition of each **suevey** plot, as shown in Table 1 (see also Figure 7), was calculated in ArcGIS from the digital land cover map created by the Bristol Bay Mapping Project (Wibbenmeyer et al. 1982).

Prior to going into the field all personnel received training on distance estimation, song and call identification, and vegetation classification (after Viereck et al. 1992).

Table 1. Proportional composition of land cover classes¹ on surveyed plots (see Figure 1 for plot location).

Cover class	Plot 1 ²	Plot 2	Plot 3
Water	0.14	0.06	0.00
Barren	0.04	0.02	0.02
Marsh/wet bog	0.01	0.09	0.01
Wet bog/wet meadow	0.16	0.14	0.13
Deciduous shrubs	0.01	0.38	0.13
Closed shrub/graminoid	0.00	0.01	0.05
Open low ericaceous	0.17	0.02	0.35
Open low shrub/graminoid	0.39	0.29	0.31
Lichen shrub tundra	0.07	0.00	0.00
Total	1.00	1.00	1.00

¹ After Wibbenmeyer et al. (1982).

² Plot 1 = 59.5 km²; Plot 2 = 22.8 km²; Plot 3 = 61.6 km².

Data analysis

Because this work is intended to continue through spring 2006, we have deferred a comprehensive analysis of numbers and habitat affinities of Marbled Godwits and other birds until completion of the study. For the 2004 effort we present 1) a detailed summary of all Marbled Godwits detected, 2) summaries of information for individual species for which breeding range and/or status was found to be substantially different than that indicated by existing information, and 3) for each taxa, plot-specific summaries of relative abundance based on numbers recorded and/or rates of detection.

Results

Plot attributes: The surveyed plots occur mostly within the Bristol Bay lowlands ecosystem (Nowacki et al. 2002) of the Alaska Peninsula, a region defined by glaciation, vulcanism, remnants of permafrost, and large concentrations of lakes, ponds, meandering rivers, and wetlands. Plots ranged in elevation between 10 and 30 m ASL with exception of a portion of Plot 3 that included the toe-slope of Aniakchak Crater at an elevation of about 200 m ASL.

All three plots surveyed in 2004 were dominated by open low shrub/graminoid, wet bog/wet meadow, and open low ericaceous land covers (Table 1). Plots 2 and 3 had much more low- to medium-tall shrubs (*Salix*, *Betula*, and *Alnus* sp.) than Plot 1, which in turn had more shallow water and lichen shrub tundra than Plots 2 and 3. Figures 2–6 show representative land covers encountered on the three plots.



Figure 2. From the base of Aniakchak Caldera looking northwest across Plot 3 to Bristol Bay. The foreground is a mixture of open low ericaceous and moss. The background is a mosaic of open and closed deciduous shrub (dark brown), and wet bog/wet meadow land covers (tan) (Photo by L. Tibbitts).



Figure 3. Closed shrub/graminoid land cover, Plot 3 (Photo R. Gill).



Figure 4. Open low shrub/graminoid and deciduous shrub land cover, Plot 2 (Photo R. Gill).



Figure 5. Open low shrub (foreground), open low ericaceous (mid), and wet bog/wet meadow land cover (far), Plot 3 (Photo R. Gill).



Figure 6. Most godwits we detected were associated with marsh/wet bog land cover such as this on Plot 1 (Photo R. Gill).

Marbled Godwits (*Limosa fedoa*): No godwits were observed by either team on Plot 1 during the 12–13 May census period (Figure 7, Appendices A & B). On the north and northeast portions of Plot 2 between 10 and 12 May, we observed two godwits (WP025, Appendix A) flying over us; a male (WP028) in flight display; two feeding birds (WP031) flushed by us; a single bird flying towards us alarm calling (WP034); and two flying high to the southwest and calling (WP049). In the southern portion of the plot we observed a bird flying high to the northeast (MAGO-01); another that was heard but never seen (MAGO-02); and one in flight display (MAGO-1) between the southeast border of the Plot and the west shore of Pike Lake. On 13–14 May on Plot 3, we observed a female flying silently over us (WP040) coming from the direction of Port Heiden and passing east (80° magnetic); two birds flying overhead (WP43a) from northeast to southwest and calling, one of which circled back to the east; and a male in flight display about 400 m south of us (WP43b). For the entire ground effort we recorded godwits on 5 of 18 (28%) transects (Figure 7, Appendix B). This represented 11 different detections totaling 15 different birds over the 63 km of transects hiked.

