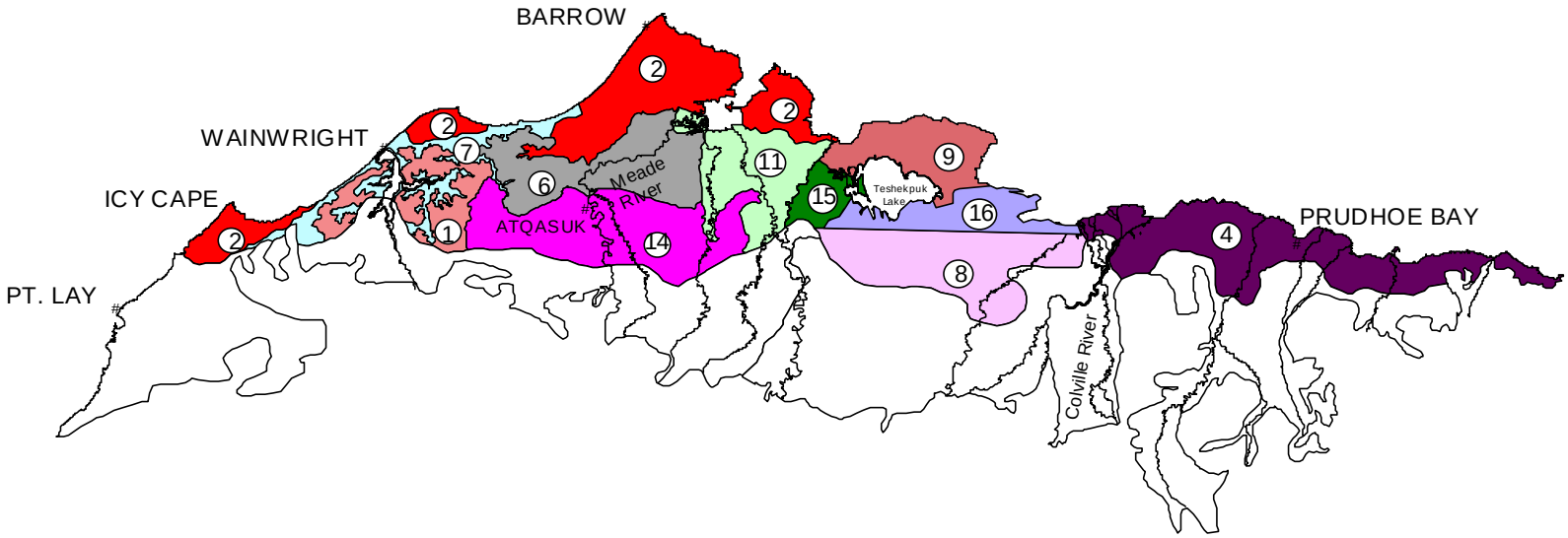

Figure 1. Survey strata for the North Slope Eider Survey, Alaska, with major hydrographic and cultural features. Unshaded units south of the eider survey area are strata surveyed by the Standard Breeding Population Survey in late June - early July.

