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Preliminary Assessment of Tundra-Nesting Birds in the Point Thomson Area, Alaska, 2001

Prepared for

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ABSTRACT

Twenty-eight 10-hectare plots were established to study tundra-nesting birds in early June 2001 in the Point Thomson area at Point Thomson Unit 3 near the gravel pad. Fourteen plots were located near proposed infrastructure and were designated as treatment plots. The other 14 plots were located on tundra away from proposed infrastructure and were designated as reference plots. The vegetation/land cover types on reference plots were matched as closely as possible with those on treatment plots. The establishment of the two plot types will allow for comparisons of bird use of tundra near and away from infrastructure should development occur in the area. Each plot was surveyed twice to determine nest density, species composition, nesting success, and habitat use for nesting tundra birds between 12 June and 5 July.

Nest densities were within the ranges reported for other North Slope areas. Diversity of common species was lower than that reported for the Prudhoe Bay area but higher than that reported for most locations in the Arctic National Wildlife Refuge. The three most common species were Lapland longspur (*Calcarius lapponicus*), semipalmated sandpiper (*Calidris pusilla*), and pectoral sandpiper (*Calidris melanotos*). Nest success was approximately 50% for all species combined, excluding Lapland longspur. Study design did not allow sufficient plot visitation to determine longspur nesting success. Predation was responsible for most nest failure, and was probably caused by arctic foxes and jaegers. Three vegetation/land cover categories dominated the landscape, and bird nest sites did not occur on any particular habitat type more than expected based on the amount of habitat available. However, for semipalmated sandpiper, and for all species combined, nests sites occurred less frequently than would be expected on wet sedge/moist sedge, dwarf shrub tundra complex.

The difference in use by nesting birds was not great between reference and treatment study plots, suggesting that the two types of plots may form a suitable baseline for use in studies of future development in the Point Thomson Unit.

Key words: *Calcarius lapponicus*, *Calidris melanotos*, *Calidris pusilla*, Lapland longspur, oilfield development, pectoral sandpiper, semipalmated sandpiper, shorebirds, tundra habitats, vegetation/land cover

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INTRODUCTION

The Point Thomson Unit owners (BP Exploration (Alaska) Inc. (BPXA), ExxonMobil Corporation, Phillips Alaska Inc., and Chevron-Texaco) are considering development of an oilfield in the Point Thomson Unit, about 80 km east of the Prudhoe Bay oilfield. The proposed development would include the construction of gravel roads to production sites east and west of the existing Point Thomson Unit 3 gravel pad (Figure 1). The length of the roads to the proposed east and west well pads would be approximately 7 and 10 km, respectively. In addition, a gravel airstrip oriented northeast to southwest would be constructed approximately 3 km south of the Point Thomson Unit 3 pad. A gravel road would connect the airstrip to that pad and to the east and west well pad roads. An elevated pipeline to transport produced oil would be constructed parallel to the road system from the east well pad to the west well pad and would continue west to connect with the Badami Pipeline. Gravel for construction of the infrastructure would be mined from a proposed site near the northeast end of the airstrip, and a gravel storage area would be established north of the mine site (Figure 1).

Oilfield developers and wildlife managers are concerned about the effect of North Slope development on wildlife populations. Numerous studies in the Prudhoe Bay area have described the responses of wildlife to oilfield operations and development (Troy 1988; Pollard et al. 1989; Troy and Carpenter 1990; Truett et al. 1994, 1997). Frequently, these studies have been conducted during the production phase of oilfield development after construction of oilfield infrastructure has occurred, and comparisons of pre- and post-development wildlife activity are not possible. Pre-development data may be helpful in determining placement of facilities and assessing the responses of wildlife to oilfield development.

Several studies have already been conducted in the Point Thomson Unit. In 1983, an environmental report described the vegetation/land forms, birds, mammals, and fish of the Point Thomson Unit (Hampton et al. 1983). Wright and Fancy (1980) reported on the responses of birds and caribou to exploratory drilling operations at the Point Thomson Unit 4 pad. Fechhelm et al. (2000) collected data on fish resources in the coastal waters near Point Thomson in 1999, and that study was continued during summer 2001. Noel and Funk (1999) produced a vegetation/land cover map for portions of the Point Thomson Unit. Annual systematic aerial surveys of molting waterfowl have included the marine waters of the Point Thomson Unit (Noel et al. 2000), and systematic aerial surveys of large mammals have been conducted over terrestrial habitats in the Point Thomson area (Pollard and Noel 1995; Noel and King 2000; Noel and Olson 2001). LGL et al. (1999) produced an environmental report for the Point Thomson area.

Other studies conducted on the Arctic Coastal Plain near the Point Thomson Unit have included fish and bird studies in the Badami Unit west of Point Thomson (Fechhelm et al. 1995, TERA 1995) and an environmental assessment of the Badami Unit (BPXA 1995). South of the Point Thomson Unit, TERA (1993a) characterized the breeding season bird community for the Yukon Gold project. East of Point Thomson, the U.S. Fish and Wildlife Service (USFWS) has conducted numerous studies in the Arctic National Wildlife Refuge (ANWR) (e.g., Oates et al. 1987).

In 2001, LGL Alaska Research Associates, Inc. (LGL) was contracted by BPXA on behalf of the Point Thomson Unit Owners to collect pre-development baseline data on tundra-nesting birds in the area proposed for development in the Point Thomson Unit. A base camp was established at Point Thomson Unit 3 gravel pad and study plots were located within walking distance of the camp (Figures 1 and 2). Study plots were located both near (treatment plots) and away from (reference plots) proposed infrastructure. Study plots were censused during the nesting season to determine nest density and success, species composition, and habitat use by tundra birds. This report presents the findings of that study.

BUSINESS RATIONALE

Since oilfield development began on the Arctic Coastal Plain of Alaska in the late 1960s, oilfield developers and wildlife managers have been concerned about the effects of oilfield development on wildlife. Specifically, there has been concern regarding disturbance and displacement of tundra-nesting birds by oilfield activities, and the effects of predators that may be attracted by oilfield infrastructure (Troy 1988; Troy and Carpenter 1990; Johnson et al. 1992). The results of pre-development baseline studies at Point Thomson will provide a basis for comparisons with data collected after development that may provide insight into the effects of oilfield operations on tundra-nesting birds. Pre-development baseline data on habitat preferences for tundra-nesting birds may aid oilfield developers and wildlife managers in determining future locations of oilfield infrastructure.

OBJECTIVES

The objectives of this study are to:

- Collect baseline data to characterize the tundra-nesting birds of the Point Thomson area by determining nest density, species composition, and nesting success.
- Determine the habitat types used by tundra-nesting birds at Point Thomson.
- Establish study plots on tundra near and away from sites of proposed infrastructure that can be surveyed before and after development to make pre- and post-development comparisons of tundra-nesting bird activity.

STUDY AREA

The Point Thomson Unit extends along the coast from the Staines River in the east to approximately 5 km east of Bullen Point in the west. It includes marine areas that extend from approximately 3 to 10 km offshore, as well as some of the barrier islands in that area. South of the shoreline, the Point Thomson Unit extends inland 8 to 11 km in the eastern portion of the unit and 3 to 5 km in the west. The study area is located near the coast in the central portion of the unit and includes the tundra area within approximately 4 km from the Point Thomson Unit 3 gravel pad (Figures 1 and 3).

The area is generally a flat coastal plain extending south to the Brooks Range and is composed primarily of wet and moist tundra. Microrelief is characterized by the presence of strangmoor ridges, high- and low-centered polygons, and hummocks. Wetlands are a dominant component of the Point Thomson Unit as evidenced by the presence of numerous lakes, ponds, streams, and aquatic tundra vegetation types (Noel and Funk 1999).

The Point Thomson Unit contains at least nine abandoned gravel pads that were used as drilling platforms during exploratory operations. Most early exploration was conducted during the late 1970s and early 1980s. Three gravel pads (Point Thomson Unit Numbers 1 and 3, and Alaska State C-1) are located near the study area. The exploratory wells on these pads were plugged and abandoned by 1981, although the Point Thomson Unit 3 gravel pad has been used over the years as a staging area for other exploratory efforts and as a campsite for various projects.

METHODS

Site Selection and Plot Setup

Twenty-eight 10-ha study plots were overlaid onto an existing vegetation/land cover map (Noel and Funk 1999) that included delineation of the proposed development for the Point Thomson Unit (Figure 2). For analysis in future years, the study plots were divided into "reference" and "treatment" plots on the basis of their proximity to proposed infrastructure. Fourteen study plots were placed on tundra within 500 m of proposed infrastructure in areas that could be accessed on foot from a campsite at the Point Thomson Unit 3 gravel pad. These plots were designated as treatment plots and were located adjacent to proposed roads, the proposed airstrip, and the proposed mine site and gravel storage area. Another 14 study plots were located on tundra approximately 1 km or more from proposed infrastructure in habitats that matched as closely as possible those of corresponding treatment plots. These 14 plots were designated as reference plots. Each 10-ha study plot encompassed an area with dimensions of either 100 m x 1000 m or 200 m x 500 m.

Study plots located within walking distance from the Point Thomson Unit 3 gravel pad were established in the field during 2–7 June 2001. For study plots measuring 100 m x 1000 m, a wooden stake was placed every 50 m along the centerline of the plot. For study plots measuring 200 m x 500 m, wooden stakes were also placed 50 m apart and two centerlines were established, each 50 m from the edge of the plot. Each stake was marked with numbers and arrows to establish a grid of 20 cells in each study plot, each measuring

50 m x 50 m, on either side of the centerline. Starting and ending points for transect centerlines were determined using a Trimble Geo-Explorer Global Positioning System (GPS) unit (Appendix A).

Data Collection

From 12 June through 5 July, each study plot was censused twice for nesting birds. The first and second census periods were from 12–21 June, and from 24 June through 5 July, respectively (Table 1). Nesting birds were censused using a rope drag method to flush incubating birds from their nests (described in Troy et al. 1983). The rope drags involved two biologists walking abreast along the grid lines dragging a nylon rope between them. A third biologist walked behind the rope, midway between the two biologists dragging the rope. Birds that had not been flushed during this procedure, but that exhibited behavior indicating that they might be nesting in the area, were also observed to determine if they had a nest.

All located nests were marked with a plain wooden tongue depressor on which was written the species name and an identification number. The tongue depressor was inserted into the tundra approximately 1 m from the nest in the direction of the study plot centerline. A fluorescent orange tongue depressor with a direction arrow and the number of paces to the nest was inserted into the tundra on the centerline. Information including species, nest number and location, date, habitat description, and number of eggs or young was recorded in a field notebook. Data from field notebooks were transcribed onto permanent data sheets each evening, and were later transferred to computer spreadsheets.

Bird use of each plot was also determined during the rope drag censuses. The biologist walking behind the rope recorded species, numbers of individuals and their behavior, grid cell within which the bird was recorded, and general habitat characteristics for all birds observed during the census period. Jaegers and owls that were flying over the plots were considered to be hunting and were counted in the census. Birds flying over the plots that did not appear to be actively using the plots were not recorded.

During the second rope drag census, the final status (successful or failed) of some nests was determined; however, many nests were still active, and the final status of these nests could not be determined. Nests that were still active after the second census were revisited after the breeding season, from 11–13 August, to determine status.

Nest success or failure was determined using the criteria of Troy and Wickliffe (1990). A nest was considered to have failed if the initiation date was known and the nest was found empty before the normal incubation time was completed, or if signs of predation, such as broken eggs, fox scat or scent at an empty nest, or a destroyed nest were present. For shorebirds, a nest was considered successful if it contained tiny egg shell fragments ("egg bits" originating from egg shell pipping). For waterfowl, a nest was considered successful if egg shells with dry membranes attached to the shell were found in or near the nest cup. For Lapland longspurs (*Calcarius lapponicus*), a nest was considered successful if fledged young were observed near the nest. The presence of feather sheathes (powdery material shed from developing feathers) and alarmed adults near an empty nest were also used as indicators of nest success. However, the presence of feather sheaths in the nest cup only indicated that the chicks were close to fledging and did not preclude the possibility of nest predation late during the developing period of young birds.

Data Analysis

Nest density data (total number of nests per 10-ha plot) were compared for each pair of reference and treatment plots. Nest density (nests per km^2) for each species on all reference plots combined was compared with nest density on all treatment plots combined. Species richness (the number of species nesting in each plot) was compared between pairs of reference and treatment plots, and the total number of species nesting in all reference plots combined was compared to the total number of species nesting in all treatment plots combined.

The criteria for determining nest status was straightforward for shorebirds and waterfowl because young leave the nest shortly after hatching; nest success or failure was determined by the characteristics of egg shells remaining at the nest. Nests of shorebirds and waterfowl were classified as successful or unsuccessful, and the numbers of successful and unsuccessful nests were compared between pairs of reference and treatment plots.

The status of Lapland longspur nests was more difficult to determine because young longspurs remain in the nest for 8 to 12 days after hatching. The nest contents are only indicators of nest status and are not diagnostic in determining nest success or failure. Because success or failure of longspur nests could not be determined with the same degree of certainty as for shorebirds and waterfowl, the final status of longspur nests was considered separately from that of other species.

The number of bird sightings (total number of sightings per 10-ha plot) was calculated for each study plot. The total number of bird sightings was compared for each pair of reference and treatment plots during each survey period. The number of sightings in each plot type was also compared between the first and second survey periods. Behavior classifications recorded during each survey were totaled for each species and differences in behaviors were compared for each species between the first and second survey period.

The percentage of each vegetation/land cover category in each study plot was determined. Percentages were totaled for reference plots, treatment plots, and for all study plots combined. The average percent cover of each vegetation/land cover category was calculated for reference plots, treatment plots, and for all study plots combined.

The vegetation/land cover category at each nest site was determined by mapping the nest location on the existing vegetation/land cover map (Noel and Funk 1999). The number of nests of each species in each vegetation/land cover category was calculated. Photographs were taken at most nest sites during 11–13 August and later examined to verify that vegetation/land cover categories had been correctly assigned to each nest. A chi-square test was used to compare the number of nests observed with the number expected based on the amount of habitat available in the various vegetation/land cover categories.

RESULTS

Some bird species that were observed in the area of the campsite at Point Thomson Unit 3, or while observers walked between the study plots and camp, were not recorded during the nesting surveys. Table B1 lists all species seen in the Point Thomson area during the study period.

Nest Density

The total number of nests of all species combined was slightly higher on reference plots than on treatment plots (Tables 2 and 3, Appendix C). As a group, shorebirds dominated the nesting avifauna in terms of number of species and number of nests; however, the most abundant individual species nesting on both plot types was Lapland longspur (Table 3). Semipalmated sandpiper (*Calidris pusilla*) and pectoral sandpiper (*Calidris melanotos*; Figure 3) were also fairly common nesting species. Waterfowl nested in much lower densities than other groups.

Of the three most common nesting species, more Lapland longspur nests were found in treatment plots than in reference plots (Table 3). In contrast, more semipalmated sandpiper and pectoral sandpiper nests were found in reference plots than in treatment plots, although for pectoral sandpiper, the difference in the number of nests between the two plot types was only one nest. The numbers of nests of other species were all much lower and comparisons of these numbers are probably not useful (Table 3).

Species Composition

More species nested in reference plots than in treatment plots (13 vs. 8; Table 3). One unidentified eider nest was found on a treatment plot. This nest was probably a king eider nest and was not included in calculations of species richness because there were other king eider nests on treatment plots. The difference in the numbers of species in the two plot types was due primarily to small numbers of nests of shorebirds and waterfowl that were found in reference plots (Table 3). Only one species, stilt sandpiper (*Calidris himantopus*; Figure 3) that nested in treatment plots was not found nesting in reference plots.

Nest Success

Nest success for non-passerines (all species excluding Lapland longspur) was higher on reference plots (55%) than on treatment plots (43%; Table 4). On all plots combined the overall nest success for all non-passerines was 49%. For Lapland longspurs, two nests (one in each plot type) were classified as successful, 24 nests (12 in each plot type) were classified as likely successful based on the presence and amount of feather sheath material in the nest cup, and 37 nests (16 in reference plots and 21 in treatment plots) failed.

Bird Use

During the first census period (first rope drag), slightly more bird sightings were recorded on reference plots than on treatment plots (Tables 5 and D1). During the second census period, more birds were observed on treatment plots than on reference plots.