On 14 May, we conducted two, low-level aerial transects (see Methods) between Port Heiden and Pilot Point. The transects were 10- to 15-km inland from the coast and roughly parallel but separated by 2 to 5 km—only coming within a few hundred meters of each other at a single location just inland from Cinder Lagoon (Figure 8). Along these transects we found Marbled Godwits (12 detections totaling 18 birds; Appendices A & B) distributed from about opposite Hook Lagoon to Ugashik Bay, with most observations in two clusters—one east of Cinder Lagoon and one southeast of Cape Menshikof (Figure 8). Godwits at these sites were generally associated with large expanses of standing water and emergent vegetation, with 6 of 12 detections occurring in marsh/wet bog land cover class, followed by 3 in wet bog/wet meadow, 1 in open low ericaceous/marsh, 1 in open low shrub graminoid, and 1 on mudflats.



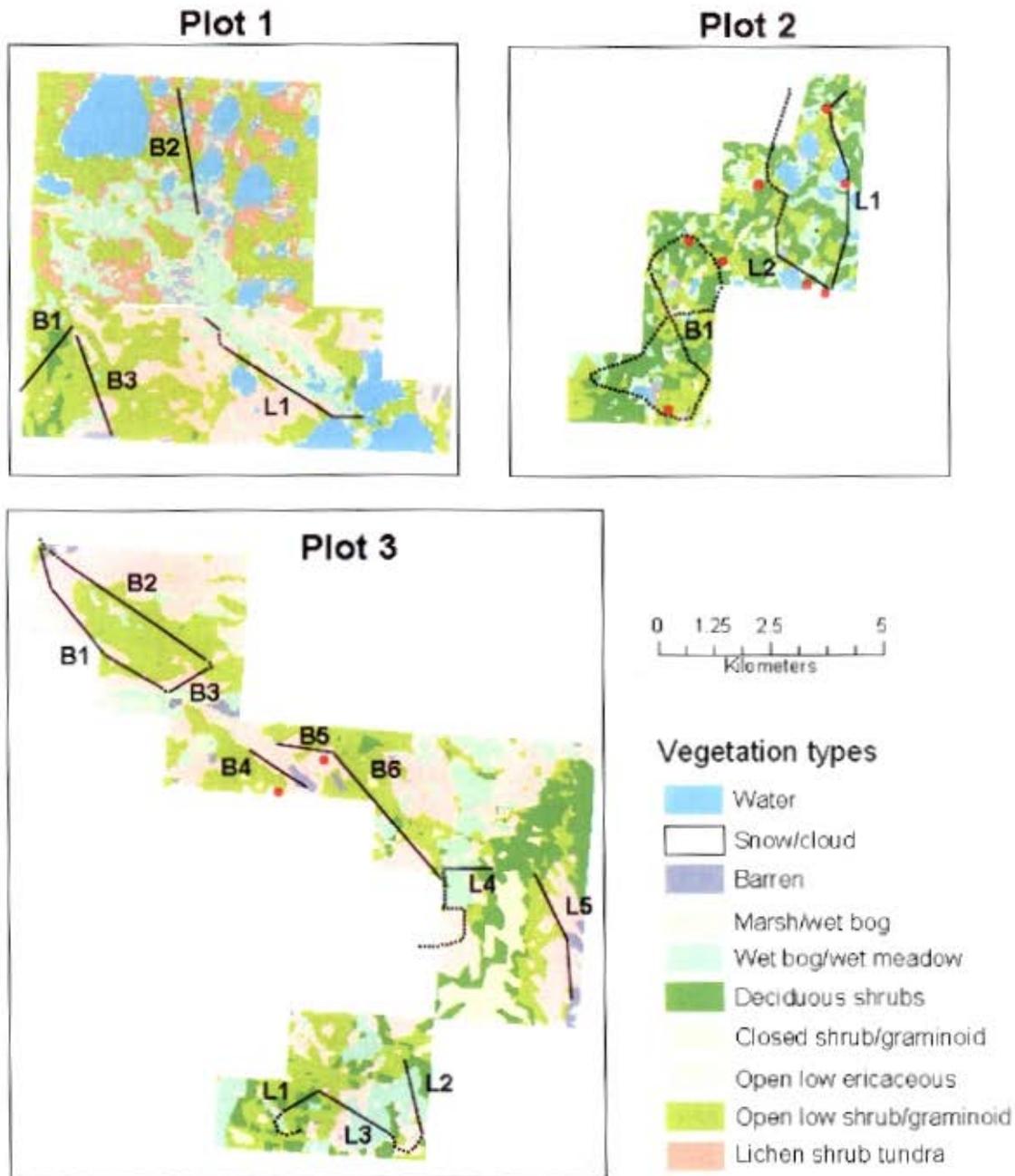


Figure 7. Transect locations and observations (red circles) of Marbled Godwits on the three ground plots, 10–14 May 2004 (some circles represent multiple observations; see Appendices A & B). Dotted lines = transects along which observers deviated from line-transect sampling but continued to record information on all Marbled Godwits encountered.