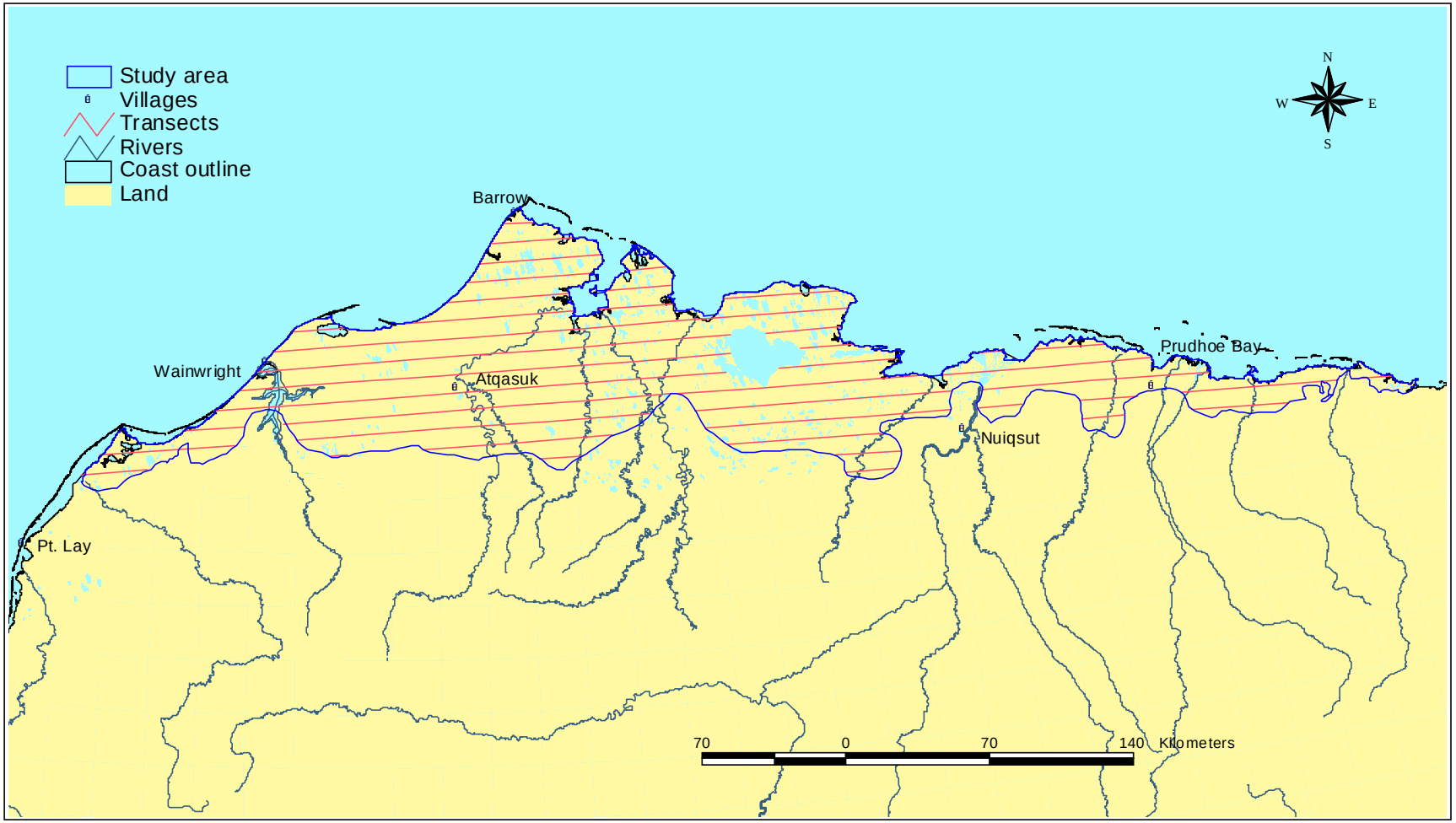

Figure 2. Aerial transects flown during the North Slope eider breeding population survey, Alaska, June 9-14, 2002.

Table 1. Survey design, North Slope Eider Survey, 1992-2002.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Recon. dates (June)	NA	8	10-12	8	6	5-10	6	8	11	9-10	8
Survey dates (June)	20-29	9-18	12-19	9-18	7-17	11-20	6-15	11-17	11-18	11-17	9-14
Total transect length (km)	2,784	3,146	3,193	3,248	3,199	3,232	3,527	3,478	2,905	3,200	3145
Sample area (km^2)	1,113	1,253	1,277	1,300	1,279	1,292	1,410	1,391	1,162	1,280	1258
Survey area (km^2)	30,755	30,755	30,755	30,755	30,755	30,755	30,755	30,755	30,755	30,755	30,755
Sample % of survey area	3.6	4.1	4.2	4.2	4.2	4.2	4.6	4.5	3.8	4.2	4.1
Pilot/observer[1]	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL	BL
Observer[2]	GB	GB	GB	GB	GB	TT	TT	TT	JF	JF	AB
Survey flight hours	40.2	50.5	50.3	54.5	53.1	50.2	49.0	51.5	41.7	33.8	38.1

1. BL:Bill Larned 2. GB:Gregory Balogh, TT:Tim Tiplady, JF:Julian Fischer, AB:Alan Brackney

Table 2. Ratio of total lone males to total males (lone males plus males in pairs) in the sample for king eider and spectacled eider, 1992-2002, North Slope Eider Survey, Alaska. We suggest that higher numbers indicate later average breeding phenology for the survey.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Avg.
King eider	.54	.21	.31	.33	.58	.27	.48	.25	.32	.14	.34	.34
Spectacled eider	.52	.52	.44	.42	.55	.53	.56	.29	.55	.37	.53	.48