The number of bird observations declined in both plot types from the first to the second census period. The decline in the number of observations recorded during the second census period did not include all species on all plots (Table 6). More Lapland longspurs were observed on treatment plots during the second census than the first, and parasitic jaeger (*Stercorarius parasiticus*) observations increased on both plot types from the first to the second census period. The most common nesting species (Lapland longspur, semipalmated sandpiper, and pectoral sandpiper) were also the most commonly observed species on both reference and treatment plots (Table 6).

Pomarine jaegers (*Stercorarius pomarinus*) were common in the Point Thomson area and were frequently observed early in the season during plot set-up and during the first census period. By late June, pomarine jaegers had declined in abundance and no pomarine jaegers were observed during the second census period (Table 6).

The most common behaviors observed for all species combined on all study plots combined were feeding, incubating, and displaying (Table 7). Most of the behaviors recorded for pectoral sandpipers during the first survey period were feeding and displaying. During the second survey period, incubation became the dominant behavior. Semipalmated sandpipers followed a similar pattern, although few birds were recorded as displaying during either survey period. For Lapland longspurs, feeding and displaying remained the dominant behaviors recorded during both survey periods. This general pattern of behavior (feeding, displaying, and incubation) was exhibited by most other species, although the numbers of observations were low. However, most observations of jaegers and other predators, i.e., short-eared owl (*Asio flammeus*) and northern harrier (*Circus cyaneus*), were of birds hunting over the study plots.

Habitat Selection

In all study plots combined, three vegetation/land cover categories as described by Noel and Funk (1999) dominated the landscape (Table 8). Vegetation/land cover category IIId (wet sedge/moist sedge, dwarf shrub tundra complex) covered a slightly larger area than categories IVa (moist sedge, dwarf shrub/wet graminoid tundra complex) and Va (moist sedge, dwarf shrub tundra). These three vegetation/land cover categories accounted for 85% of the total area of all study plots combined. All vegetation/land cover categories for the Point Thomson area are briefly described in Table 9.

The combined total areas for various vegetation/land cover categories for reference and treatment plots each followed a similar pattern (Table 8). The greatest difference in the distribution of vegetation/land cover categories between the two plot types was in the amount of category Ve (moist graminoid, dwarf shrub tundra/barren complex), which was less well represented on treatment plots. Category Ve is similar to category Va and is distinguished from it by the presence of numerous frost scars or frost boils.

For all tundra-nesting bird species combined, and for all plots combined, nests occurred in seven different vegetation/land cover categories (Table 10). Approximately 89% of all nests occurred on one of the three most abundant vegetation/land cover categories. Nests occurred most frequently in categories IVa and Va, and to a lesser extent in IIId.

Considering only the nests of the three most common nesting species (Lapland longspur, semipalmated sandpiper, and pectoral sandpiper), 73% occurred in categories IVa and Va, 16% occurred in category IIId, and 11% occurred in other categories (Table 10). Considering all species combined on all study plots combined, tundra-nesting birds did not preferentially choose any particular habitat for nesting sites more than would be expected based on the amount of habitat available. The same is true for individual species with regard to nest site selection by longspurs and pectoral and semipalmated sandpipers. However, when considering all species combined and semipalmated sandpiper alone, the occurrence of nest sites on vegetation/land cover category IIId was less than would be expected based on the amount of habitat available ($P < 0.05$). The numbers of nests of other species were too low to make similar comparisons.

The number of nests of Lapland longspurs and semipalmated sandpipers were divided almost equally between vegetation/land cover categories IVa and Va (Table 10). Slightly more pectoral sandpipers nested in category IVa than in category Va. Although a significant selection for nest sites in a particular vegetation/land cover category could not be demonstrated for all species combined or for individual species, 86% of all semipalmated sandpiper nests were located in one of these two vegetation/land cover categories.

DISCUSSION

Nest Density

Overall nest density on the Point Thomson study plots in 2001 (52.2 nests per km^2) falls within the range of nest densities reported for the Prudhoe Bay area since the 1980s, although nest densities have generally been higher at Prudhoe Bay (e.g., Troy and Carpenter 1990; TERA 1991, 1993b, 1996; Rodrigues 1992). The studies at Prudhoe Bay have generally incorporated a more intensive field effort than was implemented in the current study. At Point Thomson we visited each study plot twice during the nesting season, whereas the study plots at Prudhoe Bay were often visited five or more times during the nesting season. Increased visitation to study plots in the Point Thomson study area would likely have resulted in slightly higher nest densities than were recorded in 2001. However, some of the higher nest densities reported in the Prudhoe Bay area (140.8 nests per km^2) occurred in the Colville River Delta, where each study plot was censused only once during the nesting season (Johnson et al. 2000).

East of Prudhoe Bay, tundra-nesting bird studies have been conducted midway between Prudhoe Bay and the Point Thomson Unit 3 study area in the Kadleroshilik River and Badami areas (TERA 1995), at the Yukon Gold area approximately 15 km south of Point Thomson Unit 3 (TERA 1993a), and east of Point Thomson in the ANWR (Martin and Moitoret 1981; Oates et al. 1987). In the Point Thomson Unit, Wright and Fancy (1980) conducted tundra-nesting bird studies near Point Gordon and Point Sweeney, west of Point Thomson Unit 3.

Nest densities at Point Thomson Unit 3 in 2001 (52.2 nests per km^2) were lower than those reported at the Kadleroshilik River (69.7 nests per km^2) and Badami areas (74.3 nests per km^2) for studies conducted in 1994, but higher than those reported at Yukon Gold (28.3 nests per km^2). Nest densities at Point Thomson Unit 3 were generally slightly higher than those reported at coastal and inland sites in ANWR (Oates et al. 1987), although nest densities averaged 83.5 nests per km^2 on study plots in the Canning River delta (Martin and Moitoret 1981). Wright and Fancy (1980) reported approximately 80 nests per km^2 in the western portion of the Point Thomson Unit. All of the above studies employed a more intensive field effort than the current study.

On tundra study plots on the Arctic Coastal Plain, waterfowl generally nest in lower densities than other bird groups (TERA 1995). This was the case at Point Thomson in 2001 (Table 3). The nesting density of waterfowl at Point Thomson (2.5 nests per km^2) was similar to, but slightly higher than, that reported for the Badami area (1.3 nests per km^2; TERA 1995). However, waterfowl nest densities at Point Thomson were lower than those reported by TERA (1995) for the Kadleroshilik area (5.0 nests per km^2), the Prudhoe Bay area (6.0 nests per km^2), and the Milne Point area (6.3 nests per km^2). No threatened or endangered waterfowl were found nesting on Point Thomson study plots in 2001 and no threatened or endangered species were observed in the area during the course of the study.

Species Composition

TERA (1993a, 1995) has noted that species composition of tundra-nesting birds differs among areas across the Arctic Coastal Plain of Alaska from Prudhoe Bay to ANWR. Lapland longspur is generally the most abundant nesting species in all areas, and pectoral sandpiper is also common to abundant in all locations. In the Prudhoe Bay area, these species are joined by semipalmated sandpiper and one of the phalaropes, either red (*Phalaropus fulicaria*) or red-necked (*Phalaropus lobatus*), forming a group of four species that are all common nesters at most locations. In most areas of ANWR and at the Yukon Gold area south of Point Thomson, semipalmated sandpiper and the phalaropes are uncommon nesting species, and only two species, longspurs and pectoral sandpipers, are common. However, the composition of tundra-nesting birds of one area of ANWR, the Canning River delta, resembles that of Prudhoe Bay in that the four common nesting species at Prudhoe Bay are also common nesting species there (Martin and Moitoret 1981).

The Point Thomson area appears to be intermediate between the Prudhoe Bay area and ANWR in terms of diversity of common nesting species. Point Thomson is similar to ANWR in that phalaropes appear to be uncommon nesting species; however, semipalmated sandpiper, which is not a common species at most ANWR locations, is a fairly common nesting species at Point Thomson. The presence of semipalmated sandpiper as a common nesting species at Point Thomson is similar to what might be expected for the Prudhoe Bay area, although the low number of phalaropes nesting at Point Thomson distinguishes that area from Prudhoe Bay. The species composition of nesting birds in the Point Thomson area appears to be similar to that of the Badami area, approximately 30 km to the west (see TERA 1995).

Nest Success

Nest success at Point Thomson for all species combined, excluding Lapland longspur (49%) falls within the range reported for other studies in the Prudhoe Bay area (e.g., Troy and Carpenter 1990; TERA 1991, 1993b). Nest success in the Yukon Gold area during one year of study in 1993 (86%) was much higher than at Point Thomson, although nest density at Yukon Gold (28.3 nests/km^2) was approximately half that of the Point Thomson area (52.2 nests/km^2). Nest success at the Badami area, west of Point Thomson, was not reported (TERA 1995).

Jaegers and arctic foxes (*Alopex lagopus*) are known to prey on tundra-nesting birds and their eggs (Maher 1970, 1974; Martin and Barry 1978; Burgess 2000), and these predators are probably responsible for most of the nesting failure at Point Thomson in 2001. Pomarine jaegers were common at Point Thomson early in the nesting season. Pomarine jaegers feed primarily on lemmings and breed only during years of high lemming concentrations (Pitelka et al. 1955; Maher 1974). Non-breeding pomarine jaegers are known to be opportunistic feeders during low lemming years and will prey on birds and bird eggs (Maher 1974). Lemming numbers were probably not high enough to initiate breeding by pomarine jaegers at Point Thomson in 2001, as no pomarine jaegers were observed in the area after 21 June, although lemmings were observed in the area through the entire survey period. Pomarine jaegers were often observed hunting over the study plots and may have been responsible for some nest predation.

Parasitic jaegers are less reliant on lemmings and prey more on birds and eggs than do pomarine jaegers (Maher 1974; Martin and Barry 1978). Parasitic jaegers were observed hunting over tundra study plots during the entire study period. It is likely that more predation on tundra-nesting birds at Point Thomson may have resulted from parasitic jaegers than from pomarine jaegers. Long-tailed jaegers (*Stercorarius longicaudus*) were occasionally observed in the study area, but because of their low occurrence, they probably did not significantly affect the numbers of tundra-nesting birds.

Arctic foxes were not observed on any of the study plots during census periods, although they were frequently observed hunting in the general area of the study plots. Arctic foxes are known as predators of nesting birds in the Prudhoe Bay area (Troy and Carpenter 1990; Johnson et al. 1993a, 1993b; Burgess 2000; Noel and Johnson 2000) and were observed taking eggs from nests of Canada geese (*Branta canadensis*) near the campsite at Point Thomson on several occasions. Fox scent was detected at one depredated longspur nest, and fox scat was present at two depredated semipalmated sandpiper nests. Arctic foxes may have been one of the primary predators of tundra bird nests at Point Thomson in 2001.

Bird Use

The densities of birds using the Point Thomson study plots (Table 6) were similar to those reported for other North Slope areas (Spindler 1978; Martin and Moitoret 1981; Troy 1985, 1988; Rodrigues 1992). The reduced number of sightings from the first to the second census period is most likely the result of reduced levels of display and feeding, and increased levels of incubation as the season progressed, particularly for pectoral and semipalmated sandpipers (Table 7). Pectoral sandpiper sightings during the second census period were less than half of the numbers recorded for the first census period (Table 6), and almost no males were observed displaying during the second survey period (Table 7). Male pectoral sandpipers do not participate in incubation and care of the young, and typically leave the breeding grounds during the incubation period before the eggs hatch (Pitelka et al. 1974). Semipalmated sandpiper sightings followed this general trend, although the differences between survey periods were not as dramatic. Semipalmated sandpipers follow a different breeding strategy than pectoral sandpipers and are monogamous; both adults share in incubation and care of the young (Pitelka et al. 1974). Semipalmated sandpipers are not likely to leave the breeding ground before the young are hatched.

The levels of feeding and display for Lapland longspurs remained relatively high during both census periods, but the number of birds incubating dropped. Predation of longspur nests was probably fairly high. Of 63 longspur nests, 37 (59%) were known to have failed. Some of the 24 nests classified as possibly successful, based on presence and amount of feather sheath material, probably also failed, adding to the 59% of nests known to have failed. Nest predation would decrease the number of birds incubating. Male longspurs continued to display throughout the study period, and feeding observations likely included adults from unsuccessful nests and fledglings from successful nests.

Habitat Selection

TERA (1995) reported nest densities of tundra birds in different vegetation types in the Badami area, and Martin and Moitoret (1981) compared bird nest densities on different tundra types in the Canning River delta. Most nesting bird species in both of these studies were similar to those nesting at Point Thomson in 2001, although red phalaropes, which occurred in low numbers at Badami and Point Thomson, were common in some areas in the Canning River delta.

Habitats were divided into three types at Badami (wet tundra, moist/wet tundra complex, and moist/dry tundra; TERA 1995) and at the Canning River delta (lowland, mesic, and upland; Martin and Moitoret 1981). For the purposes of discussion, these habitat types can be classified as wet, wet/moist, and moist/dry, respectively, according to the relative amount of wetness. Wet tundra habitats are poorly drained and may have standing water in some areas; moist/wet habitats are intermediate in wetness; and moist/dry habitats are well drained and dryer. If vegetation/land cover types at Point Thomson are combined in such a way that IIIa, IIId, and IIIe form one category, and Va and Ve form a second category (categories III and V), then vegetation/land cover categories III, IV, and V at Point Thomson would be comparable to the habitat classifications at Badami and the Canning River delta. Vegetation/land cover categories III, IV and V correspond to wet, wet/moist, and moist/dry, respectively.

Habitats used for nesting display similar trends at Point Thomson and Badami (Table 11). Higher nest densities occur in wet/moist habitats and lower nest densities occur in wet habitats at both locations. At these locations, Lapland longspur, semipalmated sandpiper, and pectoral sandpiper are the dominant species. At the Canning River delta, the higher nest densities occur on wet/moist habitats as at the other locations; however, wet habitats have higher densities than moist/dry habitats (Table 11). At the Canning River delta, Lapland longspur, semipalmated sandpiper, and pectoral sandpiper are also dominant species, along with a fourth species, red phalarope. Red phalarope was the most numerous breeding species in the lowland, or wet, study plot. Rodrigues (1994) reported that red-necked phalaropes in the Prudhoe Bay area also selected nest sites in wet areas. In this sense, the avifauna of the Canning River delta more closely resembles that of Prudhoe Bay than it does that of Point Thomson or the Badami area.

At the Canning River delta (Martin and Moitoret 1981) and in the current study, more semipalmated sandpiper nests were found on wet/moist and moist/dry habitats than on wet habitats. Rodrigues (1994) also reported semipalmated sandpipers nesting more commonly on drier habitats than on wet ones in the Prudhoe Bay area. However, TERA (1995) reported the highest nest densities for semipalmated sandpipers at Badami on moist/wet habitats and the lowest on moist/dry habitats. Wet habitats at Badami were intermediate in nest density for semipalmated sandpiper.

Although tundra-nesting birds in the current study did not nest in any particular habitat type more than would be expected based on the amount of habitat available, for all species combined and for semipalmated sandpiper alone, fewer nests than expected were observed in wet habitats. Phalaropes commonly nest in wet habitats, and three of the four phalarope nests found at Point Thomson were in wet habitats. However, phalaropes were uncommon nesting birds at Point Thomson in 2001, which probably helped to account for the lower number of nests found in wet habitats. Preliminary results at Point Thomson indicate that wet/moist and moist/dry habitats (vegetation/land cover categories IV and V, respectively) may be more important for nesting birds in the Point Thomson area than wet habitats (vegetation/land cover category III).

SUMMARY

The nest density of birds in the Point Thomson area in 2001 was similar to nest densities reported for other areas of the Arctic Coastal Plain. Species diversity at Point Thomson was intermediate between what might be expected at Prudhoe Bay to the west and the Arctic National Wildlife Refuge to the east. Lapland longspur was the most common nesting species, and the number of longspur nests was almost equal to the number of nests of all shorebird species combined. Pectoral and semipalmated sandpipers were also fairly common nesting species. All other shorebird species nested in lower densities. The density of waterfowl nests was also relatively low, and no threatened or endangered waterfowl were found nesting or were observed in the study area.

Nest success was approximately 50% for all species combined, excluding longspurs. Data were insufficient to determine nesting success for longspurs. The most frequently observed predators on the study plots were jaegers. Arctic foxes were also observed in the area, although no foxes were observed on study plots during surveys. It is likely that jaegers and arctic foxes were responsible for most of the nest predation at Point Thomson in 2001.