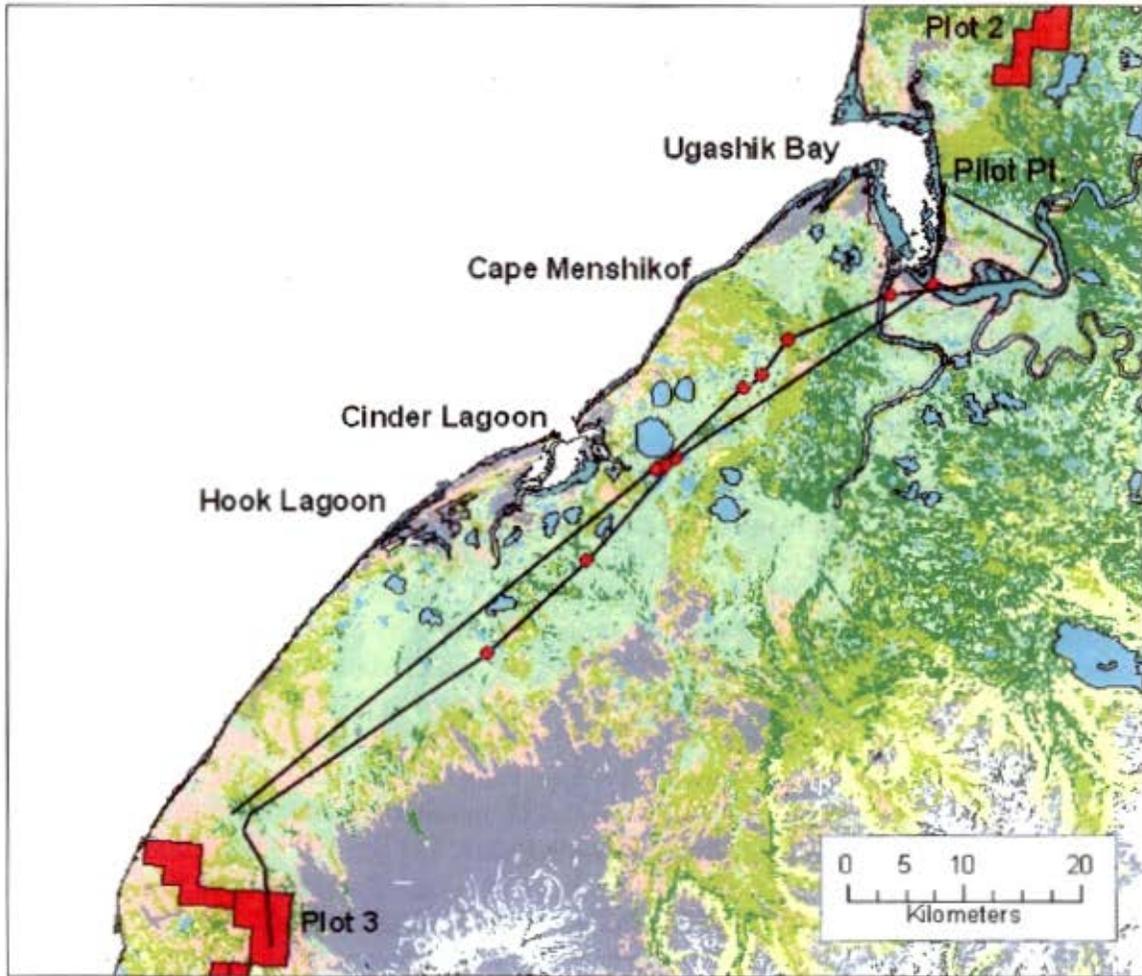


Figure 8. Locations of Marbled Godwits (red circles) seen on aerial transects flown on 14 May 2004 between Port Heiden and Pilot Point (see also Appendices A & B). Circles overlap near Cinder Lagoon.



Pacific Golden-Plover (*Pluvialis fulva*). This species was found in about equal numbers on Plots 1 and 2 but in higher density on Plot 3 (Appendix C) and, though we found no direct evidence of breeding (i.e., nests, chicks), *fulva* undoubtedly nested along this portion of the Alaska Peninsula. Observations included: on 10 May one heard calling near the west end of the Pilot Point runway (off plot) and in the evening one heard calling south of Transect B1 (Figure 7). On 11 May on Plot 2 (central and south portions), we saw two “pairs” (hereafter pairs = a male and female) chasing each other while at the same time two other males were in flight display in nearby adjacent territories; a single male was seen on the ground giving alarm calls at our presence and then briefly chasing a passing male before returning near us and resuming alarm calling. On 12 May on Plot 1, we observed three males in flight display; a pair of birds standing silently; a pair that flushed, flew about calling, and then landed back at the spot from which they took flight; and a single male landing and then silent. On 13–14 May on Plot 3, we saw a pair plus a single male, all in aerial display; two pairs of birds