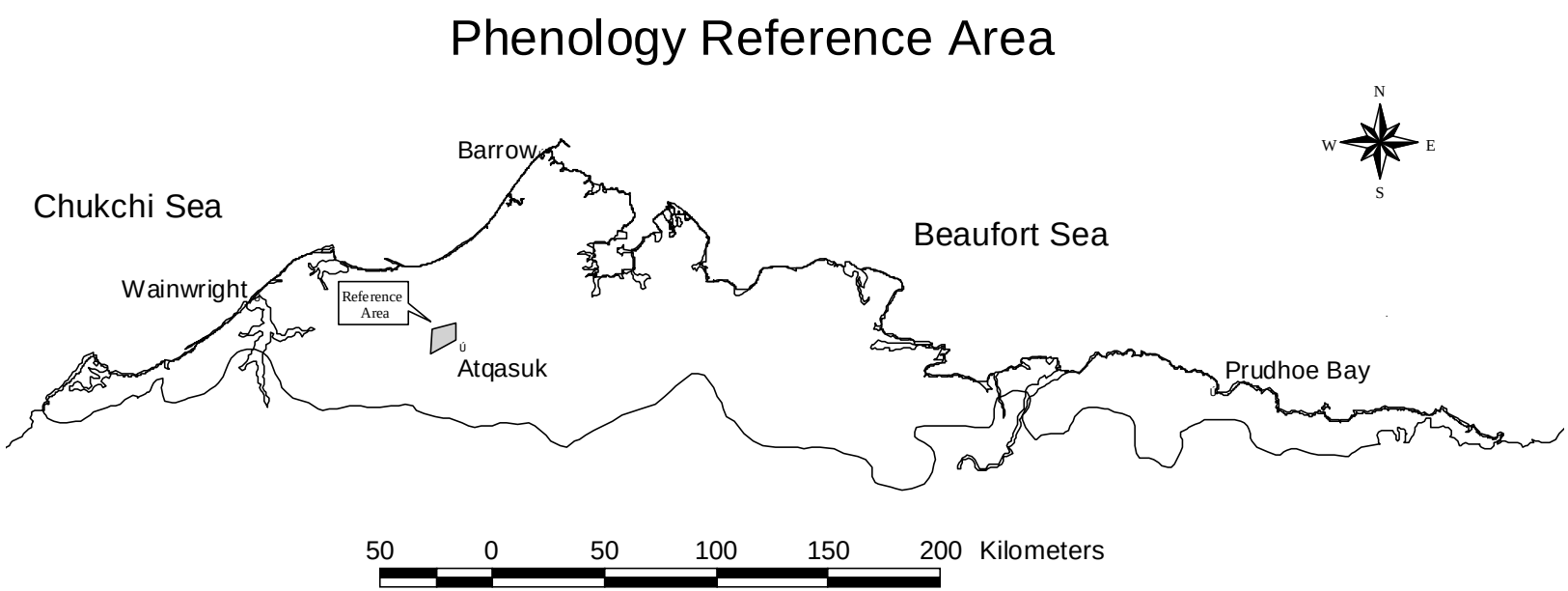

Figure 3. Location of phenology reference area, North Slope Eider Survey, Alaska, June 1999-2002.

