Yukon Flats Loon Survey
July 20 and 21, 2006

Key words: Common Loon, Pacific Loon, and Red-throated Loon; Yukon Flats National Wildlife Refuge; loon density; aerial survey; interior Alaska.

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EXECUTIVE SUMMARY

Surveys have indicated the Yukon Flats National Wildlife Refuge 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 loon surveys have been conducted by the Refuge staff since 1984. A line-transect loon survey which accounted for sightability bias in estimates was conducted in 1988. Additionally, the Refuge conducted loon surveys annually from 1999 – 2003 in mid July using strip transect methodology similar to that used by the Division of Migratory Birds. The latter survey was repeated in 2006.

The density estimate for Pacific Loons in 2006 was 0.33 loons/km², and the overall population estimate for the study area was 9,270. This is a 32% decrease from the 5-year mean calculated for surveys conducted from 1999 – 2003, though trends were not significant. Windy survey conditions (15 – 25 knots) on 21 July, 2006 likely contributed to lower counts.

One Common Loon, and zero Red-Throated Loons (*G. stellata*) were observed in 2006, which is notably fewer observations than in 1999 – 2003. The low number of observations in 2006 may be attributed to changes in the pilot(observer), given most observations of these species in previous years were made by the prior pilot/observer.

Yukon Flats Pacific loon estimates from the Refuge survey were compared to those from the Alaska-Yukon waterfowl breeding pair survey for 1999 – 2003 and 2006. The Refuge loon survey consistently estimated loon densities 3 – 4 times greater than density estimates from the Alaska-Yukon breeding pair survey; however, annual trends were surprisingly consistent between surveys. This consistency in annual trend instills confidence in our estimates, and implies that the surveys are giving us similar information regarding population trend, and that efforts may be duplicative. Differences in the magnitude of densities between the 2 surveys are likely due to survey timing, sample size, and transect location. Given the similarity in results, we recommend that the Refuge loon survey be tailored to monitoring loon productivity in mid to late August when young are highly detectable. Estimates of productivity will compliment density estimates calculated from the Alaska-Yukon breeding pair survey, providing additional information about interior loon populations.

Additionally, we recommend that the survey design be modified to more intensively sample a smaller study area of higher quality habitat in order to obtain more precise population estimates required for detecting significant change.
Introduction

Loons have been surveyed during the Alaska-Yukon waterfowl breeding pair survey (Division of Migratory Birds, USFWS) since 1953 (Conant and Mallek 2006). Additionally, the Yukon Flats Refuge staff has surveyed loons intermittently since 1984, with the most comprehensive loon survey conducted in 1988 (Quang and Lanctot 1991, Lanctot and Quang 1992). Annual loon surveys were conducted from 1999 to 2003 as part of the station’s wildlife inventory plan (Bertram and Vivion 2003). This survey was not conducted in 2004 and 2005, and was reinitiated in 2006, with results documented in this report.

Surveys indicate that Yukon Flats National Wildlife Refuge (NWR) is an important breeding area for Pacific loons (Gavia pacifica) (Groves et al. 1996, Lanctot and Quang 1992). Statewide aerial surveys indicate that Yukon Flats NWR 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 NWR are more comparable to coastal tundra ecosystems than to other lower density boreal habitats (Groves et al. 1996). Reported densities from aerial surveys of Pacific Loons on Yukon Flats NWR 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; Lanctot and Quang (1992) estimated densities of 0.49 loons/km² in early June using methodology that corrects for visibility bias in estimates; and Bertram and Vivion (2003) reported late breeding season (mid-July) Pacific Loon densities of 0.43 – 0.59 loons/km² using uncorrected survey techniques similar to Groves et al. (1996).