in aerial chase; a pair on the ground about 75 m apart calling; a male chasing another pair; five single males at different locations, all in flight display; and two males on the ground giving alarm calls. All observations suggested birds were in the late stages of courtship and/or early stages of egg-laying or incubation. (Note: in part as a result of these observations, Alaska Peninsula/Becharof NWR staff arranged for Dr. Wally Johnson to visit the Alaska Peninsula to assess nesting by Pacific Golden-Plovers. Over the course of his visit, and with the help of Paul Brusseau and Mark Johnson, he found eight active nests of *P. fulva*, two in the Naknek area and six near Port Heiden. Observations on 10–11 June suggested hatch was in progress [W. Johnson pers. comm.].) The nearest confirmed nesting sites for this species (Johnson and Connors 1996) is Nunivak and Nelson islands, over 500 km northwest of both Naknek and Port Heiden. Recent observations, however, suggest the species nests in the watershed of the Stuyahok and Kaktuli rivers, 125 km and 375 km north-northeast, respectively, of Naknek and Port Heiden (A. Bennett in Johnson and Connors 1996). Sightings of *P. fulva* between 18 and 22 May 2002 within a few kilometers of Plots 1 and 2 (C. Wightman et al. unpubl.) lacked sufficient detail to assess the nesting status of these birds.





Figure 9. Nesting habitat of Pacific Golden-Plovers, Port Heiden (Photo R. Gill).