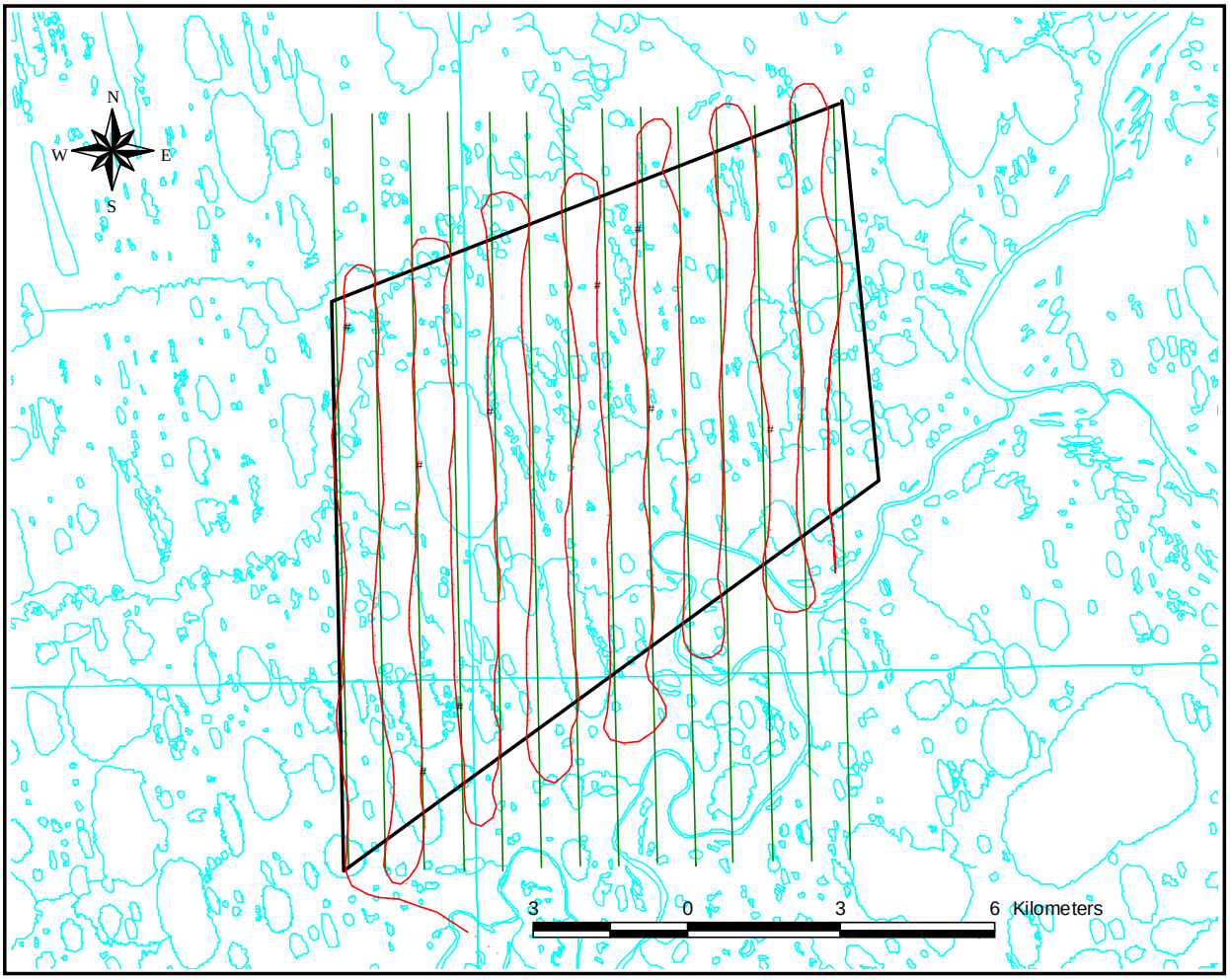

Figure 4. Hydrology, transects (straight green lines), flight path (curved red line), and spectacled eider observations (black dots) from an aerial survey of a 97.4 km^2 phenology reference area, North Slope Eider Survey, Alaska, June 10, 2002.

Table 3. Survey parameters for five replicate aerial surveys of a 97.4 km^2 reference study area located 15 km NW of Atqasuk, Alaska, June 2002.

Date	Pilot	Observer	Start time	Elapsed time min.	Wind spd Knots	Sky cond.
6/10	Larned	Brackney	13:42	57	10	ovcst
6/13	Larned	Brackney	15:16	64	12	brkn
6/16	Larned	Brackney	10:41	59	5	brkn
6/22	Mallek	Marks	17:42	62	10	ovcst