Yukon Flats NWR may also be an important breeding area for common loons (G. immer) (Lanctot 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

We conducted an aerial loon survey on 20 and 21 July, 2006 on the Yukon Flats NWR (study area = 27,972 km²). Thirty transects were surveyed, with a strip width of 400 m (200 m on each side of the aircraft). Each transect was 25.7 km long and covered an area of 10.4 km², with the area surveyed equal to 310.8 km² (Figure 1). Transects were flown in an Aviat Husky Model A-IB 60 meters above ground level at a speed of 80 knots. Observations were collected on the left side by the pilot and on the right side by a back seat observer. Compact tape recorders were used to record data. Population estimates were derived by expanding observed densities to the survey area. The survey required 15 flight hours (including ferry time), or two flight days to complete. The total cost for the survey, including transit time, was approximately $1750 (flight time + fuel).

In 2006, a new pilot/observer conducted the survey, while all previous surveys (1988 to 2003) were flown by the same pilot/observer. The passenger/observer was the same from 1999 – 2003
and in 2006. Loon densities and population estimates for all years (1999 – 2003, 2006) were calculated separately for the left and right side of the aircraft in order to examine the affects of change in pilot/observer in 2006.

The Alaska-Yukon waterfowl breeding pair survey has been conducted annually since 1952, and includes waterfowl habitat throughout Alaska and the Yukon Territory. As part of this effort, waterfowl within Yukon Flats (Strata 4) have been surveyed annually in mid to late May, during which loons have been consistently counted since 1974 (Groves pers. Comm.). The Refuge loon survey is conducted in mid July. The study area for the Refuge loon survey is similar in size and location to the Alaska-Yukon Strata 4 survey, however the placement of transects is different and the number of transects surveyed is greater (Figure 1). Pacific Loon densities and population estimates from the Alaska-Yukon Strata 4 survey (Conant and Mallek 2006) were compared with those from the Yukon Flats Refuge survey for 1999 – 2003, and 2006.

Results and Discussion

The density estimate for Pacific Loons was 0.33 loons/km², and the overall population estimate for the study area was 9,270. This was a 32% decrease from the 5-year mean calculated for 1999 – 2003 (13,698) (Figure 2), though it was not possible to detect significant changes among years due to high variance in the estimates (Table 1). Windy survey conditions (15 – 25 knots) on 21 July, 2006 likely contributed to lower counts. Windy conditions produce increased wave action causing birds to find cover in lake vegetation, decreasing their detectability.

In 2006, we observed one Common Loon, and zero Red-throated Loons. Small sample sizes precluded the calculation of density and population estimates (Table 1). More Common and Red-throated Loons were detected in previous survey years; a range of 9 – 17 Common Loons and 0 – 5 Red-throated Loons were observed per year in 1999 – 2003. In 1999 – 2003, most Common and Red-throated Loon detections were made by the pilot/observer on the left side of the aircraft. The absence of this individual may account for low numbers in 2006.

The passenger/right hand side observer has consistently counted more Pacific Loons over all survey years (Figure 3). Population estimates, when calculated separately for the left and right seats, were on average 47 % (+/- 0.07 %) lower on the left side. These differences may be attributed to differences in habitat between the left and right sides of the aircraft, or, more likely, the pilot may detect fewer birds because attention is split between looking for birds and piloting the aircraft. In 2006, the pilot/left side observer saw fewer Pacific Loons than the right seat observer; however, this difference was no greater than differences observed in previous years, implying minimal affect of a new pilot/observer. Though the magnitude of the number of birds detected annually varied between observers, changes in the population among years, or annual trends, were similar (Figure 3).

The Refuge loon survey consistently estimated loon densities 3 – 4 times greater than density estimates from the Alaska-Yukon breeding pair survey; however, annual trends were surprisingly consistent between surveys (Figure 4). This consistency implies that the surveys are giving us similar information regarding population trend, and that efforts may be duplicative. Differences in the magnitude of density between the 2 surveys are likely due to differences in survey timing,
sampling intensity, and transect placement. The later timing of the Refuge loon survey probably captures later arriving non-breeders and additional breeders not captured in the earlier Alaska-Yukon survey. Additionally, the sample size for the Refuge survey is larger, with the highest proportion of transects occurring on the west side of the Refuge where more loons are expected to occur. Only 2 of the 20 Alaska-Yukon transect segments are west of Beaver, whereas 12 of the 30 Refuge transects are west of Beaver (Figure 5). Many of the wetlands on the east side of the Refuge have dried, and Pacific loon distribution reflects this (Figure 5).

