



Yukon Flats National Wildlife Refuge Report

Aerial loon monitoring survey of Yukon Flats National Wildlife Refuge, Alaska – 2016

Nikki Guldager and Bryce Lake



Photo by Sheila Dufford

Yukon Flats National Wildlife Refuge
101 12th Avenue, Room 264
Fairbanks, Alaska 99701



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AERIAL LOON MONITORING SURVEY OF THE YUKON FLATS, ALASKA – 2016

Nikki Guldager and Bryce Lake, Yukon Flats National Wildlife Refuge, 101 12th Ave, Rm 264,
Fairbanks, Alaska, 99701

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EXECUTIVE SUMMARY

Aerial surveys have indicated the Yukon Flats is an important breeding area for Pacific loons (*Gavia pacifica*) and common loons (*G. immer*). Loons have been surveyed during waterfowl breeding pair surveys conducted by the Division of Migratory Birds since 1953, and more intensive loon surveys have been conducted by the Yukon Flats Refuge since 1984 (1988, 1999 – 2003, 2006 – 2013). 2016 was the 10th annual loon productivity surveys where the study design and area corresponded with the scoter and scaup breeding pair survey that is conducted annually in early June. Co-locating surveys allows for direct comparison of early and late season loon population indexes.

The overall population index for Pacific loons for the study area was 2,125 in 2016, and there are no significant trends in overall population indexes from 2007 to 2016. Late breeding survey estimates of Pacific loons were on average 55% higher than early breeding surveys conducted in 2007 to 2016 (range = -2 to +121 %). Differences in estimates between early and late summer were likely attributed to breeding behavior. Early in the season loons are focused on nest initiation, egg laying and incubation along vegetated lake margins, while later in the season, post hatch, birds frequent open water for foraging and are highly visible from the air. Additionally, late summer surveys are more likely to include non-breeders, as they may arrive on the breeding grounds after the early season surveys were completed. Pacific loon densities are highest in the west (wetlands complex north of Stevens Village), with the lowest densities occurring in the east stratum (wetlands east of Fort Yukon in the Porcupine and Black river drainages).

Fifty-one common loons were observed in 2016, which was the third highest number of detections in all survey years (13 – 57 detections). Use among strata was inconsistent with previous years; the common loon estimate was higher in the east and west strata than all previous years, while the estimate for the north stratum was lower than previous years. Three red-throated loons (*G. stellata*) were observed in 2016, which is similar to previous survey years (0 – 5 detections).

In 2016, 9 Pacific loon young were detected (percent singles or pairs with 1 or 2 young in = 8%), which was within the range of detections observed from 2007 to 2015 (1 – 15 young observed/per year). Common loon productivity was high in 2016, with 18% of singles or pairs with 1 or 2 young. Eight common loon young were observed in 2016, which was twice as many as detected in previous years.

INTRODUCTION

Loons have been surveyed during the Alaska-Yukon waterfowl breeding pair survey (Division of Migratory Birds, USFWS) in Yukon Flats since 1953 (Mallek and Groves 2011). Additionally, the Yukon Flats refuge staff have surveyed loons intermittently since 1984, with the most comprehensive loon survey conducted in 1988 (Lancot and Quang 1992, Quang and Lancot 1991). Annual loon surveys were conducted from 1999 to 2003 and 2007 to 2013 as part of the station's wildlife inventory plan (Bertram and Vivian 2003, Guldager and Lake 2013).