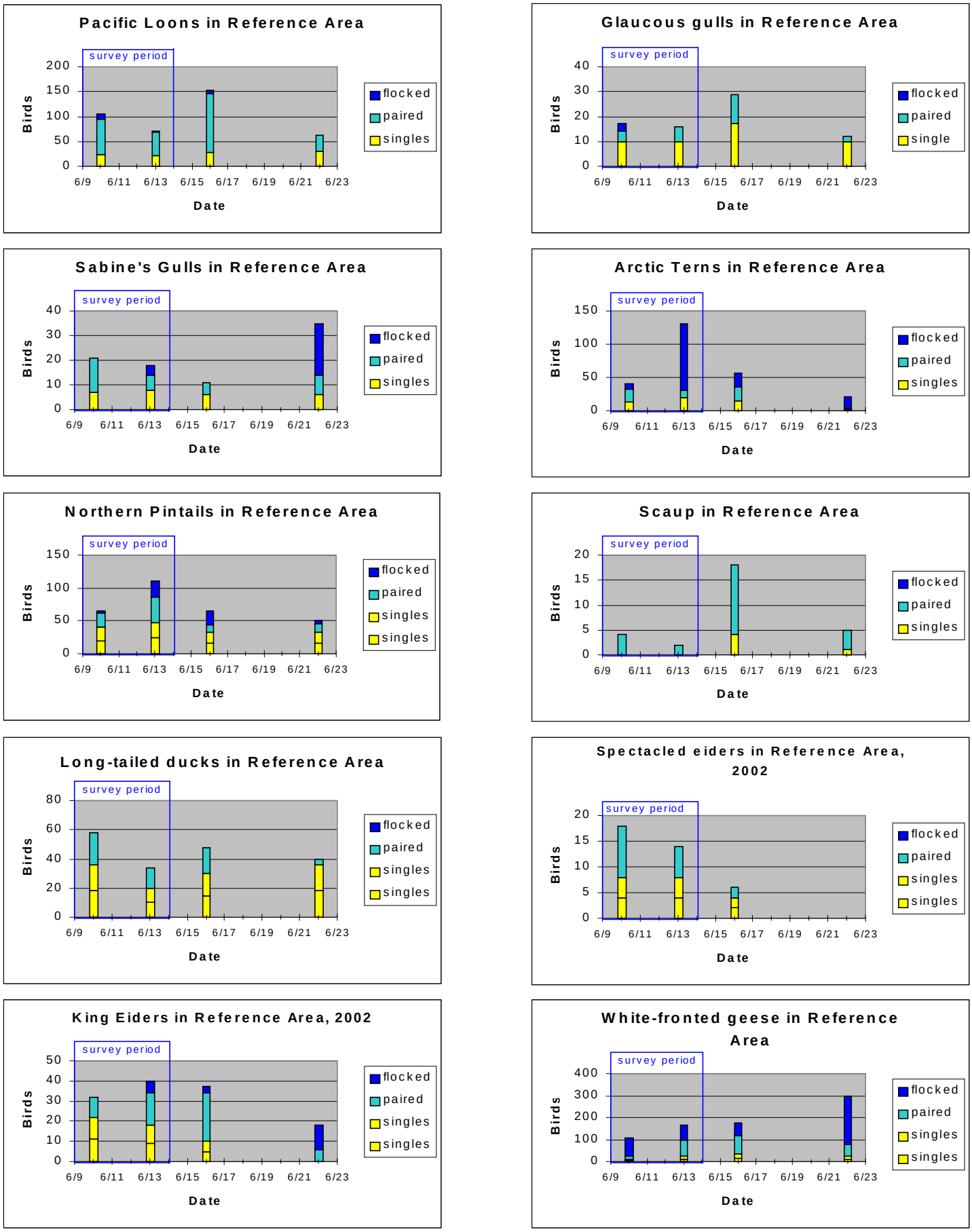

Figure 5. Counts of waterbirds on aerial transects within a 97.4 km2 phenology reference area near Atqasuk in the Arctic Coastal Plain of Alaska in June, 2002.

Table 4. Combined observations of birds by pilot and right-hand observer on aerial survey transects sampling tundra habitats on the arctic coastal plain, Alaska, June, 2002, with observable indicated population estimates calculated from these data.

Species	Single	pair	grouped birds	Indicated Total	Density birds·km^{-2}	Pop. Estimate	Pop. Std. Error	%CV
Yellow-billed loon	32	14	4	64[1]	0.050	1,551	256	16.5
Pacific loon	204	336	18	894[1]	0.710	21,850	1,356	6.2
Red-throated loon	27	42	0	111[1]	0.088	2,711	391	14.4
Jaeger spp.	67	11	0	89[1]	0.071	2,170	209	9.7
Glaucous gull	196	55	62	368[1]	0.285	8,762	694	7.9
Sabine's gull	102	67	132	368[1]	0.288	8,851	864	9.8
Arctic tern	197	89	205	580[1]	0.456	14,014	1,717	12.3
Red-breasted merganser	3	9	0	24[2]	0.019	585	222	37.9
Mallard	5	4	0	18[2]	0.015	449	195	43.3
American wigeon	0	2	0	4[2]	0.003	103	79	77.2
Northern shoveler	5	2	0	14[2]	0.011	341	154	45.1
Northern pintail	755	98	686	1,637[2]	1.880	57,819	5,495	9.5
Greater scaup	54	87	100	328[1]	0.305	9,365	974	10.4
Long-tailed duck	387	385	136	1,680[2]	1.328	40,846	1,992	4.9
Spectacled eider	69	62	9	271[2]	0.217	6,662	752	11.3
Common eider	1	12	0	26[2]	0.021	642	603	93.9
King eider	100	196	22	614[2]	0.479	14,730	1,512	10.3
Black scoter	0	1	0	2[2]	0.002	53	54	100.6
White-winged scoter	2	5	0	14[2]	0.011	338	258	76.2
Snow goose	2	3	57	65[1]	0.049	1,518	724	47.7
White-fronted goose	202	723	1,793	3,643[2]	2.886	88,762	7,830	8.8
Canada goose	19	24	40	126[2]	0.099	3,045	467	15.3
Black brant	50	36	155	327[2]	0.225	6,919	1,381	20.0
Tundra swan	126	69	18	282[1]	0.223	6,865	693	10.1
Sandhill crane	1	0	0	1[1]	0.001	27	25	91.7
Unid. small shorebird	433	295	1,383	2,406[1]	1.915	58,887	5,129	8.7
Unid. large shorebird	49	10	9	78[1]	0.060	1,842	333	18.1
Common raven	2	0	0	2[1]	0.002	48	24	50.7
Short-eared owl	1	0	0	1[1]	0.001	27	25	93.4
Snowy owl	23	1	4	29[1]	0.023	718	159	22.2
Golden eagle	5	0	0	5[1]	0.004	121	71	58.3