The most common nesting species (Lapland longspur, semipalmated sandpiper, and pectoral sandpiper) were also the most commonly observed species during surveys. Bird use of the study plots declined from the first to the second survey periods.

Although nests were found on seven different vegetation/land cover categories, 89% of all nests occurred on three vegetation/land cover categories.

Tundra-nesting birds did not choose any particular habitat type more preferentially than would be expected based on the amount of habitat available. However, when considering all species combined and semipalmated sandpiper alone, the occurrence of nests on vegetation/land cover category IIId (wet sedge/moist sedge, dwarf shrub tundra complex) was less than would be expected based on the amount of habitat available.

The difference in use by nesting birds was not great between reference and treatment study plots, suggesting that the two types of plots form a suitable baseline for use in studies of future development in the Point Thomson Unit.

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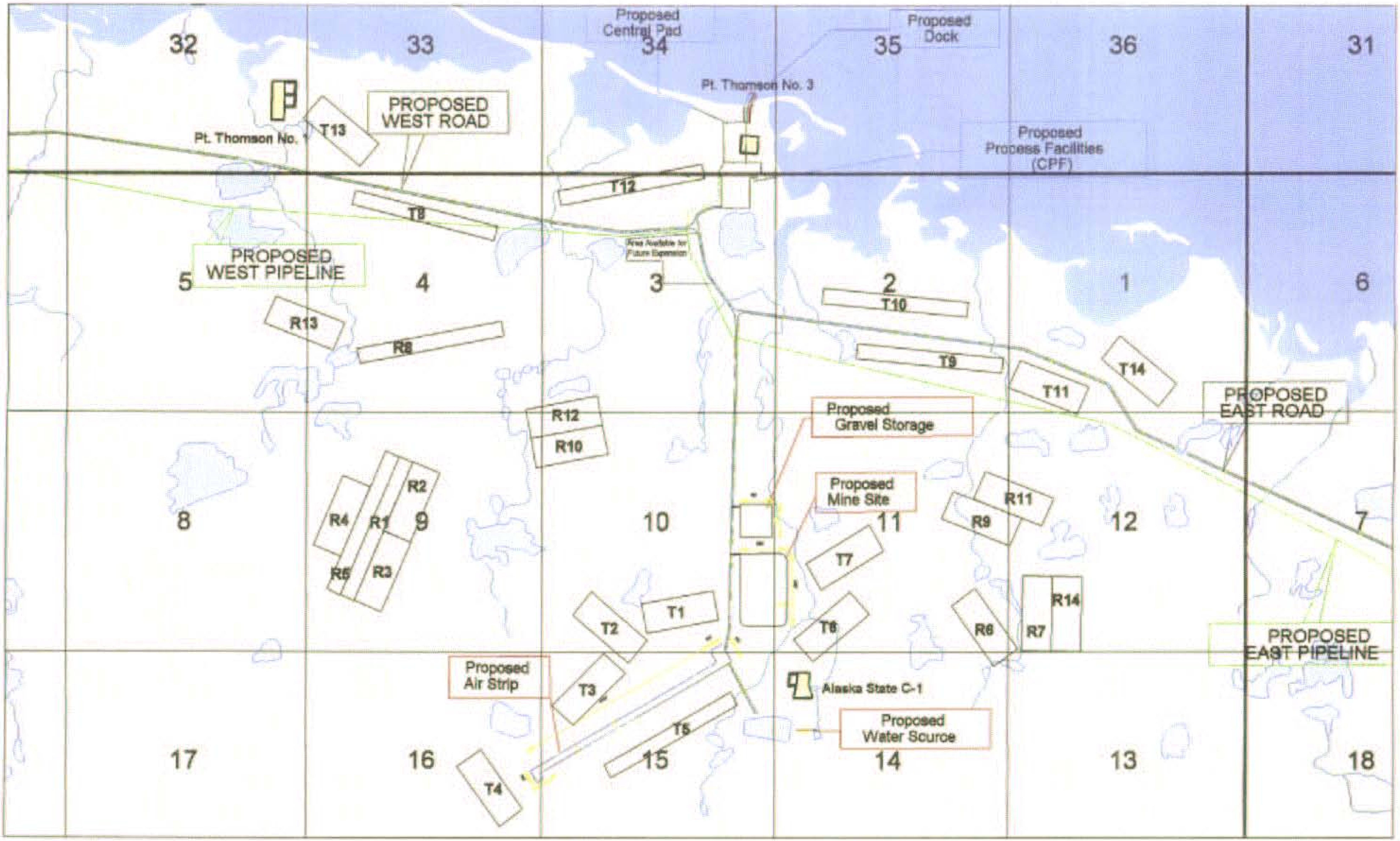
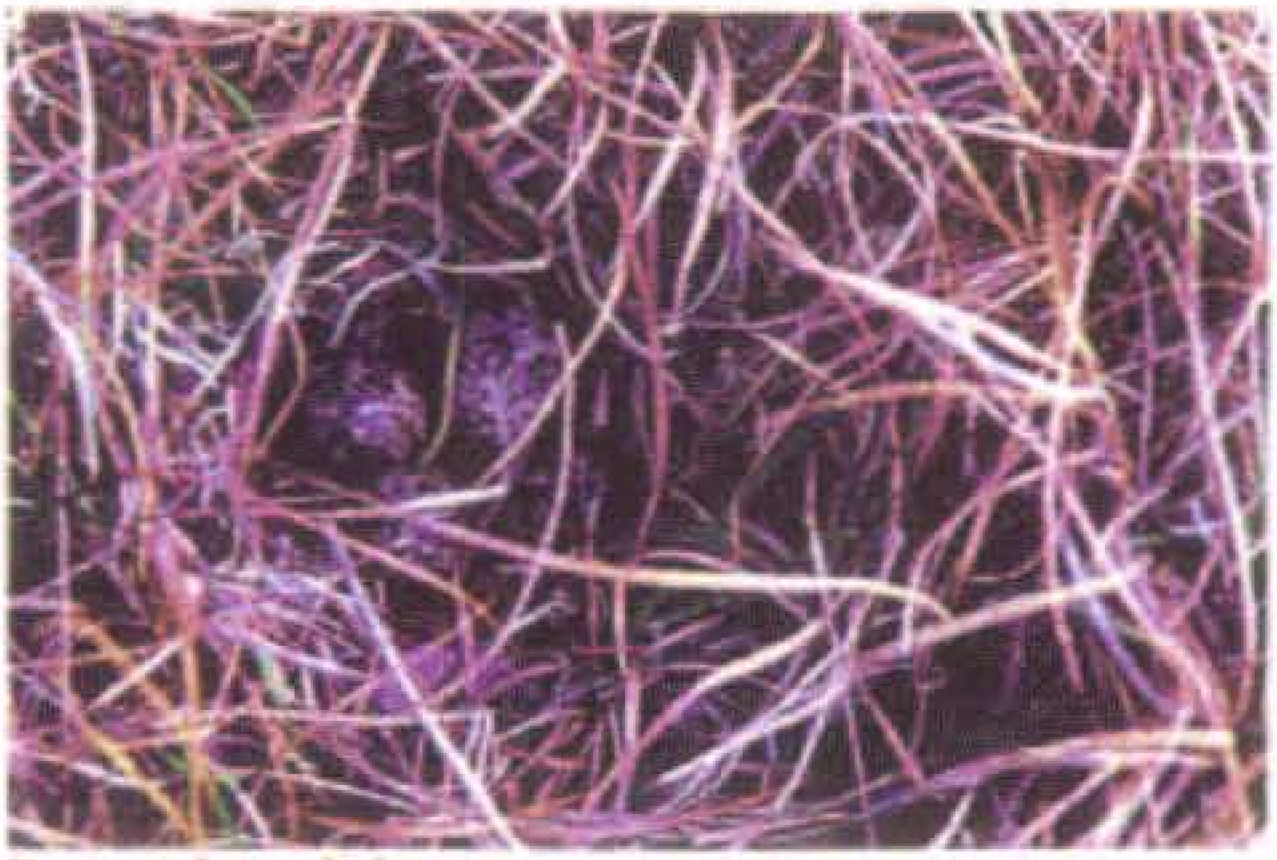


Figure 1. Location of reference and treatment study plots and proposed infrastructure at Point Thomson, Alaska, 2001.

Figure 2. Vegetation and land cover categories of reference and treatment study plots, and of the Point Thomson area, Alaska, 2001. Vegetation and land cover categories are from Noel and Funk (1999) and are briefly described in Table 9. Color codes have been modified from Noel and Funk (1999) to discriminate between similar vegetation and land cover categories.


Male pectoral sandpiper.


Pectoral sandpiper nest.


Stilt sandpiper on nest.


Grizzly bear at Point Thomson Unit 3 gravel pad.

Figure 3. Examples of common (pectoral sandpiper) and uncommon (stilt sandpiper) bird species, a tundra nest site, and the gravel pad at Point Thomson Unit 3. Photos by Robert Rodrigues.

Table 1. Survey effort in hours and minutes and by date for nest searches on each 10-ha study plot (R=reference, T=treatment), Point Thomson, Alaska, 2001.

	1st Survey		2nd Survey	
Plot	Date	Duration (hours:min)	Date	Duration (hours:min)
R1	23-Jun	1:39	4-Jul	1:10
R2	23-Jun	2:08	4-Jul	2:08
R3	23-Jun	1:37	4-Jul	1:44
R4	13-Jun	1:39	26-Jun	1:12
R5	13-Jun	1:30	26-Jun	1:20
R6	19-Jun	1:55	1-Jul	2:08
R7	18-Jun	2:20	1-Jul	2:38
R8	15-Jun	2:52	25-Jun	1:43
R9	19-Jun	2:32	5-Jul	2:01
R10	15-Jun	2:45	25-Jul	1:33
R11	19-Jun	4:18	5-Jul	2:20
R12	15-Jun	1:43	25-Jun	1:41
R13	13-Jun	3:09	26-Jun	1:57
R14	18-Jun	2:18	1-Jul	3:00
T1	22-Jun	1:59	2-Jul	1:57
T2	21-Jun	1:55	2-Jul	1:21
T3	21-Jun	1:47	2-Jul	1:20
T4	21-Jun	1:54	3-Jul	1:24
T5	22-Jun	1:28	3-Jul	1:35
T6	14-Jun	1:54	29-Jun	2:27
T7	14-Jun	2:02	29-Jun	1:59
T8	12-Jun	3:12	24-Jun	1:30
T9	17-Jun	3:16	30-Jun	1:05
T10	20-Jun	1:42	29-Jun	2:09
T11	20-Jun	2:47	30-Jun	2:14
T12	12-Jun	2:39	24-Jun	1:30
T13	12-Jun	2:10	24-Jun	2:15
T14	17-Jun	2:50	30-Jun	2:20
Total		**64:00**		**51:41**

Table 2. Total number of nests and nesting species in each reference and treatment study plot, Point Thomson, Alaska, 2001.

	Number of Nests		Number of Species	
Plot No.	Reference	Treatment	Reference	Treatment
1	5	6	5	4
2	4	4	3	3
3	4	3	2	3
4	1	2	1	1
5	3	1	2	1
6	4	7	4	4
7	8	5	4	4
8	3	4	3	3
9	5	11	3	4
10	7	6	3	1
11	8	7	4	3
12	2	6	2	3
13	8	6	5	3
14	13	3	5	2
Total	**75**	**71**	**13**	**8**

Table 3. Number of nests found and nest density for each species and for species groups on reference and treatment study plots, Point Thomson, Alaska, 2001.

	Number of Nests and Nest Density (nests/km^2)			
Species	Reference Plots		Treatment Plots	
Lapland Longspur *(Calcarius lapponicus)*	29	(20.7)	34	(24.3)
Semipalmated Sandpiper *(Calidris pusilla)*	17	(12.1)	11	(7.9)
Pectoral Sandpiper *(Calidris melanotos)*	14	(10.0)	13	(9.3)
Dunlin *(Calidris alpina)*	1	(0.7)	5	(3.6)
Buff-breasted Sandpiper *(Tryngites subruficola)*	2	(1.4)	3	(2.1)
Red-necked Phalarope *(Phalaropus lobatus)*	2	(1.4)	0	(0.0)
Red Phalarope *(Phalaropus fulicaria)*	2	(1.4)	0	(0.0)
American Golden Plover *(Pluvialis dominica)*	2	(1.4)	0	(0.0)
Long-billed Dowitcher *(Limnodromus scolopaceus)*	1	(0.7)	1	(0.7)
Stilt Sandpiper *(Calidris himantopus)*	0	(0.0)	1	(0.7)
Canada Goose *(Branta canadensis)*	1	(0.7)	0	(0.0)
King Eider *(Somateria spectabilis)*	2	(1.4)	2	(1.4)
Eider sp. *(Somateria sp.)*	0	(0.0)	1	(0.7)
Long-tailed Duck *(Clangula hyemalis)*	1	(0.7)	0	(0.0)
Rock Ptarmigan *(Lagopus mutus)*	1	(0.7)	0	(0.0)
Passerines	29	(20.7)	34	(24.3)
Shorebirds	41	(29.1)	34	(24.3)
Waterfowl	4	(2.8)	3	(2.1)
Total	**75**	**(53.3)**	**71**	**(50.7)**

Table 4. Number of successful and failed nests for each species (excluding Lapland longspur) on reference and treatment study plots, Point Thomson, Alaska, 2001. (One semipalmated sandpiper nest could not be relocated.)

	Number of Nests			
	Reference Plots		Treatment Plots	
Species	Successful	Failed	Successful	Failed
Semipalmated Sandpiper	9	7	7	4
Pectoral Sandpiper	10	4	6	7
Dunlin	0	1	3	2
Buff-breasted Sandpiper	1	1	0	3
King Eider	0	2	0	2
Red-necked Phalarope	1	1	0	0
Red Phalarope	1	1	0	0
American Golden Plover	1	1	0	0
Long-billed Dowitcher	1	0	0	1
Stilt Sandpiper	0	0	0	1
Canada Goose	0	0	0	0
Long-tailed Duck	0	1	0	0
Rock Ptarmigan	0	1	0	0
Eider sp.	0	0	0	1
Total	**24**	**20**	**16**	**21**

Table 5. Total number of birds sighted for each reference and treatment study plot and overall bird density (birds/km²) during the first and second census periods, Point Thomson, Alaska, 2001.

	Sightings (1st census period)		Sightings (2nd census period)	
Plot	Reference	Treatment	Reference	Treatment
1	12	8	14	11
2	5	18	10	5
3	8	9	7	4
4	16	8	6	9
5	11	9	6	9
6	11	18	10	22
7	20	21	22	15
8	28	25	11	17
9	19	23	10	18
10	24	14	9	14
11	22	18	12	22
12	13	38	9	6
13	38	8	9	15
14	27	33	21	25
Total Sightings	**254**	**250**	**156**	**192**
Density	**181.4**	**178.6**	**111.4**	**137.1**

Table 6. Total number of birds sighted and density (birds/km^2) of bird species on reference and treatment study plots during two survey periods, Point Thomson, Alaska, 2001.

	Reference Plots				Treatment Plots			
	1st Survey		2nd Survey		1st Survey		2nd Survey	
Species	Sightings	Density	Sightings	Density	Sightings	Density	Sightings	Density
Lapland Longspur	90	64.3	84	60.0	94	67.1	109	77.9
Pectoral Sandpiper	59	42.1	19	13.6	47	33.6	22	15.7
Semipalmated Sandpiper	36	25.7	23	16.4	38	27.1	20	14.3
Dunlin	5	3.6	0	0.0	15	10.7	13	9.3
Pomarine Jaeger	12	8.6	0	0.0	7	5.0	0	0.0
Parasitic Jaeger	1	0.7	6	4.3	8	5.7	9	6.4
Long-tailed Duck	2	1.4	0	0.0	7	5.0	4	2.9
White-rumped Sandpiper	0	0.0	0	0.0	6	4.3	0	0.0
King Eider	1	0.7	1	0.7	5	3.6	2	1.4
Buff-breasted Sandpiper	2	1.4	2	1.4	4	2.9	2	1.4
American Golden Plover	9	6.4	5	3.6	3	2.1	0	0.0
Long-billed Dowitcher	6	4.3	3	2.1	3	2.1	0	0.0
Red-necked Phalarope	1	0.7	1	0.7	3	2.1	0	0.0
Red Phalarope	8	5.7	3	2.1	0	0.0	0	0.0
Stilt Sandpiper	3	2.1	0	0.0	3	2.1	1	0.7
Long-tailed Jaeger	1	0.7	1	0.7	1	0.7	2	1.4
Rock Ptarmigan	10	7.1	4	2.9	1	0.7	3	2.1
Ruddy Turnstone	0	0.0	0	0.0	1	0.7	0	0.0
Canada Goose	2	1.4	1	0.7	1	0.7	2	1.4
Short-eared Owl	4	2.9	1	0.7	1	0.7	0	0.0
Northern Harrier	1	0.7	0	0.0	0	0.0	2	1.4
Willow Ptarmigan	1	0.7	2	1.4	1	0.7	0	0.0
Common Eider	0	0.0	0	0.0	2	1.4	0	0.0
Horned Lark	0	0.0	0	0.0	0	0.0	1	0.7
Total	**254**	**181.4**	**156**	**111.4**	**251**	**179.3**	**192**	**137.1**

Table 7. Total numbers of behaviors recorded for all species on all study plots combined during first and second census periods, Point Thomson, Alaska, 2001. Behavior codes are: AL=Alarming, CP=Copulation, DI=Display, FD=Feeding, FLU=Flush, FLY=Fly, FY=Feed Young, HU=Hunting, INC=Incubate, LD=Land, PR=Preen, RE=Rest, ST=Stand, SW=Swim, WA=Walk.