Surveys indicate that the Yukon Flats National Wildlife Refuge is an important breeding area for Pacific loons (*Gavia pacifica*) (Groves et al. 1996, Lancot and Quang 1992). Statewide aerial surveys indicate that the Yukon Flats provides habitat for approximately 75% of boreal forest nesting Pacific loons, and 8% of the Pacific loons detected statewide. Pacific loon densities on the Yukon Flats are more comparable to high density coastal tundra ecosystems than to other lower density boreal habitats (Groves et al. 1996). Reported densities from aerial surveys of Pacific loons on the Yukon Flats have varied widely due to differences in survey methodology (Russell 2002). Groves et al. (1996) reported uncorrected density estimates (not corrected for visibility bias) of 0.21 loons/km² from surveys conducted in late May; Lancot and Quang (1992) estimated densities of 0.49 loons/km² in early June using methodology that corrects for visibility bias in estimates; and Guldager and Lake (2013) reported early (early June) and late breeding season (mid-July to early-August, 2006 to 2013) Pacific loon densities of 0.14 – 0.21 and 0.21 – 0.38 loons/km², respectively, using uncorrected survey techniques similar to Groves et al. (1996).

Survey data indicate that the Yukon Flats may also be an important breeding area for common loons (*G. immer*; Lancot and Quang 1992). Approximately 18% of the estimated total number of common loons within a statewide study area occurred in Yukon Flats (Groves et al. 1996). Additionally, red-throated loons (*G. stellata*) use the Refuge, but at very low densities. Although yellow-billed loons (*G. adamsii*) are not expected to breed on the Yukon Flats, they likely migrate through when traveling to wintering grounds from northerly breeding areas.

STUDY AREA AND METHODS

In 2007, the Yukon Flats loon survey study design and area were modified to correspond with the scoter and scaup probabilistic survey design (Guldager and Bertram 2016). The design increased precision, allowed for inferences beyond sample sites, and co-location of the two surveys allowed us to directly compare early and late breeding population indexes.

The survey area (9,728.3 km²) included 58 transects chosen with a systematic random start and separated by 5.5 km. Transects were located in four strata within the Yukon Flats (Figure 1). Transects were 400 meters wide resulting in 678.4 km² of sample area. The survey was flown at 100-150 feet above ground level and at 90-105 mph in an Aviat Husky Model A-1B. Aircraft navigation and altitude were maintained with a Global Positioning System (GPS) and altimeter, respectively. Observations were collected on the left side by the pilot and on the right side by a

back seat observer. All observation locations were recorded as waypoints in the GPS, and all data associated with observations were recorded by the observer in a notebook. A circling maneuver was used to positively identify loons and young. The survey was temporally designed to maximize detection of young in order to estimate productivity.

Population indices and variance estimates were calculated using standard statistical procedures for stratified analyses, as described by Smith (1995). Visibility correction factors were not incorporated in the population indices.

RESULTS AND DISCUSSION

We conducted the Yukon Flats loon survey on 8, 11, 12 and 15 August, 2016. The survey was conducted by pilot/observer Nikki Guldager, and observer Bryce Lake. The survey requires approximately 27 flight hours (including ferry time), or 4 flight days.

Pacific Loons

The overall population index for Pacific loons for the study area was 2,125 in 2016 (Table 1). There are no significant trends in overall population indexes from 2007 to 2016 (Figure 2). The density estimate for 2016 (0.22 loons/km²) was not significantly different than previous survey years (2006 - 2015 = 0.16 to 0.38 loons/km², Figure 3). Observations were categorized as singles (52 detected in 2016), pairs (33 detected in 2016), and groups (10 detected in 2016).

Early breeding survey (June) estimates of Pacific loons from the scoter and scaup survey (Guldager and Bertram 2016) were consistently lower than late breeding surveys (July – August) conducted in 2007 to 2016 (Table 1, Figure 2). Estimated total number of Pacific loons in the study area was on average 55% greater in August than in June for 2007 – 2016. Additionally, the Alaska-Yukon breeding pair survey (Mallek and Groves 2011), which was also conducted in Yukon Flats early in the season (late May, 2007 – 2011), detected densities of Pacific loons (0.04 – 0.15 loons/km²) comparable to those observed during the scoter and scaup survey. This difference in detections between early and late summer is likely attributable to breeding behavior. In late May/early June loons are focused on nest initiation, egg laying, and incubation at nest sites located along vegetated lake margins, making birds more difficult to detect from the air. Later in the season, post hatch, birds frequent open water for foraging and are therefore highly visible from the air. Additionally, late summer surveys may include more non-breeders, as they may arrive on the breeding grounds after the early season surveys were completed.