1. singles+(2*pairs)+flocked birds 2. 2*(singles+pairs)+flocked birds 3. Black- bellied plover, lesser golden plover, red-necked phalarope, red phalarope, dowitcher spp., ruddy turnstone, dunlin, semipalmated sandpiper, pectoral sandpiper, and others. 4. bar-tailed godwit, Hudsonian godwit, whimbrel and others.

Table 5. Average Population indices, opulation growth rates and years to detect a population trend equivalent to a 50 percent growth or decline in 10 years, for observations of selected bird species in early to mid-June 1992-2002 sampling North Slope wetlands, Alaska. Variance estimates used were based on within-year sampling error among transects as stratified by 11 physiographic regions.

Species	Measure	Years	n years	Mean pop. index	Log-linear Slope	Mean population Growth Rate	Mean Population Growth Rate 90% CI	Avg. sampling error coef. of variation	Years to detect a Slope of 0.069
Yellow-billed loon	S + 2*Pr+FL	1992-2002	11	1,075	0.006	1.006	0.970 - 1.042	0.220	10.1
Pacific loon	S + 2*Pr+FL	1992-2002	11	20,997	0.010	1.010	0.977 - 1.045	0.065	4.5
Red-throated loon	S + 2*Pr+FL	1992-2002	11	2,876	-0.072	0.930	0.877 - 0.987	0.152	7.9
Jaeger spp.	S + 2*Pr+FL	1992-2002	11	4,088	0.002	1.002	0.933 - 1.077	0.118	6.6
Glaucous gull	S + 2*Pr+FL	1992-2002	11	11,855	0.002	1.002	0.957 - 1.048	0.153	7.9
Sabine's gull	S + 2*Pr+FL	1992-2002	11	6,621	-0.007	0.993	0.941 - 1.049	0.132	7.2
Arctic tern	S + 2*Pr+FL	1992-2002	11	9,996	0.073	1.075	1.058 - 1.093	0.111	6.4
Red-breasted merganser	2*(S+Pr)+Fl	1992-2002	11	343	0.112	1.118	1.002 - 1.248	0.464	16.6
Mallard	2*(S+Pr)+Fl	1992-2002	11	265	-0.018	0.982	0.808 - 1.193	0.538	18.3
American wigeon	2*(S+Pr)+Fl	1992-2002	11	424	0.076	1.079	0.921 - 1.264	0.639	20.5
Northern shoveler	2*(S+Pr)+Fl	1992-2002	11	290	0.182	1.199	0.970 - 1.484	0.396	14.9
Northern pintail	2*(S+Pr)+Fl	1992-2002	11	54,779	0.035	1.036	0.968 - 1.108	0.092	5.6
Greater scaup	S + 2*Pr+FL	1992-2002	11	4,011	0.070	1.073	1.024 - 1.124	0.195	9.3
Long-tailed duck	2*(S+Pr)+Fl	1992-2002	11	33,867	0.020	1.021	1.001 - 1.041	0.064	4.4
Spectacled eider	2*(S+Pr)+Fl	1993-2002	10	6,896	-0.013	0.987	0.953 - 1.023	0.103	6.1
king eider	2*(S+Pr)+Fl	1993-2002	10	12,884	0.031	1.031	1.006 - 1.058	0.101	6.0
Steller's eider	2*(S+Pr)+Fl	1992-2002	11	177	-0.012	0.999	0.789 - 1.265	0.369	14.2
White-winged scoter	2*(S+Pr)+Fl	1992-2002	11	304	0.114	1.120	0.957 - 1.312	0.568	19.0
Snow goose	S + 2*Pr+FL	1992-2002	11	1,608	0.133	1.143	0.987 - 1.323	0.550	18.6
Gr. White-fronted goose	S + 2*Pr+FL	1992-2002	11	72,714	0.038	1.039	0.994 - 1.085	0.080	5.2
Canada goose	S + 2*Pr+FL	1993-2002	10	7,447	-0.043	0.958	0.887 - 1.034	0.293	12.2
Black brant	S + 2*Pr+FL	1992-2002	11	4,534	0.093	1.097	1.029 - 1.170	0.290	12.1
Tundra swan	S + 2*Pr+FL	1992-2002	11	5,943	0.025	1.026	0.997 - 1.055	0.123	6.9
Sandhill crane	S + 2*Pr+FL	1992-2002	11	96	0.072	1.075	0.929 - 1.244	0.640	20.6
Unident. small shorebird	S + 2*Pr+FL	1997-2002	6	49,789	0.040	1.041	0.959 - 1.130	0.068	4.6
Common raven	S + 2*Pr+FL	1992-2002	11	66	-0.016	0.984	0.888 - 1.090	0.692	21.7
Short-eared owl	S + 2*Pr+FL	1992-2002	11	92	0.089	1.093	0.928 - 1.288	0.309	12.7
Snowy owl	S + 2*Pr+FL	1992-2002	11	858	-0.103	0.902	0.754 - 1.080	0.345	13.6