	Census	Behaviors														
Species	Period	AL	CP	DI	FD	FLU	FLY	FY	HU	INC	LD	PR	RE	ST	SW	WA
Lapland Longspur	1	1		57	43	2	8			36				8		
	2			42	51	3	16	9		25	1	1		10		
Pectoral Sandpiper	1	1		28	32	4	3			10			1	14		1
	2			1	12		2			21	1			3		
Semipalmated Sandpiper	1			2	36	2	1			15	1			1		
	2	2		1	9					24				3		1
Dunlin	1		1	5	5					4				1		
	2				3	1				4	1			2		
Pomarine Jaeger	1								14				2	1		
	2															
Parasitic Jaeger	1								5							
	2								10							
Long-tailed Jaeger	1								2							
	2								3							
Rock Ptarmigan	1			3	1	2				1				3		
	2									1				4		1
American Golden Plover	1			2	3					1				2		
	2				3		1			1						
Red Phalarope	1				3					2					1	
	2	1								2						
Red-necked Phalarope	1						1			1						
	2									1						
Long-billed Dowitcher	1			2	4					1				1		
	2				1		1			1						
Buff-breasted Sandpiper	1			1	2					2				1		
	2				1					3						
Stilt Sandpiper	1			2	2					1				1		
	2						1									
White-rumped Sandpiper	1			1	1											
	2															
Ruddy Turnstone	1													1		
	2															
King Eider	1									1			1		1	
	2									3						
Common Eider	1													2		
	2															
Long-tailed Duck	1				1						1				2	
	2														2	
Canada Goose	1				1								1			
	2									1						1
Short-eared Owl	1								4					1		
	2								1							
Northern Harrier	1								1							
	2								1							
Willow Ptarmigan	1			2												
	2													1		
Horned Lark	1															
	2				1											
Total		**5**	**1**	**149**	**215**	**14**	**34**	**9**	**41**	**162**	**5**	**1**	**5**	**60**	**6**	**4**

Table 8. Percent coverage of vegetation and land cover categories on reference plots, treatment plots, and on all study plots combined, Point Thomson, Alaska, 2001. Brief descriptions of each vegetation and land cover category are in Table 9.

	Percent Coverage		
Vegetation and Land Cover Category	Reference Plots	Treatment Plots	All Plots Combined
Ia	3.07	4.03	3.55
IIb	0.14	0.03	0.08
IIIa	1.27	3.95	2.61
IIId	32.84	32.09	32.46
IIIe	2.17	0.50	1.33
IVa	25.83	29.73	27.78
Va	25.23	24.85	25.04
Vc	1.49	1.68	1.58
Ve	5.98	0.44	3.21
IXb	0.00	0.01	0.01
IXi	0.00	0.81	0.41
XIa	1.92	1.84	1.88
Total	**100**	**100**	**100**

Table 9. Description of vegetation and land cover categories in the Point Thomson area from Noel and Funk (1999).

Vegetation and Land Cover Category	Category Description
Ia	Water
IIb	Aquatic Graminoid Tundra
IId	Water/Tundra Complex
IIIa	Wet Sedge Tundra
IIIb	Wet Graminoid Tundra
IIIc	Wet Sedge Tundra/Water Complex
IIId	Wet Sedge/Moist Sedge, Dwarf Shrub Tundra Complex
IIIe	Wet Sedge/Moist Sedge/Barren Complex (wet frost-scar tundra)
IVa	Moist Sedge, Dwarf Shrub/Wet Graminoid Tundra Complex
IXb	Dry Barren/Dwarf Shrub, Forb Grass Complex
IXf	Dry Barren/Dwarf Shrub, Grass Complex
IXh	Wet Barren/Wet Sedge Tundra Complex
IXi	Dry Barren/Forb, Graminoid Complex
Va	Moist Sedge, Dwarf Shrub Tundra
Vc	Dry Dwarf Shrub, Crustose Lichen Tundra
Vd	Dry Dwarf Shrub, Fructose Lichen Tundra
Ve	Moist Graminoid, Dwarf Shrub Tundra/Barren Complex
Xa	River Gravels/Beaches
Xc	Barren Gravel Outcrops
Xe	Gravel Roads and Pads
XIa	Wet Mud
XIc	Bare Peat

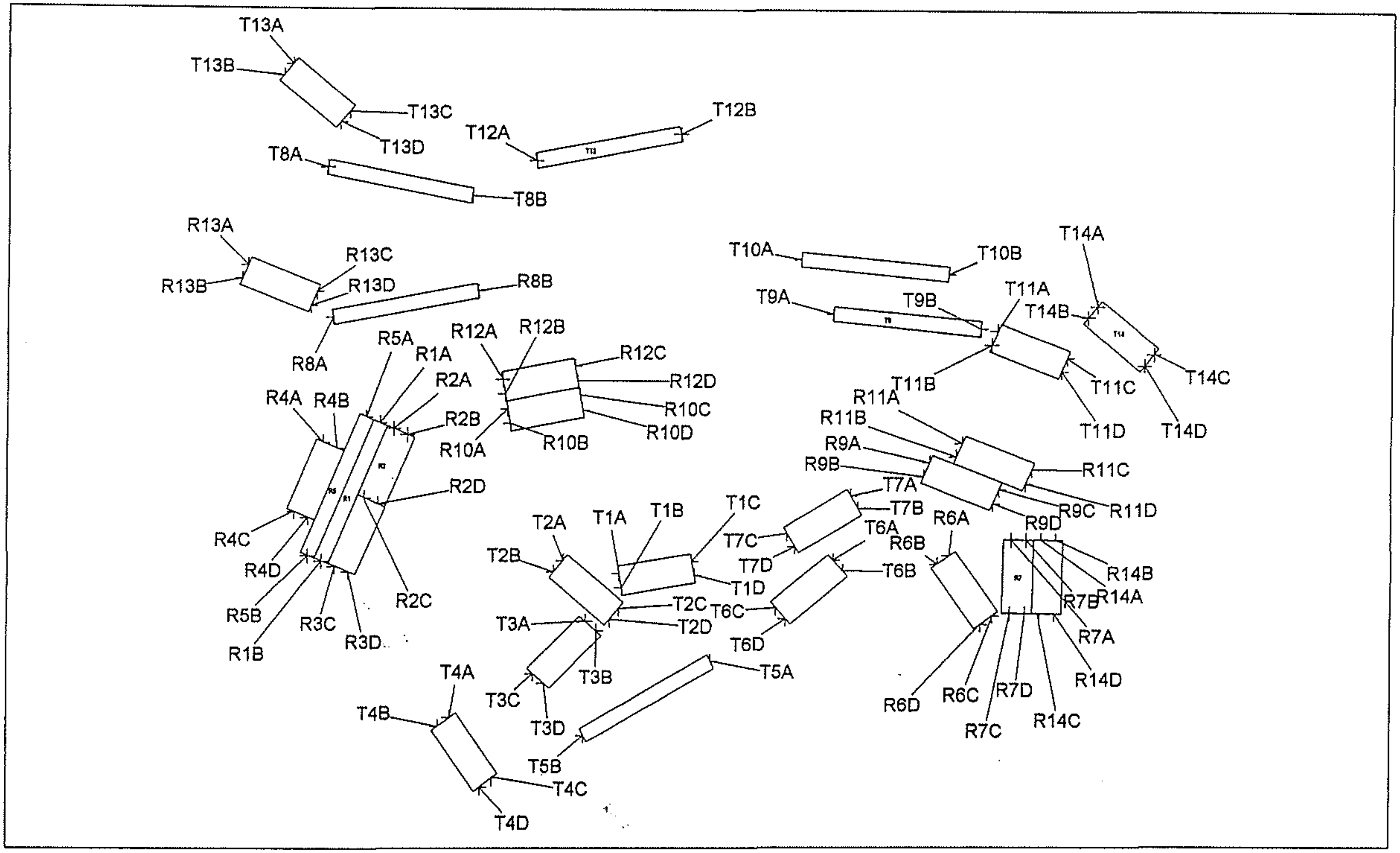
Table 10. The number of nests of each species found on vegetation and land cover categories on all study plots combined, Point Thomson, Alaska, 2001.

	Vegetation and Land Cover Category						
Species	Ia	IIIa	IIId	IIIe	IVa	Va	Ve
Lapland Longspur			13	2	20	21	7
Pectoral Sandpiper			4	1	13	8	1
Semipalmated Sandpiper		1	2	1	12	12	
Dunlin			2		2	2	
Buff-breasted Sandpiper			1	1	2	1	
King Eider			2		2		
Red-necked Phalarope			1		1		
Red Phalarope			1	1			
American Golden Plover					1	1	
Long-billed Dowitcher			2				
Stilt Sandpiper			1				
Canada Goose	1						
Long-tailed Duck						1	
Rock Ptarmigan					1		
Eider Species					1		
Total	**1**	**1**	**29**	**6**	**55**	**46**	**8**
Percent of total	**0.7**	**0.7**	**19.9**	**4.1**	**37.7**	**31.5**	**5.5**

Table 11. Nest densities of all species combined on three basic habitat types at locations on the Arctic Coastal Plain, Alaska. Nest densities at Badami are from TERA (1995), and those at the Canning River Delta are from Martin and Moitoret (1981).

	Nest Density (Nests/km^2)		
Location	Wet	Wet/Moist	Moist/Dry
Pt. Thomson, 2001	35.7	70.2	64.3
Badami, 1995	60.0	84.0	76.4
Canning River Delta, 1980	92.5	136.5	78.1
Canning River Delta, 1979	59.2		51.0

APPENDICES



Appendix Figure A1. Location of coordinates for centerlines of treatment and reference study plots at Point Thomson, Alaska, 2001. See Table A1 for coordinates.

Appendix Table A1. GPS coordinates (WGS84) for end points of transect centerlines for treatment and reference study plots, Point Thomson, Alaska, 2001. Refer to Appendix Figure A1 for locations of centerline endpoints.

Transect Centerline Endpoint	Latitude	Longitude	Transect Centerline Endpoint	Latitude	Longitude
T1_A	70.143937	-146.274005	R1_B	70.144708	-146.327577
T1_B	70.143054	-146.273537	R2_A	70.152681	-146.314673
T1_C	70.144710	-146.260890	R2_B	70.152337	-146.312191
T1_D	70.143840	-146.260405	R2_C	70.148528	-146.319889
T2_A	70.144740	-146.284126	R2_D	70.148194	-146.317407
T2_B	70.144046	-146.285813	R3_C	70.144375	-146.325107
T2_C	70.141833	-146.274014	R3_D	70.144041	-146.322625
T2_D	70.141147	-146.275678	R4_A	70.151860	-146.327347
T3_A	70.141061	-146.280037	R4_B	70.151526	-146.324864
T3_B	70.140464	-146.278067	R4_C	70.147700	-146.332524
T3_C	70.137874	-146.289401	R4_D	70.147366	-146.330042
T3_D	70.137270	-146.287413	R5_A	70.153352	-146.319663
T4_A	70.135227	-146.304324	R5_B	70.145041	-146.330057
T4_B	70.134696	-146.306500	R6_A	70.145045	-146.214648
T4_C	70.131542	-146.296698	R6_B	70.144523	-146.216757
T4_D	70.131005	-146.298840	R6_C	70.141391	-146.206903
T5_A	70.138633	-146.257339	R6_D	70.140867	-146.209039
T5_B	70.134151	-146.280291	R7_A	70.146036	-146.203602
T6_A	70.144758	-146.235432	R7_B	70.146025	-146.200960
T6_B	70.144085	-146.233647	R7_C	70.141538	-146.203754
T6_C	70.141873	-146.245595	R7_D	70.141524	-146.201126
T6_D	70.141208	-146.243832	R8_A	70.159266	-146.325751
T7_A	70.148689	-146.232209	R8_B	70.160937	-146.299760
T7_B	70.147920	-146.230846	R9_A	70.150664	-146.218125
T7_C	70.146374	-146.243552	R9_B	70.149838	-146.219157
T7_D	70.145610	-146.242187	R9_C	70.149068	-146.205772
T8_A	70.168843	-146.326716	R9_D	70.148239	-146.206804
T8_B	70.166688	-146.301010	R10_A	70.153829	-146.294189
T9_A	70.159587	-146.235199	R10_B	70.152951	-146.293724
T9_B	70.158700	-146.208782	R10_C	70.154646	-146.281207
T10_A	70.162926	-146.241445	R10_D	70.153767	-146.280723
T10_B	70.162064	-146.215078	R11_A	70.151843	-146.212336
T11_A	70.158590	-146.206182	R11_B	70.151018	-146.213378
T11_B	70.157764	-146.207215	R11_C	70.150240	-146.199982
T11_C	70.156984	-146.193805	R11_D	70.149415	-146.201015
T11_D	70.156161	-146.194838	R12_A	70.155597	-146.295143
T12_A	70.168816	-146.289381	R12_B	70.154719	-146.294678
T12_B	70.170477	-146.263353	R12_C	70.156414	-146.282159
T13_A	70.174689	-146.333243	R12_D	70.155535	-146.281675
T13_B	70.173999	-146.334952	R13_A	70.162464	-146.341201
T13_C	70.171790	-146.323085	R13_B	70.161635	-146.342231
T13_D	70.171106	-146.324755	R13_C	70.160862	-146.328792
T14_A	70.160136	-146.188514	R13_D	70.160034	-146.329818
T14_B	70.159435	-146.190177	R14_A	70.146013	-146.198296
T14_C	70.157240	-146.178372	R14_B	70.145998	-146.195661
T14_D	70.156543	-146.180021	R14_C	70.141508	-146.198478
R1_A	70.153015	-146.317160	R14_D	70.141493	-146.195836

Appendix Table B1. Bird species observed in the Pt. Thomson study area, 1 June through 5 July, 2001.