From 2009 to 2016, during the June and August survey, the west strata commonly has the highest number of birds (estimated and observed), and the lowest densities are observed in the east stratum (Table 1, Figure 2).

Common Loons

The density estimate for common loons was 0.07 loons/ km² in 2016. The overall population index for the study area was 723 in 2016, which was within the range of estimates from 2007 – 2015 (range = 184 – 808) (Table 1). However, use among strata was inconsistent with previous

years. The common loon estimate was higher in the east and west strata than all previous years, while the estimate for the north stratum was lower than previous years (Table 1, Figure 4).

Red-throated Loons

Three red-throated Loons (*G. stellata*) were observed 2016, which is similar to previous survey years (range = 0 – 5).

Trumpeter Swans

Trumpeter swans have been opportunistically surveyed during the scoter and scaup survey in June and during the loon survey in August since 2007. The estimated total number of swans in the study area during the August loon survey in 2016 was 1,346, which was the highest estimate for 2007 – 2015 (397 – 1,176). As in previous surveys, trumpeter swan densities in the west stratum were highest compared to other survey strata (Table 1), and swan densities increased in all strata in 2016, relative to the previous 9-year means (east = 50, north = 157, south = 188, west = 459).

Loon Productivity

In 2016, 9 Pacific loon young were detected, which was within the range of detections observed from 2007 to 2015 (1 – 15 young observed/per year). The observed low productivity of Pacific loons (percent singles or pairs with 1 or 2 young in 2016 = 8%) is similar to other areas in Alaska. In northwest Alaska, aerial plot surveys conducted in June detected nests for 19% of Pacific loon pairs (12% of total birds), of which an unknown proportion fledged young (Bollinger and Platte 2008). Similarly, on the Yukon Delta, 5.3% and 16.7% of Pacific loon nests fledged young in 2 study years (Petersen 1976).

Common loon productivity was high in 2016 relative to previous years, with 18% of singles or pairs with 1 or 2 young. Eight common loon young were observed in 2016, which was twice as many as detected in previous years (0 common loon young observed in 2008, 2009, 2011, 2013 and 2015, 1 young in 2007 and 2010, 4 young in 2012, and 2 in 2014).

Though loon productivity is expected to be low, measures of productivity from aerial surveys are likely biased low due to increased diving activity and lower detectability of young. Additionally, 2 single bird observations may in fact be a pair, which would increase the % productive.

RECOMMENDATIONS

We recommend the following survey modifications to better estimate loon productivity for Yukon Flats:

- 1) Increase effort during the 2017 loon survey to circle the entire lake where a loon is initially detected to more confidently determine observation type (single, pair or group), and to increase detection of young. Pacific loons are energetic and frequent divers and can remain under water for long periods of time. Increased search efforts will provide better estimates of loon productivity for Yukon Flats, however, only those observations

within the strip transect will be included in extrapolated estimates for inter-annual comparison.

- 2) Conduct replicate August surveys for loons and young at a sample of wetland locations to determine occupancy, and provide a more accurate estimate of Pacific loon productivity on Yukon Flats. Conduct a pilot effort to determine sample sizes and associated survey effort to determine feasibility.

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Table 1. Indicated total number of birds counted, estimated density, and estimated total number of loons and trumpeter swans per stratum and for the entire study area from an aerial monitoring survey conducted on the Yukon Flats, Alaska, June and August 2016.