1. S = single, Pr = pair, Fl = flocked birds not in discernable pairs.

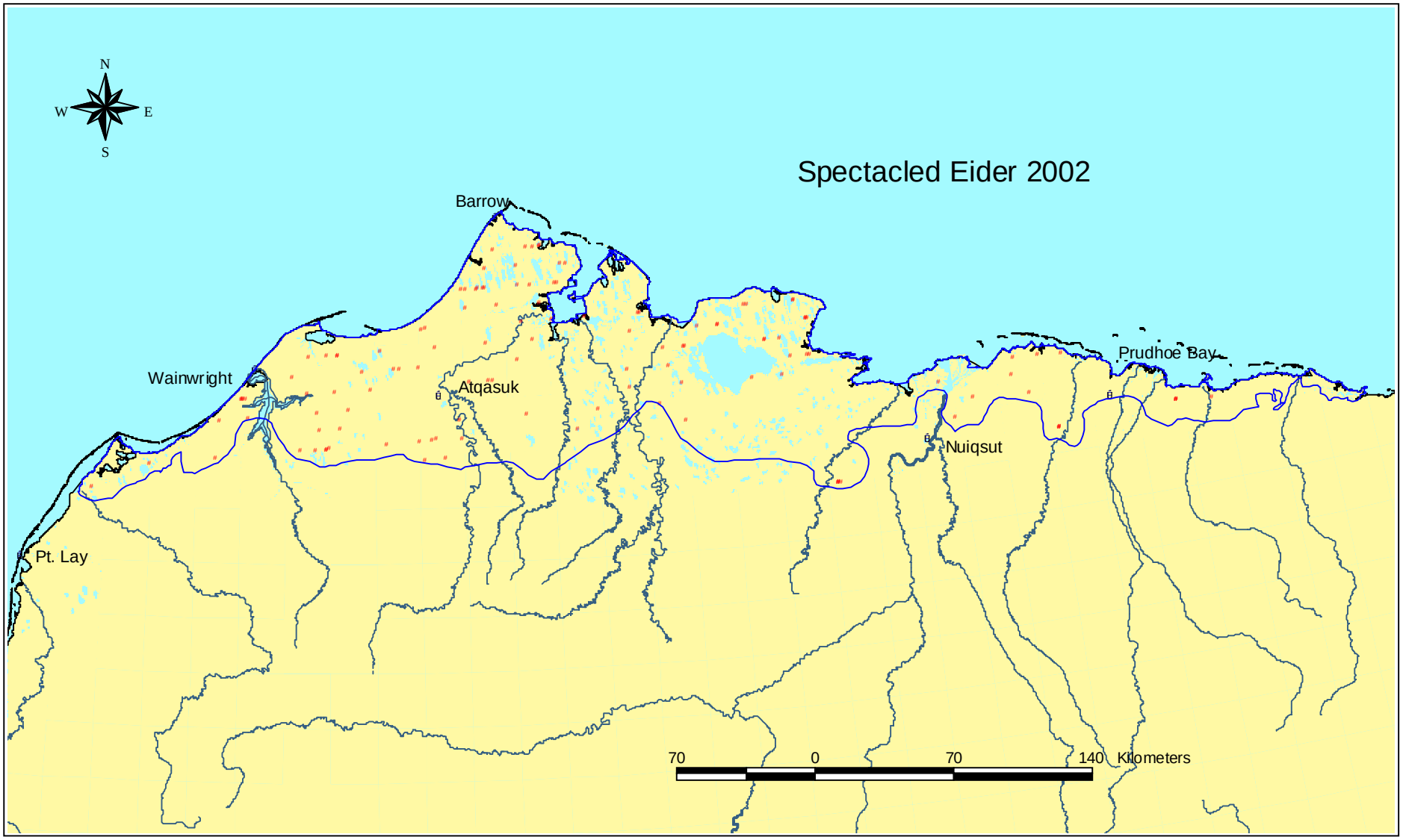

Figure 6. Locations of spectacled eiders observed during aerial surveys of the arctic coastal plain of Alaska, June, 2002.