Species	Scientific Name	Species Code
Red-throated Loon	*Gavia stellata*	RTLO
Pacific Loon	*Gavia pacifica*	PALO
Yellow-billed Loon	*Gavia adamsii*	YBLO
Tundra Swan	*Cygnus columbianus*	TUSW
Greater White-fronted Goose	*Anser albifrons*	GWFG
Snow Goose	*Chen caerulescens*	SNGO
Canada Goose	*Branta canadensis*	CAGO
Brant	*Branta bernicla*	BRAN
Mallard	*Anas platyrhynchos*	MALL
Northern Pintail	*Anas acuta*	NOPI
Scaup species	*Aythya sp.*	SCAUP
Common Eider	*Somateria mollissima*	COEI
King Eider	*Somateria spectabilis*	KIEI
Surf Scoter	*Melanitta perspicillata*	SUSC
Long-tailed Duck	*Clangula hyemalis*	LTDU
Red-breasted Merganser	*Mergus serrator*	RBME
Golden Eagle	*Aquila chrysaetos*	GOEA
Northern Harrier	*Circus cyaneus*	NOHA
Rock Ptarmigan	*Lagopus mutus*	ROPT
Willow Ptarmigan	*Lagopus lagopus*	WIPT
American Golden-Plover	*Pluvialis dominica*	ROPT
Semipalmated Plover	*Charadrius semipalmatus*	SEPL
Whimbrel	*Numenius phaeopus*	WHIM
Ruddy Turnstone	*Arenaria interpres*	RUTU
Dunlin	*Calidris alpina*	DUNL
Semipalmated Sandpiper	*Calidris pusilla*	SESA
White-rumped Sandpiper	*Calidris fuscicollis*	WRSA
Baird's Sandpiper	*Calidris bairdii*	BASA
Pectoral Sandpiper	*Calidris melanotos*	PESA
Buff-breasted Sandpiper	*Trygites subruficollis*	BBSA
Stilt Sandpiper	*Calidris himantopus*	STSA
Long-billed Dowitcher	*Limnodromus scolopaceus*	LBDO
Red-necked Phalarope	*Phalaropus lobatus*	RNPH
Red Phalarope	*Phalaropus fulicaria*	REPH
Pomarine Jaeger	*Stercorarius pomarinus*	POJA
Parasitic Jaeger	*Stercorarius parasiticus*	PAJA
Long-tailed Jaeger	*Stercorarius longicaudus*	LTJA
Glaucous Gull	*Larus hyperboreus*	GLGU
Arctic Tern	*Sterna paradisaea*	ARTE
Short-eared Owl	*Asio flammeus*	SEOW
Snowy Owl	*Nyctea scandiaca*	SNOW
Common Raven	*Corvus corax*	CORA
Horned Lark	*Eremophila alpestris*	HOLA
American Robin	*Turdus migratorius*	AMRO
Yellow Wagtail	*Motacilla flava*	YWAG
Lapland longspur	*Calcarius lapponicus*	LALO
Snow Bunting	*Plectrophenax nivalis*	SNBU

Appendix Table C1. Data base for tundra nesting bird survey at Point Thomson, Alaska, 12 June through 5 July 2001.

Species Code	Nest Number	Plot	Grid	Date	Nest Contents	Status	Comments (12 June-5 July)	Veg. and Land Cover
LALO	2	T12	37	12-Jun	6E	F	No eggs or chicks on 6/24	Va
LALO	3	T13	37	12-Jun	4E	F	No eggs or chicks on 6/24	Va
LALO	5	T13	6	12-Jun	5E	F	Center of polygon, 3 eggs and 3 chicks on 6/24	Ve
LALO	6	T12	39	12-Jun	5E	F	No eggs or chicks on 6/24	Va
LALO	7	R13	6	13-Jun	1E	F	Still incorporating nesting material into nest on 6/13, no eggs or chicks on 6/26	Va
LALO	8	R13	14	13-Jun	5E	F	4 chicks and 1 egg on 6/26	Ve
LALO	10	T7	15	14-Jun	5E	F	Top of polygon, crustose lichen, no eggs or feather sheath on 6/29.	IVa
LALO	12	R8	40	15-Jun	0E	F	Lining ripped out, no fox scent or droppings	Va
SESA	14	R10	26	15-Jun	4E	S	Indistinct FTP, dwarf shrub, lichen patches nearby, 4 eggs on 6/25	Va
SESA	16	T9	21	17-Jun	4E	F	Top of polygon, 4 eggs on 6/30	Va
LALO	17	T9	38	17-Jun	5E	U	5 chicks on 6/30	Va
PESA	18	R14	5	18-Jun	4E	S	Crustose lichen, 4 eggs on 7/1	IVa
SESA	19	R14	19	18-Jun	4E	F	Crustose lichen, no eggs on 7/1	Va
SESA	20	R14	27	18-Jun	4E	S	4 eggs on 7/1	IVa
LALO	21	R7	12	18-Jun	6E	U		IVa
SESA	22	R6	25	19-Jun	4E	F	Dry crustose lichens, 4 eggs on 7/1	Va
REPH	23	R9	19	19-Jun	3E	F	Near pond, nest not found on 7/5 (snow)	IIIe
LALO	24	R9	3	19-Jun	5E	U	Feather sheath on 7/5, no fox scent, no adults with food or alarming	Ve
LALO	25	R11	26	19-Jun	5E	F	No eggs on 7/5, fox scent present	IVa
KIEI	26	R11	16	16-Jun	U	F	At edge of pond, female not flushed, no eggs on 7/5, small amount of down present	IVa
PESA	27	T11	3	20-Jun	4E	F	No eggs on 6/30, no fox scent or adults	IVa
PESA	28	T11	22	20-Jun	4E	F	4 eggs, adult inc. on 6/30.	IVa
LALO	29	T10	33	20-Jun	6E	U	1 chick ready to fledge on 6/29.	Va
LBDO	31	T3	4	21-Jun	4E	F	Vegetation clump surrounded by water, no eggs on 7/2.	IIId
LALO	32	T3	22	21-Jun	5E	U	Strangmoor ridge through polygon, 4 chicks on 7/2	IVa
LALO	33	T2	27	21-Jun	5E	U	No eggs or sheathes on 7/2, no fox scent	IVa
BBSA	34	T5	23	22-Jun	4E	F	No eggs, bits, or fox scent on 7/3.	IIId
LALO	35	T1	11	22-Jun	6E	F	Clump of vegetation., fox scent on 7/2	IIIe
RNPH	36	R1	28	23-Jun	4E	S	Vegetation clump, 4 eggs on 7/4	IIId
KIEI	37	R5	39	23-Jun	4E	F	Clump, female still incubating on 6/26	IIId
LALO	38	T13	22	24-Jun	4E	F		Va
LALO	39	T8	14	24-Jun	2E	U	Top of ridge	Ve
SESA	40	T12	36	24-Jun	4E	S		Va
PESA	41	R10	18	25-Jun	4E	S		Va
PESA	42	R13	16	26-Jun	4E	F		Va
LALO	43	R13	31	26-Jun	6E	U		Ve
RNPH	44	R13	21	26-Jun	4E	F	Clump	IVa
LALO	45	R4	25	26-Jun	5E	U	Dwarf shrubs.	IIId
LALO	46	T6	40	29-Jun	5E	F		IIId
PESA	47	T6	35	29-Jun	4E	F	Top of polygon	IVa
DUNL	48	T6	10	29-Jun	3E	F	Top of polygon	Va
BBSA	49	T7	26	29-Jun	4E	F		IVa
LALO	50	T14	12	30-Jun	0E	F	Predated when found, no fox scent.	IVa
SESA	51	T14	4	30-Jun	4E	S	Depression, wet site w/ HCP and FTP nearby, sparse willow and dwarf shrub	IIIa
LALO	52	T11	38	30-Jun	5E	F	Dwarf shrub and graminoids w/ lichens inside FB.	IVa
LALO	53	T9	16	30-Jun	5E	F	Dry crustose lichen near	IIIe

Appendix Table C1. continued

Species Code	Nest Number	Plot	Grid	Date	Nest Contents	Status	Comments (12 June-5 July)	Veg. and Land Cover
AGPL	54	R14	5	1-Jul	3E	S	Lichen and willow present,	IVa
SESA	55	R14	3	1-Jul	4E	F	Center of polygon with dry crustose lichen and dwarf shrub	IVa
SESA	56	R14	17	1-Jul	4E	S	Center of LCP, dry crustose lichen and dwarf shrub/willow	Va
BBSA	57	R14	32	1-Jul	4E	S		IVa
SESA	58	R14	22	1-Jul	4E	S	Dry crustose lichen.	IIIe
LALO	59	R7	34	1-Jul	5E	F		IVa
LALO	60	R7	6	1-Jul	4E	F		IIId
LALO	61	T1	27	2-Jul	4E	F		IIId
LALO	62	T1	26	2-Jul	3E	U		IIId
PESA	63	R2	8	4-Jul	4E	S		IVa
PESA	64	R3	26	4-Jul	4E	S		IIIe
LALO	65	R11	21	5-Jul	4E	F		Va
LALO	66	R11	11	5-Jul	4E	U		IVa
LALO	101	T12	14	12-Jun	6E	F	No eggs or chicks on 6/24	IIId
LALO	103	T8	17	12-Jun	4E	U	2e and 3 chicks on 6/24	IVa
LALO	104	T13	27	12-Jun	5E	U	1 chick and 5 eggs on 6/24	Va
DUNL	106	T6	1	14-Jun	4E	S	Still 4e on 6/29	IVa
SESA	107	T7	5	14-Jun	2E	S	4 eggs on 6/29	IIId
PESA	108	R8	14	15-Jun	4E	F	Nearby tundra with dwarf shrubs, graminoids, lichens, no eggs on 6/25	Va
PESA	109	R10	36	15-Jun	4E	F	FB in area, no eggs on 6/25	Va
LALO	110	R10	10	15-Jun	6E	U	3 chicks and 3 eggs on 6/25	Va
LALO	112	T9	33	17-Jun	6E	F	Shrubs, no eggs or chicks on 6/30, no fox scent.	Va
LALO	113	T9	19	17-Jun	5E	F	No eggs or chicks on 6/30, possibly renested (see LALO 219).	IIId
SESA	115	T9	14	17-Jun	2E	F	Top of polygon with shrubs, lichens, dry microhabitat, still 2 eggs on 6/30.	IIId
DUNL	116	T9	8	17-Jun	4E	S	4 eggs on 6/30, 1 pipped.	IIId
SESA	117	R14	34	18-Jun	4E	S	Dwarf shrubs, lichens, near pond edge, 4 eggs on 7/1	IVa
SESA	118	R7	18	18-Jun	4E	F	4 eggs on 7/1	IVa
DUNL	119	R6	37	19-Jun	4E	F	No eggs or fox scent on 7/1	IIId
LALO	120	R11	34	19-Jun	6E	U	Feather sheath on 7/5, no fox scent, no adults with food or alarming	IVa
LALO	121	R11	18	19-Jun	6E	F	No eggs or chicks on 7/5, no fox scent or feather sheath	IVa
SESA	122	T11	35	20-Jun	3E	U	Polygon top, shrubs, 3 eggs on 6/30, adult inc.	Ia
LALO	123	T10	19	20-Jun	6E	S	5 chicks on 6/29	IVa
LALO	124	T4	11	21-Jun	5E	U	Strangmoor hummock, no eggs or chicks on 7/3	Ve
PESA	125	T2	11	21-Jun	4E	F	Hummock. No eggs, bits, fox scent or adults on 7/2	IIId
STSA	126	T1	8	22-Jun	4E	F	No fox scent on 7/2	IVa
BBSA	127	T1	11	22-Jun	4E	F	Egg shells still present on 7/2, fox?	IIId
PESA	128	R1	9	23-Jun	4E	F	Still 4 eggs on 7/4	IIIe
LALO	129	R2	30	23-Jun	5E	S	No eggs or chicks on 7/4	IIId
LALO	130	R3	6	23-Jun	3E	F	No eggs, chicks, fox scent or adults on 7/4	IVa
PESA	131	T13	38	24-Jun	4E	F		IIId
PESA	132	T8	17	24-Jun	4E	S		Va
PESA	133	R12	18	25-Jun	4E	S		IVa
LALO	134	R5	1	26-Jun	4C1E	S		Ve
PESA	135	T7	17	29-Jun	4E	F	On Strangmoor hummock with lichen and dwarf shrubs.	IIId
SESA	136	T7	26	29-Jun	4E	F	Indistinct FTP, on Strangmoor hummock with lichens.	IVa
LALO	137	T10	39	29-Jun	6C	F	Lichens and dwarf shrubs	IVa
LALO	138	T11	11	30-Jun	3E	S	Graminoids and dwarf shrubs, near LCP and FTP	Va
PESA	139	T9	18	30-Jun	3E	F	Dwarf shrubs and lichen, eggs lacking pigment-almost white.	IVa

Appendix Table C1. continued

Species Code	Nest Number	Plot	Grid	Date	Nest Contents	Status	Comments (12 June-5 July)	Veg. and Land Cover
PESA	140	T9	7	30-Jun	4E	F		IIId
SESA	141	R7	20	1-Jul	4E	S	Edge of mudflat, lichens	IIId
SESA	142	R7	34	1-Jul	4E	U	Dwarf shrubs and lichen	IVa
BBSA	143	R7	14	1-Jul	4E	S	In dry spot at edge of FTP, lichens, graminoids, shrubs, and FB.	IVa
PESA	144	R6	10	1-Jul	4E	F		Va
LBDO	145	R1	25	4-Jul	4E	S		IVa
PESA	146	R3	28	4-Jul	4E	S	Indistinct LCP	IIId
DUNL	202	T8	29	12-Jun	2E	S	FB within 4m of nest, 4e on 6/24	IIId
DUNL	204	T12	37	12-Jun	4E	S	No eggs on 6/24	IVa
LALO	205	R5	14	13-Jun	6E	F	5 chicks on 6/26	Va
SESA	206	T6	15	14-Jun	4E	U	Shrubs, still 4e on 6/29	IIId
PESA	207	T6	21	14-Jun	4E	S	Flat area on top, lichen areas nearby, still 4e on 6/29.	IVa
SESA	209	R8	11	15-Jun	4E	S	Lichens nearby, no willows, no eggs on 6/25, fox dung on edge of cup	IVa
SESA	210	R12	1	15-Jun	4E	F	Indistinct FTP, willow and lichen nearby, 4 eggs on 6/25	Va
LALO	211	R10	37	15-Jun	5E	S	Lichens, willows nearby, 5 chicks on 6/25	Va
LALO	212	R10	18	15-Jun	5E	F	FB near, dwarf shrub. On 6/25 3 eggs, 1 shell, 1 egg with hole in it but no chick inside, nest appears abandoned, no adults nearby.	Va
SESA	214	T6	28	29-Jun	3E	F	Top of polygon, 1 egg outside of nest about 1 ft away, shrubs, willows near nest.	Va
LALO	215	T10	29	29-Jun	5E	S	Shrubs, deep trough	Va
LALO	216	T10	7	29-Jun	2E	U	Some shrubs, possible re-nest (?)-no failed nest nearby.	Va
SESA	217	T14	14	30-Jun	4E	F	Indistinct FTP with HCP near, willows and other shrubs, lichens on nearby HCP, LCP and Strangmoor also in immediate area.	Va
PESA	218	T9	25	30-Jun	4E	F	Willows at nest	IVa
LALO	219	T9	21	30-Jun	4E	S	Willows on ridge, possible resent of LALO 113 in grid 19.	Va
LALO	220	R14	14	1-Jul	3E	U	Willows and other dwarf shrubs on ridge, wet polygon basins and troughs	Va
CAGO	221	R7	29	1-Jul	U	U		IVa
KIEI	222	T3	39	2-Jul	6E	F	Depression between two ridges, no lakes nearby	IVa
EISP	223	T2	36	2-Jul	0E	F	Between ridges, no fox scent, down torn out of nest and scattered nearby, sparse willows on ridge.	IVa
KIEI	224	T1	16	2-Jul	5E	F	Between two small clumps of vegetation	IIId
LALO	225	T4	17	3-Jul	4E	U	Dwarf willows, Dryas on ridge , wet troughs with standing water.	IIId
LALO	226	R1	28	4-Jul	0E	F	Willows on rim, predated	IIId
LALO	227	R3	18	4-Jul	4C	U	Indistinct LCP	IVa
PESA	228	R9	9	5-Jul	4E	S	Indistinct LCP/FTP/Strangmoor, sparse willows nearby	Va
PESA	229	R11	30	5-Jul	3E	F	Indistinct FTP, willow and dwarf shrub present, lichens on ridge top	IVa
LTDU	230	R13	31	11-Aug		F	Predated when found, no fox scent.	Va
LALO	301	R14	3	18-Jun	6E	F	Dwarf shrubs, no eggs on 7/1	IVa
LALO	302	R14	32	18-Jun	5E	F	No eggs or chicks on 7/1	IVa
SESA	303	R14	35	18-Jun	4E	S	Top poly, 4 eggs on 7/1	IVa
AGPL	304	R6	16	19-Jun	4E	F	Dry lichens, no eggs or fox scent on 7/1	Va
LALO	305	R9	36	19-Jun	4E	S	1 chick ready to fledge on 7/5	Ve
LALO	306	R9	9	19-Jun	5E	U	Feather sheath on 7/5, no fox scent, no adults with food or alarming	Va
SESA	307	R11	17	19-Jun	4E	F	Fox dropping in nest cup on 7/5, some egg bits and small pieces of shell present	IVa
PESA	308	T11	12	20-Jun	4E	F	No eggs or fox scent on 6/30.	IVa
LALO	309	T11	17	20-Jun	6E	F	No eggs or sheathes on 6/30	IVa
LALO	310	T10	4	20-Jun	6E	F	No eggs, droppings, or fox scent on 6/29	Va
PESA	311	T2	22	21-Jun	4E	S	Adult inc. on 7/2	IVa

Appendix Table C1. continued

Species Code	Nest Number	Plot	Grid	Date	Nest Contents	Status	Comments (12 June-5 July)	Veg. and Land Cover
REPH	312	R1	33	23-Jun	2E	S	Strangmoor clump, 2 eggs on 7/4	IIId
LALO	313	R2	16	23-Jun	6E	U	Strangmoor clump, 1 chick about to fledge on 7/4	IVa
ROPT	314	R2	15	23-Jun	7E	F	Still on nest on 7/4, not flushed	IVa
SESA	315	T13	38	24-Jun	4E	S		Va
LALO	316	T12	39	24-Jun	4E	F		Va
PESA	317	R10	15	25-Jun	4E	S		Va
SESA	318	R13	9	26-Jun	4E	F	Strangmoor clump	Va
SESA	319	R13	25	26-Jun	4E	S		Va

Species Codes are contained in Appendix Table B1.
In Plot, T and R = Treatment and Reference, respectively.
In Nest Contents, E = eggs, C = chicks, U = unknown.
In Status, F = failed, S = successful, U = unknown.
Vegetation and land cover descriptions are in Noel and Funk (1999).