Species	Stratum	Sample Area km ² (n) ^b	Indicated Total		Density (birds/km ²)		Estimated Total	
			June	Aug	June	Aug	June	Aug
COLO ^a	east	157.8 (16)	2	20	0.01	0.13	27	274
	north	268.1 (18)	5	7	0.05	0.07	94	132
	south	105.3 (10)	12	16	0.04	0.06	144	192
	west	119.2 (9)	3	8	0.02	0.05	45	121
	Total	650.4 (53)	22	51	0.03 ^c	0.07 ^c	312 ^c	723 ^c
PALO ^a	east	157.8 (16)	10	3	0.06	0.02	137	41
	north	268.1 (18)	19	24	0.18	0.23	359	454
	south	105.3 (10)	20	47	0.07	0.18	240	564
	west	119.2 (9)	28	76	0.18	0.48	424	1,151
	Total	650.4 (53)	77	150	0.11 ^c	0.22 ^c	1,091 ^c	2,125 ^c
TRSW ^a	east	157.8 (16)	4	7	0.03	0.05	55	96
	north	268.1 (18)	6	15	0.06	0.14	113	283
	south	105.3 (10)	27	34	0.10	0.13	324	408
	west	119.2 (9)	32	39	0.20	0.25	484	590
	Total	650.4 (53)	69	95	0.10 ^c	0.14 ^c	978 ^c	1,346 ^c

^a COLO = common loon, PALO = Pacific loon, and TRSW = Trumpeter swan.

^b Total Stratum Area (km²): west = 2,388.7, south = 3,217.3, north = 1,989.8, east = 2,132.4.

^c Total estimate is from a model that is not strata specific.