Black-bellied Plover (*P. squatarola*). This species was present on all three plots, but encountered more frequently on Plots 1 and 3. Observations strongly suggest nesting and, if confirmed, would extend the known breeding range to the central Alaska Peninsula, some 300 km southeast of the nearest known site at Chagvan Bay (Paulson 1995). On 12 May on Plot 1, we recorded a single bird landing and alarm calling; a previously undetected bird that got up to chase another Black-bellied Plover flying past us; a pair initially seen standing that took flight and chased a male *P. squatarola* flying nearby; a male in flight display that landed near us and called repeatedly; and a pair that landed nearby and was silent. On 11 May on Plot 2, we saw a male silently feeding on *Empetrum*-dominated tundra. On 13–14 May on Plot 3, we recorded two males in flight display; a pair on the ground of which the male exhibited drooped-wing and wing-flutter behaviors; a three-bird chase; and two single alarm-calling males. (Note: on 10 June 2004, Wally and Mark Johnson found a nest with four eggs near Port Heiden [W. Johnson pers. comm.] and Laurel Bennett, NPS, photographed a nest near Kukaklek Lake, south of Iliamna Lake on 4 June 2004 [A. Bennett in litt.])



Figure 10. *Empetrum*- and lichen-dominated habitat near Port Heiden from which Black-bellied Plovers were seen in nest-distraction and flight displays (Photo R. Gill).

General avifauna: We recorded 55 species of birds during the five days we spent on plots (Appendix C). Shorebirds (Charadriidae and Scolopacidae) and songbirds (Passeriformes) comprised about half of all species seen with 14 noted for each group, followed by 12 species of waterfowl (Anseriformes), 5 species of gulls and terns (Laridae), 4 species each of raptors (Falconiformes) and diving birds (Gaviiformes and Podicipediformes), and single species of Galliformes (Willow Ptarmigan) and Gruiformes (Sandhill Crane).

Discussion

Marbled Godwits were found on or immediately adjacent to two of the three plots (Plots 2 and 3) we surveyed and they exhibited behaviors that strongly suggested local nesting. On Plot 2 most observation indicated that birds were associated with large wetland complexes in the north portion of the plot and just off the plot about Pike Lake. On Plot 3, all observations were of birds in transit, either flying to or from the vicinity of Port Heiden and inland areas to the northeast.

To date, the only nests of this species have been found in the Ugashik Bay area from a single site about 30 km southeast of Pilot Point (Mehall-Niswander 1997). Numerous observations of godwits from intertidal areas of Ugashik Bay during the nesting period (Gibson and Kessel 1989, Mehall-Niswander 1997, Maley et al. 2003) suggest nesting may also occur closer to the bay and/or that some birds fly considerable distances from inland nesting areas to forage regularly on intertidal habitats. Similar patterns were observed in the Port Heiden area (Maley et al. 2003; this study); these, along with observation of birds in flight display, indicate local nesting by godwits.

Future work. In 2005, we would like to do two things: (1) visit Plot 4 as well as confirm the nesting status of godwits on Plots 2 and 3, and (2) conduct a range-wide census using small helicopters to estimate more precisely the breeding population size of Marbled Godwits on the Alaska Peninsula. This technique showed great promise in 2004 because it appeared to accommodate several critical assumptions of line-transect sampling (Buckland et al. 2001). For example, the helicopter afforded clear center-line visibility and godwits on the line were easily seen. Godwits within the flight path appeared to flush just ahead of the helicopter and were therefore detected at or very near their initial location. Observers could potentially estimate accurate perpendicular distances and intervals from the transect line following techniques described in Choquenot (1995). In addition, existing land cover maps and knowledge of godwit habitat preferences (Mehall-Niswander 1997, Morse and Powell 2004, Gill et al. unpubl., this study) can be used to derive a stratified sampling universe along the Alaska Peninsula and real-time voice/GPS recording software (e.g., Butler et al. 1995; J. Hodges, unpubl.) can be used to accurately fix records of birds and land cover features. Such a comprehensive census would allow us to evaluate Marbled Godwit use of BLM lands relative to that elsewhere within their range.

Acknowledgments

Jeff Denton of the Bureau of Land Management arranged funding for the work and provided critical background information. Paula Huckleberry, our pilot, assured a safe and efficient operation. Susan Savage and staff of Alaska Peninsula/Becharof NWR were instrumental in arranging logistics and support throughout the work. We thank them all.