Appendix Table D1. Database for bird sightings on reference and treatment study plots at Point Thomson, Alaska, 2001. Period is the 1st or 2nd census period. Species codes are in Appendix Table B1. Key to behavior abbreviations are in Table 7.

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R1	13	1	23-Jun	LALO	1	DI	1		1		30-33	NE, 10-15	5	Cold, ice on water, 75-80% of transect with standing water.
R1	22	1	23-Jun	LBDO	1	FD			1		30-33	NE, 10-15	5	
R1	27	1	23-Jun	LALO	1	DI	1		1		30-33	NE, 10-15	5	
R1	30	1	23-Jun	PESA	1	DI	1		1		30-33	NE, 10-15	5	
R1	28	1	23-Jun	RNPH	1	INC	1		1		30-33	NE, 10-15	5	
R1	30	1	23-Jun	LALO	1	DI	1		1		30-33	NE, 10-15	5	
R1	32	1	23-Jun	LALO	2	FD	1	1	2		30-33	NE, 10-15	5	
R1	33	1	23-Jun	REPH	1	INC	1		1		30-33	NE, 10-15	5	
R1	15	1	23-Jun	REPH	1	FD			1		30-33	NE, 10-15	5	
R1	9	1	23-Jun	PESA	1	INC		1	1		30-33	NE, 10-15	5	
R1	5	1	23-Jun	LALO	1	ST	1		1		30-33	NE, 10-15	5	
R10	21	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	No snow on plot.
R10	33	1	15-Jun	PESA	1	ST	1		1		40	NE, 5	100	
R10	32	1	15-Jun	POJA	1	HU			1		40	NE, 5	100	
R10	37	1	15-Jun	LALO	1	INC		1	1		40	NE, 5	100	
R10	2	1	15-Jun	LALO	2	FD	2		2		40	NE, 5	100	
R10	38	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	
R10	4	1	15-Jun	STSA	1	DI			1		40	NE, 5	100	
R10	6	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	
R10	36	1	15-Jun	PESA	1	INC		1	1		40	NE, 5	100	
R10	28	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	
R10	26	1	15-Jun	SESA	1	INC			1		40	NE, 5	100	
R10	18	1	15-Jun	LALO	1	INC		1	1		40	NE, 5	100	
R10	26	1	15-Jun	AGPL	1	DI			1		40	NE, 5	100	
R10	5	1	15-Jun	POJA	1	HU			1		40	NE, 5	100	
R10	12	1	15-Jun	PESA	1	FD	1		1		40	NE, 5	100	
R10	12	1	15-Jun	STSA	1	FD			1		40	NE, 5	100	
R10	10	1	15-Jun	LALO	1	INC		1	1		40	NE, 5	100	
R10	7	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	
R10	11	1	15-Jun	LALO	1	DI	1		1		40	NE, 5	100	
R10	11	1	15-Jun	DUNL	1	DI			1		40	NE, 5	100	
R10	13	1	15-Jun	PESA	1	FD	1		1		40	NE, 5	100	
R10	13	1	15-Jun	BBSA	1	DI	1		1		40	NE, 5	100	
R10	13	1	15-Jun	PESA	1	FD		1	1		40	NE, 5	100	
R11	22	1	19-Jun	ROPT	1	FD	1		1		40	N, 2	95	
R11	21	1	19-Jun	AGPL	2	DI			2		40	N, 2	95	
R11	21	1	19-Jun	ROPT	1	FLU		1	1		40	N, 2	95	
R11	22	1	19-Jun	PESA	1	ST	1		1		40	N, 2	95	
R11	22	1	19-Jun	LALO	1	ST	1		1		40	N, 2	95	
R11	26	1	19-Jun	LALO	1	INC		1	1		40	N, 2	95	
R11	26	1	19-Jun	PESA	2	AL	1	1	2		40	N, 2	95	
R11	30	1	19-Jun	PESA	2	U	1	1	2		40	N, 2	95	
R11	34	1	19-Jun	LALO	1	INC		1	1		40	N, 2	95	
R11	36	1	19-Jun	LALO	1	DI	1		1		40	N, 2	95	
R11	27	1	19-Jun	PESA	1	ST	1		1		40	N, 2	95	
R11	17	1	19-Jun	SESA	1	INC			1		40	N, 2	95	
R11	17	1	19-Jun	PESA	1	ST		1	1		40	N, 2	95	
R11	15	1	19-Jun	SESA	1	FD			1		40	N, 2	95	
R11	7	1	19-Jun	PESA	1	FD		1	1		40	N, 2	95	
R11	4	1	19-Jun	PESA	1	ST	1		1		40	N, 2	95	
R11	16	1	19-Jun	SESA	1	FD			1		40	N, 2	95	
R11	16	1	19-Jun	KIEI	1	INC		1	1		40	N, 2	95	
R11	18	1	19-Jun	LALO	1	INC		1	1		40	N, 2	95	
R12	21	1	15-Jun	PESA	1	FD	1		1		40	NE, 5	100	Small snow patches in grids 7, 8, 11, 35, 38, 36, 40.
R12	25	1	15-Jun	PESA	1	DI	1		1		40	NE, 5	100	
R12	29	1	15-Jun	LBDO	1	DI			1		40	NE, 5	100	

Appendix Table D1. continued

Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Estimated Weather Conditions: Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R12	31	1	15-Jun	AGPL	2	U			2		40	NE, 5	100	
R12	35	1	15-Jun	CAGO	1	RE			1		40	NE, 5	100	
R12	33	1	15-Jun	SESA	2	FD			2		40	NE, 5	100	
R12	40	1	15-Jun	DUNL	1	DI			1		40	NE, 5	100	
R12	23	1	15-Jun	LTDU	2	FD	1	1	2		40	NE, 5	100	
R12	27	1	15-Jun	POJA	1	HU			1		40	NE, 5	100	
R12	1	1	15-Jun	SESA	1	INC			1		40	NE, 5	100	
R13	2	1	13-Jun	PESA	1	DI	1		1		45	E, 5-10	80	Snow in grids 17, 18; small occasional snow patches elsewhere, <1%.
R13	4	1	13-Jun	LALO	1	FLY	1		1		45	E, 5-10	80	
R13	4	1	13-Jun	PESA	1	FD	1		1		45	E, 5-10	80	
R13	6	1	13-Jun	LALO	1	INC		1	1		45	E, 5-10	80	
R13	8	1	13-Jun	LALO	1	FD	1		1		45	E, 5-10	80	
R13	8	1	13-Jun	LALO	1	FD		1	1		45	E, 5-10	80	
R13	6	1	13-Jun	LBDO	1	ST			1		45	E, 5-10	80	
R13	10	1	13-Jun	LBDO	1	FD			1		45	E, 5-10	80	
R13	12	1	13-Jun	PESA	1	FD	1		1		45	E, 5-10	80	
R13	4	1	13-Jun	BBSA	1	ST			1		45	E, 5-10	80	
R13	12	1	13-Jun	WIPT	1	DI	1		1		45	E, 5-10	80	
R13	12	1	13-Jun	ROPT	1	DI	1		1		45	E, 5-10	80	
R13	12	1	13-Jun	LALO	2	DI	2		2		45	E, 5-10	80	
R13	14	1	13-Jun	LALO	1	INC		1	1		45	E, 5-10	80	
R13	19	1	13-Jun	LALO	1	FD		1	1		45	E, 5-10	80	
R13	19	1	13-Jun	PESA	1	DI	1		1		45	E, 5-10	80	
R13	23	1	13-Jun	SESA	2	FD			2		45	E, 5-10	80	
R13	32	1	13-Jun	SESA	2	FD			2		45	E, 5-10	80	
R13	32	1	13-Jun	POJA	1	ST			1		45	E, 5-10	80	
R13	5	1	13-Jun	SESA	2	FD			2		45	E, 5-10	80	
R13	5	1	13-Jun	PESA	1	FD	1		1		45	E, 5-10	80	
R13	37	1	13-Jun	PESA	1	FD	1		1		45	E, 5-10	80	
R13	U	1	13-Jun	LALO	1	DI	1		1		45	E, 5-10	80	
R13	25	1	13-Jun	SESA	1	FD			1		45	E, 5-10	80	
R13	22	1	13-Jun	PESA	1	FD	1		1		45	E, 5-10	80	
R13	24	1	13-Jun	SESA	2	FD			2		45	E, 5-10	80	
R13	26	1	13-Jun	SESA	2	FD			2		45	E, 5-10	80	
R13	36	1	13-Jun	NOHA	1	HU		1	1		45	E, 5-10	80	
R13	30	1	13-Jun	POJA	2	HU			2		45	E, 5-10	80	
R13	38	1	13-Jun	LALO	1	FD		1	1		45	E, 5-10	80	
R13	38	1	13-Jun	LALO	1	DI	1		1		45	E, 5-10	80	
R14	6	1	18-Jun	AGPL	1	ST			1		45	W, 5-10	100	Light rain.
R14	3	1	18-Jun	LALO	1	INC		1	1		45	W, 5-10	100	
R14	5	1	18-Jun	PESA	1	INC		1	1		45	W, 5-10	100	
R14	9	1	18-Jun	PESA	2	DI	2		2		45	W, 5-10	100	
R14	32	1	18-Jun	SESA	1	INC			1		45	W, 5-10	100	
R14	19	1	18-Jun	SESA	1	INC			1		45	W, 5-10	100	
R14	19	1	18-Jun	SESA	1	FLY			1		45	W, 5-10	100	
R14	16	1	18-Jun	LALO	1	DI	1		1		45	W, 5-10	100	
R14	37	1	18-Jun	PESA	1	DI	1		1		45	W, 5-10	100	
R14	36	1	18-Jun	PAJA	1	HU			1		45	W, 5-10	100	
R14	36	1	18-Jun	ROPT	1	DI	1		1		45	W, 5-10	100	
R14	36	1	18-Jun	POJA	1	HU			1		45	W, 5-10	100	
R14	32	1	18-Jun	LALO	1	INC		1	1		45	W, 5-10	100	
R14	30	1	18-Jun	LALO	1	DI	1		1		45	W, 5-10	100	
R14	28	1	18-Jun	SESA	2	FD			2		45	W, 5-10	100	
R14	16	1	18-Jun	REPH	2	FD			2		45	W, 5-10	100	
R14	23	1	18-Jun	PESA	1	DI	1		1		45	W, 5-10	100	
R14	23	1	18-Jun	LALO	2	DI	2		2		45	W, 5-10	100	
R14	27	1	18-Jun	SESA	1	INC			1		45	W, 5-10	100	
R14	33	1	18-Jun	LALO	1	DI	1		1		45	W, 5-10	100	
R14	35	1	18-Jun	SESA	1	INC			1		45	W, 5-10	100	
R14	35	1	18-Jun	LALO	2	FD	1	1	2		45	W, 5-10	100	
R2	30	1	23-Jun	LALO	1	INC		1	1		36-40	NE, 15	5	Cold, water frozen on tundra, 75-80% of plot with standing water.

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R2	1	1	23-Jun	PESA	1	FD		1	1		36-40	NE, 15	5	
R2	14	1	23-Jun	LALO	1	DI	1		1		36-40	NE, 15	5	
R2	16	1	23-Jun	LALO	1	INC		1	1		36-40	NE, 15	5	
R2	15	1	23-Jun	ROPT	1	INC		1	1		36-40	NE, 15	5	
R3	28	1	23-Jun	LALO	1	FD	1		1		Low 30s	NE, 10-20	50	Frozen tundra and ice; 75-80% of plot with standing water.
R3	38	1	23-Jun	PESA	1	FD		1	1		Low 30s	NE, 10-20	50	
R3	33	1	23-Jun	LALO	1	FD	1		1		Low 30s	NE, 10-20	50	
R3	6	1	23-Jun	AGPL	1	FD			1		Low 30s	NE, 10-20	50	
R3	8	1	23-Jun	SEOW	1	HU			1		Low 30s	NE, 10-20	50	
R3	3	1	23-Jun	LALO	2	FLY	2		2		Low 30s	NE, 10-20	50	
R3	6	1	23-Jun	LALO	1	INC		1	1		Low 30s	NE, 10-20	50	
R4	5	1	13-Jun	LALO	1	DI	1		1		50	NE, 5-8	80	No snow, standing water in many areas.
R4	14	1	13-Jun	LALO	1	DI	1		1		50	NE, 5-8	80	
R4	14	1	13-Jun	PESA	1	RE	1		1		50	NE, 5-8	80	
R4	18	1	13-Jun	LALO	2	FD	1	1	2		50	NE, 5-8	80	
R4	7	1	13-Jun	PESA	1	DI	1		1		50	NE, 5-8	80	
R4	5	1	13-Jun	LALO	1	DI	1		1		50	NE, 5-8	80	
R4	2	1	13-Jun	POJA	1	HU			1		50	NE, 5-8	80	
R4	31	1	13-Jun	PESA	1	ST		1	1		50	NE, 5-8	80	
R4	27	1	13-Jun	LALO	1	DI	1		1		50	NE, 5-8	80	
R4	25	1	13-Jun	LBDO	2	DI			2		50	NE, 5-8	80	
R4	25	1	13-Jun	STSA	1	DI			1		50	NE, 5-8	80	
R4	23	1	13-Jun	LALO	1	FLY	1		1		50	NE, 5-8	80	
R4	21	1	13-Jun	LALO	1	ST	1		1		50	NE, 5-8	80	
R4	21	1	13-Jun	PESA	1	DI	1		1		50	NE, 5-8	80	
R5	9	1	13-Jun	PESA	2	FD	2		2		Upper 40s	NE, 5	70	Thunder storm, very wet plot with standing water.
R5	11	1	13-Jun	REPH	2	FD	2		2		Upper 40s	NE, 5	70	
R5	14	1	13-Jun	LALO	1	INC		1	1		Upper 40s	NE, 5	70	
R5	18	1	13-Jun	PESA	1	DI	1		1		Upper 40s	NE, 5	70	
R5	24	1	13-Jun	PESA	1	DI	1		1		Upper 40s	NE, 5	70	
R5	26	1	13-Jun	PESA	2	FD	1	1	2		Upper 40s	NE, 5	70	
R5	30	1	13-Jun	POJA	1	HU			1		Upper 40s	NE, 5	70	
R5	19	1	13-Jun	LALO	1	FLU			1		Upper 40s	NE, 5	70	
R6	39	1	19-Jun	SESA	1	FD			1		33	NW, 5	100	
R6	37	1	19-Jun	DUNL	1	INC			1		33	NW, 5	100	
R6	25	1	19-Jun	LALO	1	DI	1		1		33	NW, 5	100	
R6	25	1	19-Jun	SESA	1	INC			1		33	NW, 5	100	
R6	22	1	19-Jun	LALO	1	DI	1		1		33	NW, 5	100	
R6	8	1	19-Jun	LALO	1	DI	1		1		33	NW, 5	100	
R6	16	1	19-Jun	AGPL	1	INC			1		33	NW, 5	100	
R6	16	1	19-Jun	LALO	1	DI	1		1		33	NW, 5	100	
R6	19	1	19-Jun	DUNL	1	DI			1		33	NW, 5	100	
R6	1	1	19-Jun	LALO	2	FD	1	1	2		33	NW, 5	100	
R7		1	18-Jun	SESA	1	FLU			1		40	W, 20	100	
R7		1	18-Jun	CAGO	1	FD			2		40	W, 20	100	
R7		1	18-Jun	SESA	1	FD			1		40	W, 20	100	
R7	34	1	18-Jun	PESA	1	FLU			1		40	W, 20	100	
R7	36	1	18-Jun	LALO	1	FLY	1		1		40	W, 20	100	
R7	34	1	18-Jun	SESA	2	DI			2		40	W, 20	100	
R7	34	1	18-Jun	ROPT	1	DI	1		1		40	W, 20	100	
R7	12	1	18-Jun	LALO	1	INC		1	1		40	W, 20	100	
R7	26	1	18-Jun	AGPL	1	FD	1		1		40	W, 20	100	
R7	20	1	18-Jun	LALO	1	FLY	1		1		40	W, 20	100	
R7	18	1	18-Jun	SESA	1	INC			1		40	W, 20	100	
R7	16	1	18-Jun	LALO	2	FD	1	1	2		40	W, 20	100	
R7	12	1	18-Jun	ROPT	1	ST	1		1		40	W, 20	100	
R7	15	1	18-Jun	SESA	1	FD			1		40	W, 20	100	
R7	17	1	18-Jun	ROPT	1	ST	1		1		40	W, 20	100	
R7	17	1	18-Jun	LALO	1	FD	1		1		40	W, 20	100	
R7	17	1	18-Jun	ROPT	2	FLU	1	1	2		40	W, 20	100	