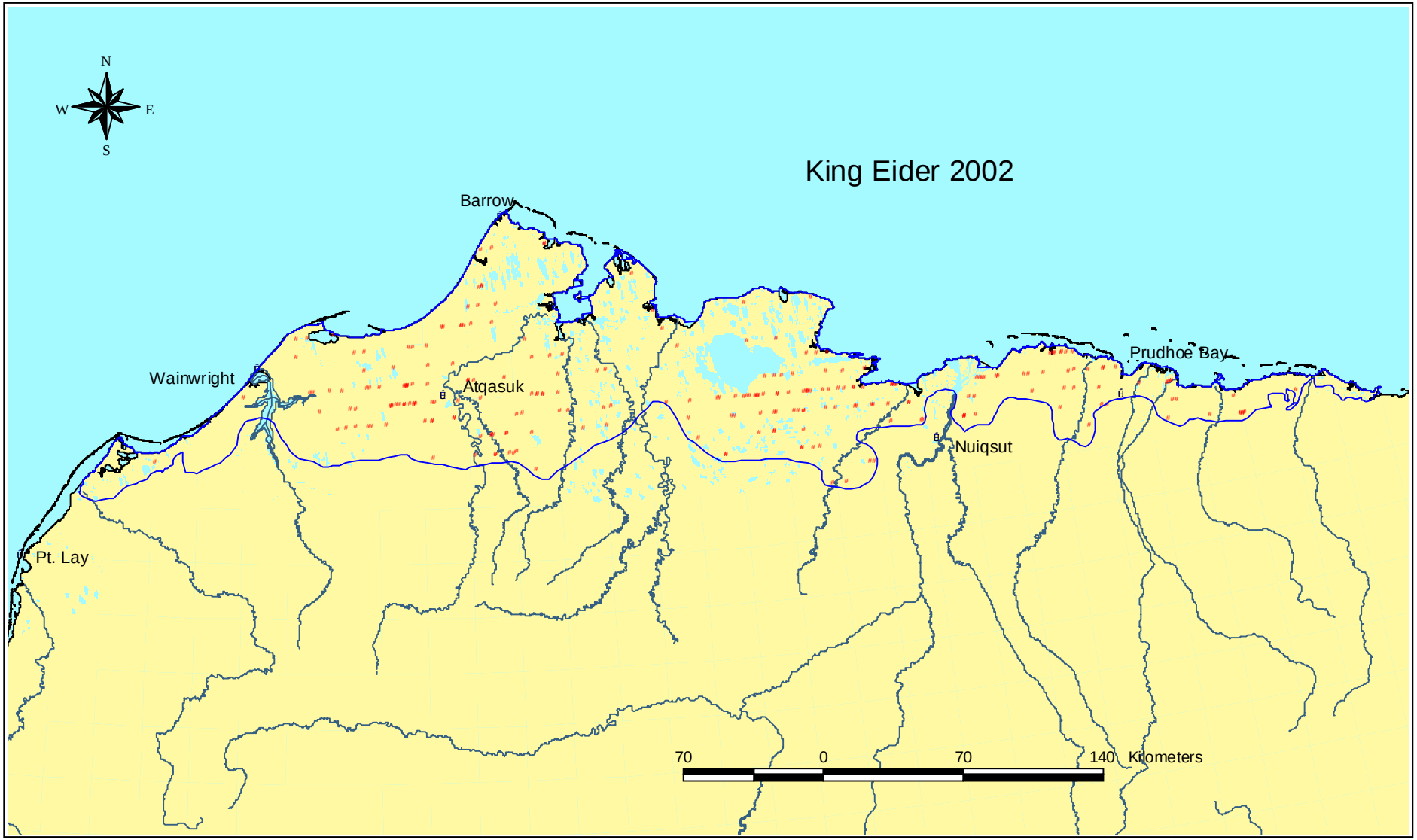

Figure 7. Locations of king eiders observed during aerial surveys of the arctic coastal plain of Alaska, June 2002...