Literature Cited

- American Ornithologists' Union. 1998. Check-list of North American Birds. 7th ed. Am. Ornithol. Union, Washington, D.C.
- Alaska Shorebird Working Group. 2004. A Conservation Plan for Alaska Shorebirds. Unpublished Report, Alaska Shorebird Working Group, 2nd ed. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK.
- Borchers, D. L., S. T. Buckland, and W. Zucchini. 2002. Estimating animal abundance: closed populations. Springer-Verlag, London.
- Brown, S., C. Hickey, B. Harrington, and R. Gill (eds.). 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.
- Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press.
- Butler, W. I., Jr., J. I. Hodges, and R. A. Stehn. 1995. Locating waterfowl observations on aerial surveys. Wildl. Soc. Bull. 23:148–154.
- Choquenot, D. 1995. Species- and habitat-related visibility bias in helicopter counts of kangaroos. Wildl. Soc. Bull. 23:175–179.
- Donaldson, G., C. Hyslop, G. Morrison, L. Dickson, and I. Davidson (eds.). 2001. Canadian shorebird conservation plan. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario.
- Gibson, D. D., and B. Kessel. 1989. Geographic variations in the Marbled Godwit and description of an Alaska subspecies. Condor 91:436–443.
- Gratto-Trevor, C. L. 2000. Marbled Godwit (*Limosa fedoa*). In The Birds of North America, No. 492 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Mehall-Niswander, A. C. 1997. Time budget and habitat use of Marbled Godwits (*Limosa fedoa beringiae*) breeding on the Alaskan Peninsula. M.S. thesis, Oregon State University, Corvallis, Oregon.
- Morse, J. A., and A. N. Powell. 2004. Assessment of potential habitat for Marbled Godwits on the Alaska Peninsula. Unpubl. Report, USGS, Anchorage, and U. of Alaska Cooperative Fish and Wildlife Research Unit., Fairbanks, AK.
- Nowacki, G., P. Spencer, M. Fleming, T. Bock, and T. Jorgenson. 2002. Unified ecoregions of Alaska: 2001. USGS Open-file Report 02–297, Anchorage, AK.

Viereck, L. A., C. T. Dymess, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. Gen. Tech. Rep. PNW-GTR-286. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 278 pp.

Wibbenmeier
Wibbenmeier, M. W., J. G. Grunblatt, and L. S. Shea. 1982. User's Guide for Bristol Bay Land Cover Maps. Anchorage, AK.

Wilson, D. E., and D. M. Reeder. 1993. Mammal species of the world. Smithsonian Institution Press, Washington, DC.

Appendix A. Summary of Marbled Godwit detections. See Figures 7 and 8 for locations.

Team ^a	Waypoint ^b	Distance from point/line (m)	Latitude	Longitude	Plot	Transect	No. of birds	Behavior
L&R	025	150–250	57.70640	-157.42135	2	L1	2	Flying over; one calling
L&R	028	450–650	57.69361	-157.41466	2	L1	1	Male in flight display
L&R	031	20–30	57.66920	-157.42042	2	L2	2	Feeding, flushed by observers
L&R	034	30–50	57.67053	-157.42485	2	L2	1	Flying towards observers, alarming
L&R	049	250–350	57.69072	-157.44584	2	L2	2	Flying over, calling
B&M	MAGO-01	400–600	57.67385	-157.45825	2	B1	1	Flying over
B&M	MAGO-02	<100	57.67962	-157.47023	2	B1	1	Heard only
B&M	MAGO-1	500	57.64360	-157.47679	2	B1	1	Flight display
B&M	040	125–150	56.97269	-158.55841	3	B4	1	Female flying over, silent
B&M	43a	200–300	56.98003	-158.54294	3	B5	2	Flying over, calling
B&M	43b	>300	56.98003	-158.54294	3	B5	1	Male in flight display
B&M	009	50	57.18096	-158.18917		aerial	1	Flushed by helicopter
B&M	010	50	57.25866	-158.05743		aerial	1	Flushed by helicopter
B&M	011	40	57.33236	-157.95649		aerial	2	Flushed by helicopter
B&M	011	50	57.33230	-157.95650		aerial	2	Flushed by helicopter
B&M	012	75	57.33526	-157.95087		aerial	2	Flushed by helicopter
B&M	013	60	57.34168	-157.93784		aerial	1	Flushed by helicopter
B&M	015	10	57.48665	-157.58284		aerial	1	Flushed by helicopter
L&R	129	25	57.33229	-157.96503		aerial	2	Flushed by helicopter
L&R	130	25	57.39865	-157.84530		aerial	2	Flushed by helicopter
L&R	131	75	57.41001	-157.82012		aerial	1	Flushed by helicopter
L&R	132	50	57.43779	-157.78648		aerial	2	Flushed by helicopter
L&R	134	50	57.47513	-157.64425		aerial	1	Flushed by helicopter