**Recommendations**

Consistency in annual loon population trends between the Alaska-Yukon breeding pair survey and the Refuge loon specific survey indicates that they are giving us similar information and that efforts may be duplicative. We recommend that the Refuge loon survey be modified to monitor loon productivity. Specifically, we recommend that this loon survey be conducted in mid-late August when young are highly detectable. Estimates will include adults and young, rather than adults only. In order to properly count young, each loon detected along a strip transect will be circled to acquire an accurate count of young. This addition to the survey will add approximately one survey day, or 7 hours, to the survey, which will cost approximately $812 (flight time + fuel). This is calculated based on 100 total loon group detections at 3 additional minutes each, and 2 additional hours of ferry time. This survey modification will provide us with productivity information for limited additional effort and cost. Estimates of productivity will compliment population estimates calculated from the Alaska-Yukon breeding pair survey, providing additional information about interior loon populations.

Additionally, we recommend that the study area and survey transect layout be modified to correspond with the scoter and scaup (SS) survey (Figure 6) (Mallek 2005). These transects more intensively sample a smaller study area of higher quality habitat. This will increase our sampling fraction and the number of loon detections, which will increase our precision and power to detect changes among years. Eliminating large lakeless areas from the study area will also make population expansions more realistic. Furthermore, co-locating loon surveys with the SS survey will allow us to opportunistically estimate the loon population in early June from SS survey data, allowing for direct comparison to the proposed late season loon productivity survey. This survey modification will add an additional day to survey length ($912 = flight time + fuel for 8 hours), making total survey length (with above addition of counting young) equal to 4 days, with a total survey cost of approximately $3,500.

Further recommendations include recording GPS coordinates for all observations. The feasibility of using the moving map computer program developed by Jack Hodges will be explored. The program allows observations to be seamlessly geo-referenced using a GPS-linked computer and a microphone.

**References Cited**


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1 T = total individual birds observed, singles, pairs and groups
2 P = A (T/S) (A = Square kilometers in stratum = 27971.87 km² (10,800 mi²))
3 SE = standard error
4 S = Square kilometers in sample = 310.80 km² (120mi²)
5 1999 data are not comparable to other survey because data was lost from transects 3-8 and 30. Estimates were calculated from S= 238.28 km² (92 mi²).
6 Unknown species
7 The 1988 and 1999 surveys include a proportion of unidentified diving loons observations (see Table 2), the increase in the final density estimate is reflected.
Figure 1. Map features of the Yukon Flats National Wildlife Refuge (brown) in relation to the Refuge Loon survey transects (yellow) and the Alaska Yukon Breeding pair survey transects (black).
Figure 2. Estimated number of Pacific Loons within the Refuge study area, 1999 – 2003, and 2006.

Figure 3. Number of Pacific Loons observed during the Refuge loon survey in 1999 – 2003 and 2006. Observations are totaled for both sides of the aircraft, and are also displayed separately for the right and left side observers.
Figure 4. Density (birds/km²) estimates of Pacific Loons calculated from the Refuge loon survey, which is conducted in mid – July (1999 – 2003, and 2006), and the Alaska – Yukon breeding pair survey, which is conducted annually in the Refuge in late May.
Figure 5. Mean number of Pacific loons per transect calculated for 6 survey years, 1999 – 2003, and 2006. Transects marked with a black star are those from the Alaska-Yukon breeding pair survey, and unmarked transects are those from the Refuge loon survey. Transects colored yellow have the least number of loons, while the red transects have the highest number of loons observed.
Figure 6. Proposed study area and survey transects for future loon surveys. Study area and transects correspond with the scoter and scaup survey conducted in early June. Transects more intensively sample a smaller study area of higher quality habitat relative to previous surveys.