Appendix Table D1. continued

Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Estimated Weather Conditions: Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R8	2	1	15-Jun	SESA	2	FD			2		40-45	0	100	Small patch of snow in grid 39.
R8	4	1	15-Jun	PESA	2	DI	2		2		40-45	0	100	
R8	8	1	15-Jun	LALO	2	DI	2		2		40-45	0	100	
R8	14	1	15-Jun	SEOW	1	HU			1		40-45	0	100	
R8	12	1	15-Jun	LALO	1	FD		1	1		40-45	0	100	
R8	11	1	15-Jun	SESA	1	INC			1		40-45	0	100	
R8	14	1	15-Jun	PESA	1	INC		1	1		40-45	0	100	
R8	14	1	15-Jun	PESA	1	DI	1		1		40-45	0	100	
R8	26	1	15-Jun	LALO	1	DI	1		1		40-45	0	100	
R8	30	1	15-Jun	SEOW	1	ST			1		40-45	0	100	
R8	30	1	15-Jun	SEOW	1	HU			1		40-45	0	100	
R8	39	1	15-Jun	LALO	1	FD	1		1		40-45	0	100	
R8	39	1	15-Jun	PESA	2	FD	1	1	2		40-45	0	100	
R8	39	1	15-Jun	LALO	1	FD		1	1		40-45	0	100	
R8	15	1	15-Jun	LALO	2	FLY	2		2		40-45	0	100	
R8	9	1	15-Jun	POJA	2	HU			2		40-45	0	100	
R8	13	1	15-Jun	DUNL	1	ST			1		40-45	0	100	
R8	11	1	15-Jun	POJA	1	HU			1		40-45	0	100	
R8	15	1	15-Jun	PESA	2	DI	2		2		40-45	0	100	
R8	9	1	15-Jun	PESA	1	DI	1		1		40-45	0	100	
R8	1	1	15-Jun	PESA	1	ST	1		1		40-45	0	100	
R9	26	1	19-Jun	LALO	1	DI	1		1		35	W, 5-10	95	Snow in grid 28.
R9	34	1	19-Jun	LALO	1	DI	1		1		35	W, 5-10	95	
R9	36	1	19-Jun	LALO	1	INC		1	1		35	W, 5-10	95	
R9	36	1	19-Jun	LALO	1	FD	1		1		35	W, 5-10	95	
R9	36	1	19-Jun	LALO	2	FD	2		2		35	W, 5-10	95	
R9	40	1	19-Jun	LALO	1	FD	1		1		35	W, 5-10	95	
R9	29	1	19-Jun	LTJA	1	HU			1		35	W, 5-10	95	
R9	21	1	19-Jun	PESA	1	ST	1		1		35	W, 5-10	95	
R9	19	1	19-Jun	REPH	1	SW			1		35	W, 5-10	95	
R9	19	1	19-Jun	REPH	1	INC	1		1		35	W, 5-10	95	
R9	19	1	19-Jun	PESA	1	DI	1		1		35	W, 5-10	95	
R9	19	1	19-Jun	PESA	1	FLU		1	1		35	W, 5-10	95	
R9	11	1	19-Jun	LALO	1	INC		1	1		35	W, 5-10	95	
R9	9	1	19-Jun	PESA	1	FD		1	1		35	W, 5-10	95	
R9	5	1	19-Jun	PESA	1	DI	1		1		35	W, 5-10	95	
R9	1	1	19-Jun	LALO	1	FD	1		1		35	W, 5-10	95	
R9	3	1	19-Jun	LALO	1	INC		1	1		35	W, 5-10	95	
R9	8	1	19-Jun	PESA	1	ST	1		1		35	W, 5-10	95	
T1	23	1	22-Jun	LALO	1	DI	1		1		30s	NE, 5-10	30	Ice crust on ponds.
T1	30	1	22-Jun	LALO	1	DI	1		1		30s	NE, 5-10	30	
T1	33	1	22-Jun	LALO	1	DI	1		1		30s	NE, 5-10	30	
T1	21	1	22-Jun	SESA	1	FD			1		30s	NE, 5-10	30	
T1	21	1	22-Jun	STSA	1	FD			1		30s	NE, 5-10	30	
T1	8	1	22-Jun	STSA	1	INC			1		30s	NE, 5-10	30	
T1	11	1	22-Jun	BBSA	1	INC		1	1		30s	NE, 5-10	30	
T1	11	1	22-Jun	LALO	1	INC		1	1		30s	NE, 5-10	30	
T10	13	1	20-Jun	LALO	1	DI	1		1		35-40	W, 5	100	
T10	16	1	20-Jun	SESA	1	ST			1		35-40	W, 5	100	
T10	19	1	20-Jun	LALO	1	INC		1	1		35-40	W, 5	100	
T10	19	1	20-Jun	LALO	1	FD	1		1		35-40	W, 5	100	
T10	23	1	20-Jun	LALO	1	FD		1	1		35-40	W, 5	100	
T10	32	1	20-Jun	LALO	1	DI	1		1		35-40	W, 5	100	
T10	33	1	20-Jun	LALO	1	INC		1	1		35-40	W, 5	100	
T10	38	1	20-Jun	LALO	2	FD	1	1	2		35-40	W, 5	100	
T10	22	1	20-Jun	PESA	1	FLU		1	1		35-40	W, 5	100	
T10	22	1	20-Jun	LALO	1	ST	1		1		35-40	W, 5	100	
T10	8	1	20-Jun	PESA	1	FD	1		1		35-40	W, 5	100	
T10	8	1	20-Jun	PESA	1	FD		1	1		35-40	W, 5	100	
T10	4	1	20-Jun	LALO	1	INC		1	1		35-40	W, 5	100	
T11	6	1	20-Jun	LALO	1	DI	1		1		40s	W, 5	90	
T11	37	1	20-Jun	PESA	1	DI	1		1		40s	W, 5	90	
T11	4	1	20-Jun	SESA	1	FD			1		40s	W, 5	90	
T11	3	1	20-Jun	PESA	1	INC		1	1		40s	W, 5	90	

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T11	14	1	20-Jun	POJA	1	HU			1		40s	W, 5	90	
T11	14	1	20-Jun	LALO	1	DI	1		1		40s	W, 5	90	
T11	10	1	20-Jun	LALO	1	FD		1	1		40s	W, 5	90	
T11	12	1	20-Jun	PESA	1	INC		1	1		40s	W, 5	90	
T11	24	1	20-Jun	PESA	1	INC		1	1		40s	W, 5	90	
T11	17	1	20-Jun	LALO	1	INC		1	1		40s	W, 5	90	
T11	15	1	20-Jun	SESA	1	FD			1		40s	W, 5	90	
T11	39	1	20-Jun	LALO	2	DI	2		2		40s	W, 5	90	
T11	37	1	20-Jun	LALO	1	FD		1	1		40s	W, 5	90	
T11	35	1	20-Jun	SESA	1	INC			1		40s	W, 5	90	
T11	24	1	20-Jun	LALO	2	DI	2		2		40s	W, 5	90	
T11	26	1	20-Jun	PESA	1	FD	1		1		40s	W, 5	90	
T12	6	1	12-Jun	RUTU	1	ST			1		45	W, 3	5	Snow cover <5%.
T12	14	1	12-Jun	SESA	2	FD			2		45	W, 3	5	
T12	14	1	12-Jun	LALO	1	INC		1	1		45	W, 3	5	
T12	14	1	12-Jun	LALO	1	AL	1		1		45	W, 3	5	
T12	16	1	12-Jun	LALO	1	FD		1	1		45	W, 3	5	
T12	16	1	12-Jun	SESA	1	FD			1		45	W, 3	5	
T12	27	1	12-Jun	LTDU	2	SW	1	1	2		45	W, 3	5	
T12	27	1	12-Jun	PESA	1	FD		1	1		45	W, 3	5	
T12	31	1	12-Jun	DUNL	1	FD			1		45	W, 3	5	
T12	31	1	12-Jun	LALO	1	DI	1		1		45	W, 3	5	
T12	32	1	12-Jun	PESA	1	FD		1	1		45	W, 3	5	
T12	34	1	12-Jun	PESA	1	ST	1		1		45	W, 3	5	
T12	34	1	12-Jun	POJA	1	RE			1		45	W, 3	5	
T12	36	1	12-Jun	LALO	2	DI	2		2		45	W, 3	5	
T12	39	1	12-Jun	LALO	1	INC		1	1		45	W, 3	5	
T12	37	1	12-Jun	DUNL	1	INC			1		45	W, 3	5	
T12	29	1	12-Jun	PESA	2	FD	1	1	2		45	W, 3	5	
T12	25	1	12-Jun	DUNL	1	DI			1		45	W, 3	5	
T12	23	1	12-Jun	SESA	1	FD			1		45	W, 3	5	
T12	25	1	12-Jun	POJA	1	HU			1		45	W, 3	5	
T12	23	1	12-Jun	POJA	1	RE			1		45	W, 3	5	
T12	19	1	12-Jun	SESA	2	FD			2		45	W, 3	5	
T12	19	1	12-Jun	WRSA	4	FD			4		45	W, 3	5	
T12	19	1	12-Jun	WRSA	2	DI			2		45	W, 3	5	
T12		1	12-Jun	SESA	2	FD			2		45	W, 3	5	
T12		1	12-Jun	LALO	1	ST			1		45	W, 3	5	
T12		1	12-Jun	KIEI	2	RE	1	1	2		45	W, 3	5	
T13	37	1	12-Jun	LALO	1	INC		1	1		55	NW, 1-3	40	5% snow cover concentrated mainly in grids 8, 9.
T13	27	1	12-Jun	LALO	1	ST	1		1		55	NW, 1-3	40	
T13	25	1	12-Jun	PESA	1	DI	1		1		55	NW, 1-3	40	
T13	31	1	12-Jun	LALO	1	U	1		1		55	NW, 1-3	40	
T13	27	1	12-Jun	LALO	1	INC		1	1		55	NW, 1-3	40	
T13	26	1	12-Jun	LALO	1	DI	1		1		55	NW, 1-3	40	
T13	26	1	12-Jun	LALO	1	FD		1	1		55	NW, 1-3	40	
T13	6	1	12-Jun	LALO	1	INC		1	1		55	NW, 1-3	40	
T14	40	1	17-Jun	LALO	1	DI	1		1		45	WNW, 3	90	
T14	37	1	17-Jun	SESA	3	FD			3		45	WNW, 3	90	
T14	37	1	17-Jun	LTDU	3	LD	1	2	3		45	WNW, 3	90	
T14	35	1	17-Jun	DUNL	2	CP	1	1	2		45	WNW, 3	90	
T14	38	1	17-Jun	LALO	1	FD		1	1		45	WNW, 3	90	
T14	40	1	17-Jun	WIPT	1	DI	1		1		45	WNW, 3	90	
T14	36	1	17-Jun	LALO	1	DI	1		1		45	WNW, 3	90	
T14	31	1	17-Jun	KIEI	3	SW	1	2	3		45	WNW, 3	90	
T14	32	1	17-Jun	SESA	1	FD			1		45	WNW, 3	90	
T14	30	1	17-Jun	LALO	1	FD	1		1		45	WNW, 3	90	
T14	28	1	17-Jun	LTDU	2	SW	1	1	2		45	WNW, 3	90	
T14	28	1	17-Jun	LALO	3	FD	2	1	3		45	WNW, 3	90	
T14	23	1	17-Jun	SESA	1	FD			1		45	WNW, 3	90	
T14	2	1	17-Jun	PESA	1	DI	1		1		45	WNW, 3	90	
T14	7	1	17-Jun	PESA	1	FLY	1		1		45	WNW, 3	90	
T14	7	1	17-Jun	LALO	1	FD	1		1		45	WNW, 3	90	

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T14	3	1	17-Jun	PAJA	1	HU			1		45	WNW, 3	90	
T14	13	1	17-Jun	RNPH	3	FLY			3		45	WNW, 3	90	
T14	15	1	17-Jun	PESA	1	ST	1		1		45	WNW, 3	90	
T14	20	1	17-Jun	PAJA	1	HU			1		45	WNW, 3	90	
T14	8	1	17-Jun	SESA	1	FD			1		45	WNW, 3	90	
T2	38	1	21-Jun	LALO	1	FL	1		1		35-40	NE, 2-5	80	
T2	36	1	21-Jun	COEI	1	ST		1	1		35-40	NE, 2-5	80	
T2	34	1	21-Jun	PESA	1	ST		1	1		35-40	NE, 2-5	80	
T2	31	1	21-Jun	LALO	1	DI	1		1		35-40	NE, 2-5	80	
T2	32	1	21-Jun	SESA	1	FD			1		35-40	NE, 2-5	80	
T2	24	1	21-Jun	LALO	1	ST	1		1		35-40	NE, 2-5	80	
T2	22	1	21-Jun	PESA	1	INC		1	1		35-40	NE, 2-5	80	
T2	27	1	21-Jun	LALO	1	INC		1	1		35-40	NE, 2-5	80	
T2	37	1	21-Jun	PAJA	5	HU			5		35-40	NE, 2-5	80	
T2	34	1	21-Jun	COEI	1	ST	1		1		35-40	NE, 2-5	80	
T2	11	1	21-Jun	PESA	1	INC		1	1		35-40	NE, 2-5	80	
T2	15	1	21-Jun	STSA	1	ST			1		35-40	NE, 2-5	80	
T2	14	1	21-Jun	LALO	2	FD	1	1	2		35-40	NE, 2-5	80	
T3	17	1	21-Jun	PESA	2	FD		2	2		30s	Light NE	100	
T3	17	1	21-Jun	LALO	1	DI	1		1		30s	Light NE	100	
T3	13	1	21-Jun	LALO	1	FD	1		1		30s	Light NE	100	
T3	4	1	21-Jun	LBDO	1	INC			1		30s	Light NE	100	
T3	9	1	21-Jun	LTJA	1	HU			1		30s	Light NE	100	
T3	22	1	21-Jun	LALO	1	INC		1	1		30s	Light NE	100	
T3	38	1	21-Jun	LBDO	1	FD			1		30s	Light NE	100	
T3	38	1	21-Jun	LALO	1	DI	1		1		30s	Light NE	100	
T4	28	1	21-Jun	PESA	1	DI	1		1		36	N, 5	100	Very wet plot.
T4	23	1	21-Jun	PESA	1	FD	1		1		36	N, 5	100	
T4	11	1	21-Jun	LALO	1	INC		1	1		36	N, 5	100	
T4	18	1	21-Jun	PESA	1	FL		1	1		36	N, 5	100	
T4	16	1	21-Jun	LALO	2	FD	1	1	2		36	N, 5	100	
T4	12	1	21-Jun	LALO	2	FD	2		2		36	N, 5	100	
T5	39	1	22-Jun	SESA	1	DI			1		46	NW, 10	30	
T5	37	1	22-Jun	PESA	1	FLY	1		1		46	NW, 10	30	
T5	31	1	22-Jun	PESA	1	FD	1		1		46	NW, 10	30	
T5	23	1	22-Jun	BBSA	1	INC		1	1		46	NW, 10	30	
T5	21	1	22-Jun	LALO	1	DI	1		1		46	NW, 10	30	
T5	11	1	22-Jun	LALO	2	DI	2		2		46	NW, 10	30	
T5	1	1	22-Jun	PAJA	1	HU			1		46	NW, 10	30	
T5	4	1	22-Jun	LBDO	1	FD			1		46	NW, 10	30	
T6	16	1	14-Jun	POJA	1	HU			1		50	N, 5-8	10	No snow on plot other than small amount at stream bank in grids 32, 33.
T6	6	1	14-Jun	LALO	1	FD	1		1		50	N, 5-8	10	
T6	8	1	14-Jun	SESA	1	FD			1		50	N, 5-8	10	
T6	6	1	14-Jun	LALO	1	FD		1	1		50	N, 5-8	10	
T6	2	1	14-Jun	PESA	1	ST	1		1		50	N, 5-8	10	
T6	10	1	14-Jun	LALO	1	FLU		1	1		50	N, 5-8	10	
T6	16	1	14-Jun	POJA	1	HU			1		50	N, 5-8	10	
T6	16	1	14-Jun	LALO	1	DI	1		1		50	N, 5-8	10	
T6	17	1	14-Jun	SESA	1	FD			1		50	N, 5-8	10	
T6	15	1	14-Jun	SESA	1	INC			1		50	N, 5-8	10	
T6	15	1	14-Jun	LALO	1	FD	1		1		50	N, 5-8	10	
T6	37	1	14-Jun	PESA	1	FLU		1	1		50	N, 5-8	10	
T6	31	1	14-Jun	SESA	1	FD			1		50	N, 5-8	10	
T6	22	1	14-Jun	PESA	1	DI	1		1		50	N, 5-8	10	
T6	21	1	14-Jun	PESA	1	INC		1	1		50	N, 5-8	10	
T6	21	1	14-Jun	DUNL	2	FD			2		50	N, 5-8	10	
T6	37	1	14-Jun	POJA	1	HU			1		50	N, 5-8	10	
T7	17	1	14-Jun	LALO	1	ST	1		1		45-50	NE, 5-10	5	No snow on plot.
T7	7	1	14-Jun	PESA	1	DI	1		1		45-50	NE, 5-10	5	
T7	7	1	14-Jun	PESA	1	FD		1	1		45-50	NE, 5-10	5	
T7	5	1	14-Jun	SESA	2	FD			2		45-50	NE, 5-10	5	
T7	3	1	14-Jun	LALO	1	FLY	1		1		45-50	NE, 5-10	5	
T7	5	1	14-Jun	SESA	1	INC			1		45-50	NE, 5-10	5	