^a L = Lee Tibbitts, R = Robb Kaler, B = Bob Gill, M = Maksim Dementyev.

^b Waypoints represent the location of observers when they detected godwits. Waypoints collected in NAD27 datum. Distance from point/line is approximate distance bird(s) was from waypoint.

Appendix B. Detections of Marbled Godwits relative to transect and effort, May 2004 (see Figures 1 & 7).

Date	Crew ^a	Plot no.	Transect no.	Km	Hours afield	No. detections	No. of individuals
12 May	B&M	1	B1	1.7	2.5		
12 May	B&M	1	B2	2.8	3.0		
12 May	B&M	1	B3	2.5	2.5		
12 May	L&R	1	L1	4.3	5.0		
11 May	B&M	2	B1	12.8	7.5	3	3
11 May	L&R	2	L1	4.8	4.0	2	3
11 May	L&R	2	L2	6.8	8.0	3	5
13 May	B&M	3	B1	4.7	3.5		
13 May	B&M	3	B2	3.2	2.5		
13 May	B&M	3	B3	2.1	1.0		
14 May	B&M	3	B4	1.5	1.0	1	1
14 May	B&M	3	B5	2.5	2.5	2	3
14 May	B&M	3	B6	2.3	1.5		
13 May	L&R	3	L1	2.3	2.0		
13 May	L&R	3	L2	2.7	2.0		
13 May	L&R	3	L3	1.5	1.0		
14 May	L&R	3	L4	3.0	3.5		
14 May	L&R	3	L5	1.5	4.0		
Totals for ground transects				63.0	57.0	11	15
14 May	B&M	aerial trans.	B1	88.0	1.0	7	10
14 May	L&R	aerial trans.	L1	84.0	1.0	5	8
Totals for aerial transects				172.0	2.0	12	18

^a B = Robert Gill, M = Maksim Dementyev, L = Lee Tibbitts, R = Robb Kaler.

Appendix C. Numbers of each species recorded on BLM lands on the Alaska Peninsula, 10–14 May 2004. See Figure 1 for plot locations.