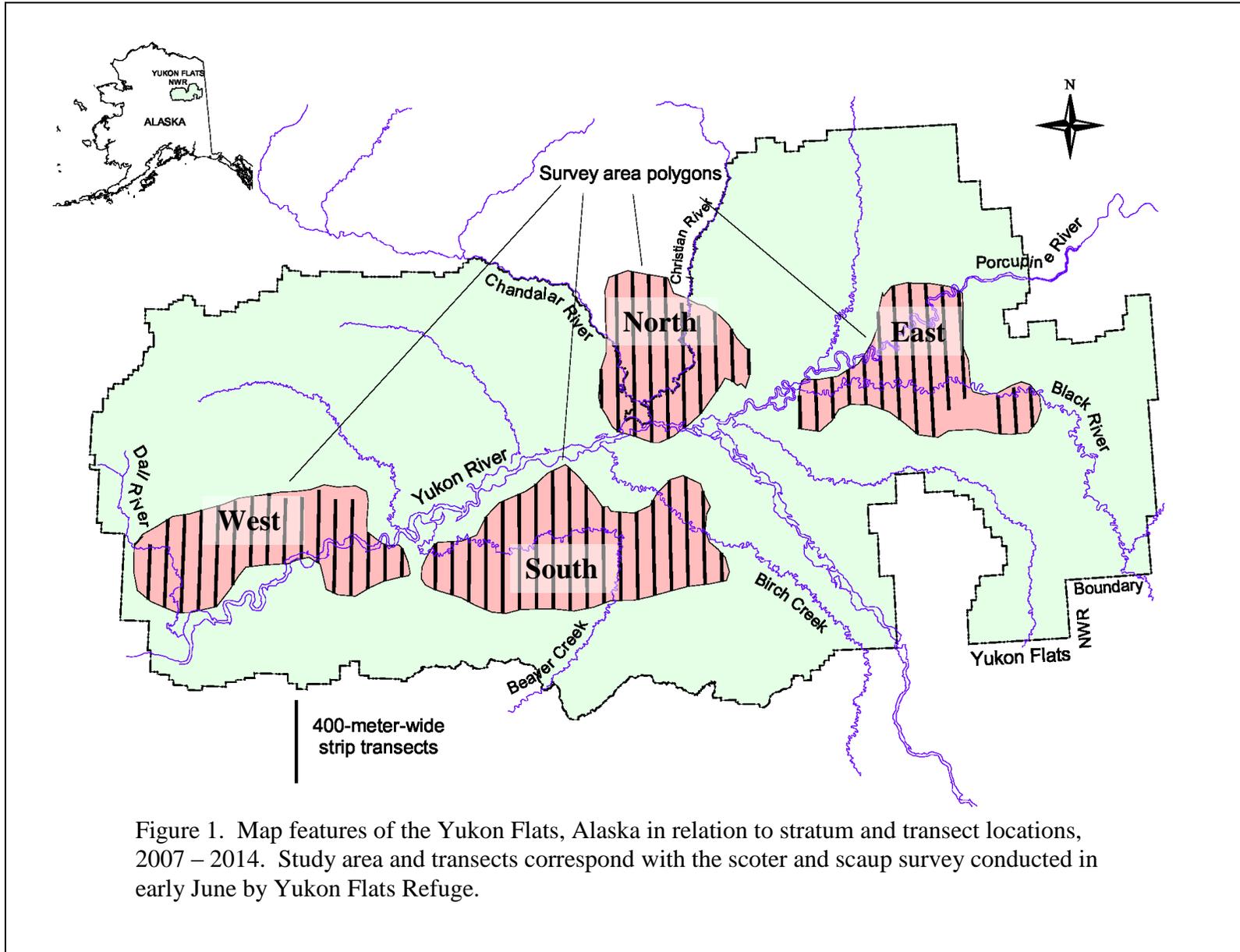


Figure 1. Map features of the Yukon Flats, Alaska in relation to stratum and transect locations, 2007 – 2014. Study area and transects correspond with the scoter and scaup survey conducted in early June by Yukon Flats Refuge.

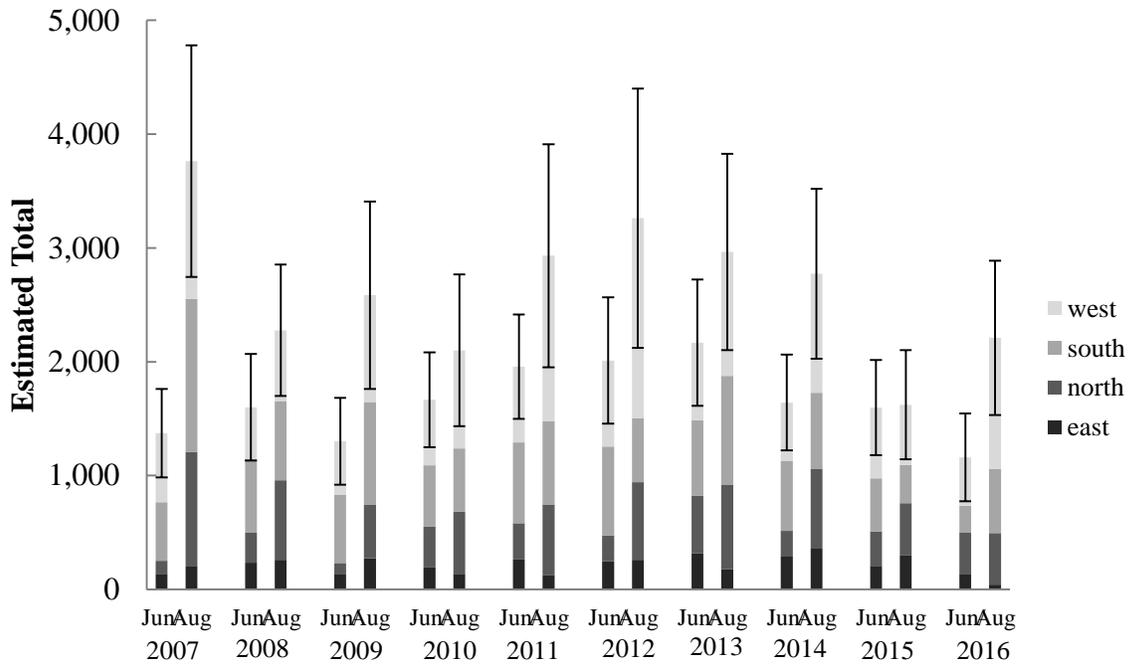


Figure 2. Estimated total number of Pacific loons by stratum with 95% confidence limits from early (June) and late (August) breeding aerial monitoring surveys conducted on the Yukon Flats, Alaska, 2007 - 2013. Error bars are from a model that was for the entire study area (not strata specific).