Species		Plot no./census dates		
		1 12–13 May	2 10–12 May	3 13–14 May
Greater White-fronted Goose	<i>Anser albifrons</i>	35	17	1
Canada Goose	<i>Branta canadensis</i>		4	
Trumpeter Swan	<i>Cygnus buccinator</i>	1	9	
Tundra Swan	<i>Cygnus columbianus</i>	6	5	4
American Wigeon	<i>Anas americana</i>	2	>10	2
Mallard	<i>Anas platyrhynchos</i>	5	>10	9
Northern Shoveler	<i>Anas clypeata</i>	6		
Northern Pintail	<i>Anas acuta</i>	20–30	>30	
Green-winged Teal	<i>Anas crecca</i>	4	>20	
Greater Scaup	<i>Aythya marila</i>	16	26	9
Black Scoter	<i>Melanitta nigra</i>		34	1
Red-breasted Merganser	<i>Mergus serrator</i>	8	8	2
Willow Ptarmigan	<i>Lagopus lagopus</i>	>20	>20	>25
Pacific Loon	<i>Gavia pacifica</i>	1	4	
Common Loon	<i>Gavia immer</i>		2	
Horned Grebe	<i>Podiceps auritus</i>	3	1	
Red-necked Grebe	<i>Podiceps grisegena</i>	2		
Bald Eagle	<i>Haliaeetus leucocephalus</i>		2	3
Northern Harrier	<i>Circus cyaneus</i>	1	2	4
Northern Goshawk	<i>Accipiter gentilis</i>		3–5	
Golden Eagle	<i>Aquila chrysaetos</i>			1
Sandhill Crane	<i>Grus canadensis</i>	18	24	4
Black-bellied Plover	<i>Pluvialis squatarola</i>	9	1	9
American Golden-Plover	<i>Pluvialis dominica</i>		2	
Pacific Golden-Plover	<i>Pluvialis fulva</i>	8	8	19
Semipalmated Plover	<i>Charadrius semipalmatus</i>	1	4	2
Greater Yellowlegs	<i>Tringa melanoleuca</i>	>2	>40	15
Lesser Yellowlegs	<i>Tringa flavipes</i>		1	
Whimbrel	<i>Numenius phaeopus</i>		1	1
Marbled Godwit	<i>Limosa fedoa</i>		11	4
Least Sandpiper	<i>Calidris minutilla</i>	>15	>30	38
Rock Sandpiper	<i>Calidris ptilocnemis</i>		1	10
Dunlin	<i>Calidris alpina</i>	>50	7	11
Short-billed Dowitcher	<i>Limnodromus griseus</i>	>50	22	9
Wilson's Snipe	<i>Gallinago delicata</i>	>20	30	>12
Red-necked Phalarope	<i>Phalaropus fulicarius</i>	3	21	2
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	13	6	5
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>		4	2
Mew Gull	<i>Larus canus</i>	7	33	12
Glaucous-winged Gull	<i>Larus glaucescens</i>	>10	2	8
Arctic Tern	<i>Sterna paradisaea</i>	12	19	
Black-billed Magpie	<i>Pica hudsonia</i>		1	
Common Raven	<i>Corvus corax</i>	>8	5	7
Tree Swallow	<i>Tachycineta bicolor</i>		2	
Black-capped Chickadee	<i>Poecile atricapillus</i>		2	

Appendix C. Continued.

Species		Plot no./census dates		
		1 12–13 May	2 10–12 May	3 13–14 May
Hermit Thrush	<i>Catharus guttatus</i>	1	>6	8
American Robin	<i>Turdus migratorius</i>	5	>40	5
American Pipit	<i>Anthus rubescens</i>		4-6	10
American Tree Sparrow	<i>Spizella arborea</i>	>15	>50	9
Savannah Sparrow	<i>Passerculus sandwichensis</i>		16	20
Fox Sparrow	<i>Passerella iliaca</i>	1	>10	5
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	1	>25	2
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	1	4	7
Lapland Longspur	<i>Calcarius lapponicus</i>	>25	12	>40
Common Redpoll	<i>Carduelis flammea</i>	>15	>20	14

Phylogenetic sequence and English and scientific names follow *The A.O.U. Check-list of North American Birds* (1998).

Appendix D. Mammal species detected on BLM lands on the Alaska Peninsula, 9–14 May 2004. See Figure 1 for plot locations.

Species		Plot no./census dates		
		1 12–13 May	2 10–12 May	3 13–14 May
Wolf	<i>Canis lupus</i>	T	T	1, T
Red fox	<i>Vulpes vulpes</i>	T, D	T	T
River otter	<i>Lontra canadensis</i>		S	
Brown bear	<i>Ursus arctos</i>	T	T	3
Moose	<i>Alces alces</i>	T, S	T, S	1, T
Caribou	<i>Rangifer tarandus</i>	21	T, S	T
Arctic ground squirrel	<i>Spermophilus parryii</i>	T	5	sev.
Beaver	<i>Castor canadensis</i>	S, L	2, S, L	L
Porcupine	<i>Erethizon dorsatum</i>			1

Phylogenetic sequence and English and scientific names follow Wilson and Reeder (1993).

T = tracks, S = sign (browse, droppings, smell, slide), D = den, L = lodge.

Numbers = number of animals seen.