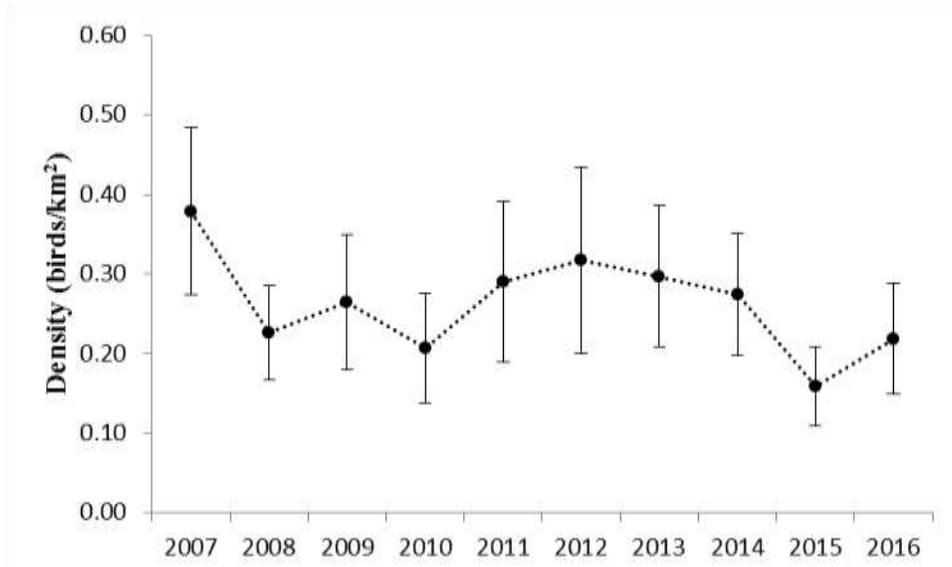


Figure 3. Density (birds/km²) estimates of Pacific loons calculated from aerial loon surveys conducted on Yukon Flats, Alaska, from August 2007 – 2016 with 95% confidence intervals.

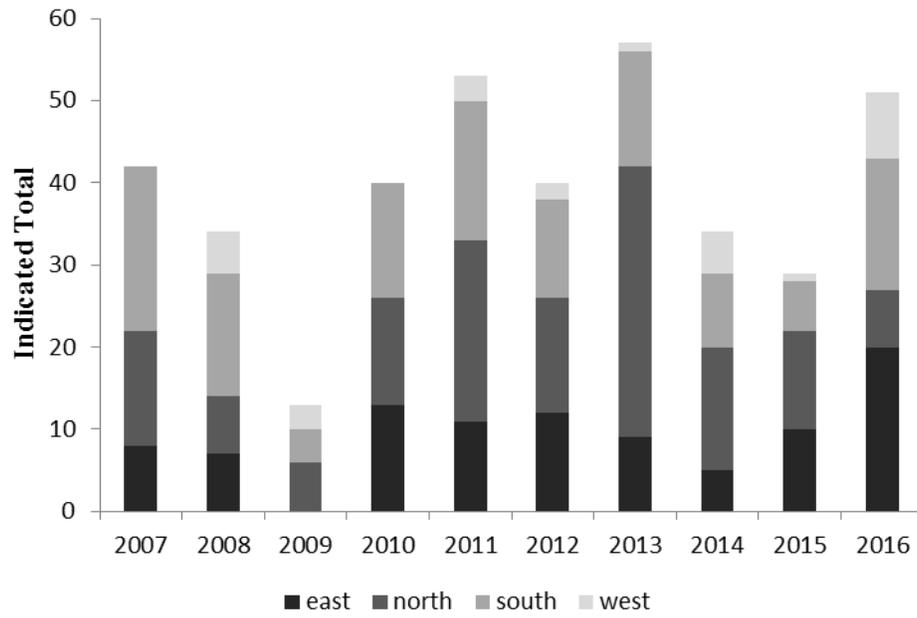


Figure 4. Indicated total number of common loons counted by stratum from aerial loon surveys conducted on Yukon Flats, Alaska, from August 2007 – 2016.