Appendix Table D1. continued

Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Estimated Weather Conditions: Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T7	5	1	14-Jun	LALO	1	INC		1	1		45-50	NE, 5-10	5	
T7	1	1	14-Jun	LALO	1	DI	1		1		45-50	NE, 5-10	5	
T7	4	1	14-Jun	SESA	1	FD			1		45-50	NE, 5-10	5	
T7	14	1	14-Jun	BBSA	1	FD			1		45-50	NE, 5-10	5	
T7	26	1	14-Jun	SESA	1	FD			1		45-50	NE, 5-10	5	
T7	28	1	14-Jun	AGPL	1	ST			1		45-50	NE, 5-10	5	
T7	28	1	14-Jun	PESA	1	FD		1	1		45-50	NE, 5-10	5	
T7	30	1	14-Jun	LALO	1	DI	1		1		45-50	NE, 5-10	5	
T7	38	1	14-Jun	DUNL	1	FD			1		45-50	NE, 5-10	5	
T7	38	1	14-Jun	SESA	1	LND			1		45-50	NE, 5-10	5	
T7	35	1	14-Jun	PESA	1	ST			1		45-50	NE, 5-10	5	
T7	29	1	14-Jun	LALO	1	DI	1		1		45-50	NE, 5-10	5	
T7	25	1	14-Jun	SESA	2	FLU			2		45-50	NE, 5-10	5	
T8	2	1	12-Jun	LALO	1	DI	1		1		45-50	WNW, 3	5	Approx. 5% snow cover.
T8	10	1	12-Jun	SEOW	1	HU			1		45-50	WNW, 3	5	
T8	8	1	12-Jun	DUNL	2	FD			2		45-50	WNW, 3	5	
T8	10	1	12-Jun	PESA	2	DI			2		45-50	WNW, 3	5	
T8	10	1	12-Jun	LALO	2	FD	1	1	2		45-50	WNW, 3	5	
T8	10	1	12-Jun	BBSA	1	FD			1		45-50	WNW, 3	5	
T8	14	1	12-Jun	LALO	2	DI	2		2		45-50	WNW, 3	5	
T8	18	1	12-Jun	SESA	1	FD			1		45-50	WNW, 3	5	
T8	30	1	12-Jun	PESA	1	FD	1		1		45-50	WNW, 3	5	
T8	30	1	12-Jun	LALO	2	FD	1	1	2		45-50	WNW, 3	5	
T8	35	1	12-Jun	PESA	1	FD	1		1		45-50	WNW, 3	5	
T8	29	1	12-Jun	PESA	1	DI	1		1		45-50	WNW, 3	5	
T8	29	1	12-Jun	DUNL	1	INC			1		45-50	WNW, 3	5	
T8	19	1	12-Jun	LALO	2	FD	1	1	2		45-50	WNW, 3	5	
T8	17	1	12-Jun	PESA	1	DI	1		1		45-50	WNW, 3	5	
T8		1	12-Jun	PESA	1	FD		1	1		45-50	WNW, 3	5	
T8	17	1	12-Jun	LALO	1	INC		1	1		45-50	WNW, 3	5	
T8		1	12-Jun	LALO	1	U	1		1		45-50	WNW, 3	5	
T8	7	1	12-Jun	LALO	1	FD	1		1		45-50	WNW, 3	5	
T9	38	1	17-Jun	LALO	1	DI	1		1		40s	NE, <5	85	Some snow along creek in grids 37, 39.
T9	33	1	17-Jun	LALO	1	INC		1	1		40s	NE, <5	85	
T9	33	1	17-Jun	LALO	2	FD	2		2		40s	NE, <5	85	
T9	23	1	17-Jun	PESA	1	FD		1	1		40s	NE, <5	85	
T9	23	1	17-Jun	SESA	1	FD			1		40s	NE, <5	85	
T9	21	1	17-Jun	SESA	1	INC			1		40s	NE, <5	85	
T9	19	1	17-Jun	LALO	1	INC		1	1		40s	NE, <5	85	
T9	16	1	17-Jun	AGPL	2	FD			2		40s	NE, <5	85	
T9	13	1	17-Jun	SESA	1	FD			1		40s	NE, <5	85	
T9	11	1	17-Jun	PESA	1	DI	1		1		40s	NE, <5	85	
T9	11	1	17-Jun	PESA	1	FD		1	1		40s	NE, <5	85	
T9	7	1	17-Jun	DUNL	1	DI			1		40s	NE, <5	85	
T9	14	1	17-Jun	SESA	1	INC			1		40s	NE, <5	85	
T9	8	1	17-Jun	DUNL	1	INC			1		40s	NE, <5	85	
T9	3	1	17-Jun	ROPT	1	ST	1		1		40s	NE, <5	85	
T9	3	1	17-Jun	PESA	1	DI	1		1		40s	NE, <5	85	
T9	18	1	17-Jun	DUNL	2	FD			2		40s	NE, <5	85	
T9	22	1	17-Jun	LALO	1	DI	1		1		40s	NE, <5	85	
T9	22	1	17-Jun	PESA	1	WA		1	1		40s	NE, <5	85	
T9	38	1	17-Jun	LALO	1	INC		1	1		40s	NE, <5	85	
R1	28	2	4-Jul	RNPH	1	INC	1		1		30s	NE, 5-10	100	
R1	33	2	4-Jul	REPH	1	INC	1		1		30s	NE, 5-10	100	
R1	9	2	4-Jul	PESA	1	INC		1	1		30s	NE, 5-10	100	
R1	4	2	4-Jul	SEOW	1	HU			1		30s	NE, 5-10	100	
R1	16	2	4-Jul	LALO	2	FY	1	1	2		30s	NE, 5-10	100	
R1	8	2	4-Jul	LALO	1	FD		1	1		30s	NE, 5-10	100	
R1	14	2	4-Jul	REPH	1	AL	1		1		30s	NE, 5-10	100	
R1	26	2	4-Jul	LALO	1	FD		1	1		30s	NE, 5-10	100	
R1	25	2	4-Jul	LBDO	1	INC			1		30s	NE, 5-10	100	
R1	40	2	4-Jul	LALO	3	FD	1	2	3		30s	NE, 5-10	100	
R1	11	2	4-Jul	LALO	1	FD	1		1		30s	NE, 5-10	100	
R10	15	2	25-Jun	PESA	1	INC		1	1		40	NE, 15-20	100	

Appendix Table D1. continued

Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Estimated Weather Conditions: Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R10	18	2	25-Jun	PESA	1	INC		1	1		40	NE, 15-20	100	
R10	12	2	25-Jun	LALO	1	ST	1		1		40	NE, 15-20	100	
R10	2	2	25-Jun	LALO	1	ST	1		1		40	NE, 15-20	100	
R10	2	2	25-Jun	SESA	1	FD			1		40	NE, 15-20	100	
R10	37	2	25-Jun	LALO	1	FLY		1	1		40	NE, 15-20	100	
R10	32	2	25-Jun	LALO	1	FLY		1	1		40	NE, 15-20	100	
R10	26	2	25-Jun	SESA	1	INC			1		40	NE, 15-20	100	
R10	23	2	25-Jun	LALO	1	DI	1		1		40	NE, 15-20	100	
R11	17	2	5-Jul	SESA	1	ST			1		38-40	N, 1-3	100	Light snow from last night beginning to melt.
R11	21	2	5-Jul	LALO	1	INC		1	1		38-40	N, 1-3	100	
R11	28	2	5-Jul	ROPT	1	WA	1		1		38-40	N, 1-3	100	
R11	27	2	5-Jul	LALO	1	ST	1		1		38-40	N, 1-3	100	
R11	34	2	5-Jul	LALO	1	ST	1		1		38-40	N, 1-3	100	
R11	34	2	5-Jul	LALO	1	FLY		1	1		38-40	N, 1-3	100	
R11	33	2	5-Jul	LALO	1	FLY	1		1		38-40	N, 1-3	100	
R11	30	2	5-Jul	PESA	1	INC		1	1		38-40	N, 1-3	100	
R11	34	2	5-Jul	AGPL	1	FD			1		38-40	N, 1-3	100	
R11	11	2	5-Jul	LALO	1	INC		1	1		38-40	N, 1-3	100	
R11	5	2	5-Jul	LALO	1	FY		1	1		38-40	N, 1-3	100	
R11	4	2	5-Jul	LALO	1	ST	1		1		38-40	N, 1-3	100	
R12	2	2	25-Jun	LALO	1	DI	1		1		45	NE, 10-15	5	
R12	1	2	25-Jun	SESA	1	INC			1		45	NE, 10-15	5	
R12	13	2	25-Jun	PESA	1	U			1		45	NE, 10-15	5	
R12	38	2	25-Jun	LALO	1	DI	1		1		45	NE, 10-15	5	
R12	35	2	25-Jun	AGPL	1	FD	1		1		45	NE, 10-15	5	
R12	29	2	25-Jun	PESA	1	FD		1	1		45	NE, 10-15	5	
R12	18	2	25-Jun	PESA	1	INC		1	1		45	NE, 10-15	5	
R12	33	2	25-Jun	PAJA	2	HU			2		45	NE, 10-15	5	
R13	12	2	26-Jun	LALO	1	FLY	1		1		45	E, 5-10	65	
R13	16	2	26-Jun	PESA	1	INC		1	1		45	E, 5-10	65	
R13	20	2	26-Jun	LALO	1	FD	1		1		45	E, 5-10	65	
R13	19	2	26-Jun	PESA	1	FD		1	1		45	E, 5-10	65	
R13	9	2	26-Jun	SESA	1	INC		1	1		45	E, 5-10	65	
R13	31	2	26-Jun	LALO	1	INC		1	1		45	E, 5-10	65	
R13	27	2	26-Jun	LALO	1	DI	1		1		45	E, 5-10	65	
R13	25	2	26-Jun	SESA	1	INC			1		45	E, 5-10	65	
R13	21	2	26-Jun	REPH	1	INC	1		1		45	E, 5-10	65	
R14	5	2	1-Jul	PESA	1	INC		1	1		40-42	E, 5-10	10	
R14	27	2	1-Jul	SESA	1	INC			1		40-42	E, 5-10	10	
R14	32	2	1-Jul	SESA	1	INC			1		40-42	E, 5-10	10	
R14	2	2	1-Jul	LALO	2	DI	2		2		40-42	E, 5-10	10	
R14	5	2	1-Jul	AGPL	1	INC			1		40-42	E, 5-10	10	
R14	3	2	1-Jul	SESA	1	INC			1		40-42	E, 5-10	10	
R14	5	2	1-Jul	SESA	1	ST			1		40-42	E, 5-10	10	
R14	7	2	1-Jul	LALO	1	FLY			1		40-42	E, 5-10	10	
R14	14	2	1-Jul	LALO	1	INC		1	1		40-42	E, 5-10	10	
R14	16	2	1-Jul	AGPL	1	FD			1		40-42	E, 5-10	10	
R14	17	2	1-Jul	SESA	1	INC			1		40-42	E, 5-10	10	
R14	7	2	1-Jul	PAJA	2	HU			2		40-42	E, 5-10	10	
R14	2	2	1-Jul	LALO	1	FLY	1		1		40-42	E, 5-10	10	
R14	31	2	1-Jul	LALO	1	DI	1		1		40-42	E, 5-10	10	
R14	32	2	1-Jul	BBSA	1	INC		1	1		40-42	E, 5-10	10	
R14	22	2	1-Jul	SESA	1	ST			1		40-42	E, 5-10	10	
R14	22	2	1-Jul	LALO	1	ST	1		1		40-42	E, 5-10	10	
R14	22	2	1-Jul	SESA	1	INC			1		40-42	E, 5-10	10	
R14	35	2	1-Jul	LALO	1	DI	1		1		40-42	E, 5-10	10	
R2	15	2	4-Jul	ROPT	1	INC		1	1		35	N, 8-12	100	
R2	40	2	4-Jul	LALO	1	FLY		1	1		35	N, 8-12	100	
R2	40	2	4-Jul	LALO	1	FLY	1		1		35	N, 8-12	100	
R2	25	2	4-Jul	LALO	1	FLY	1		1		35	N, 8-12	100	
R2	20	2	4-Jul	LALO	2	ST	2		2		35	N, 8-12	100	
R2	16	2	4-Jul	LALO	1	FY		1	1		35	N, 8-12	100	
R2	8	2	4-Jul	PESA	1	INC		1	1		35	N, 8-12	100	
R2	19	2	4-Jul	LBDO	1	FLY			1		35	N, 8-12	100	

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
R2	2	2	4-Jul	PESA	1	FD		1	1		35	N, 8-12	100	
R3	28	2	4-Jul	AGPL	1	FLY			1		40-45	N, 5	100	Slight precipitation, standing water in troughs only.
R3	28	2	4-Jul	PESA	1	INC		1	1		40-45	N, 5	100	
R3	26	2	4-Jul	PESA	1	INC		1	1		40-45	N, 5	100	
R3	28	2	4-Jul	LALO	1	FD	1		1		40-45	N, 5	100	
R3	21	2	4-Jul	LALO	1	FD		1	1		40-45	N, 5	100	
R3	18	2	4-Jul	LALO	1	INC		1	1		40-45	N, 5	100	
R3	4	2	4-Jul	PESA	1	FLY		1	1		40-45	N, 5	100	
R4	4	2	26-Jun	ROPT	1	ST	1		1		48	W, 2	90	
R4	18	2	26-Jun	LALO	1	DI	1		1		48	W, 2	90	
R4	25	2	26-Jun	LALO	1	INC		1	1		48	W, 2	90	
R4	23	2	26-Jun	PAJA	1	HU			1		48	W, 2	90	
R4	23	2	26-Jun	LTJA	1	HU			1		48	W, 2	90	
R4	28	2	26-Jun	LALO	1	DI	1		1		48	W, 2	90	
R5	14	2	26-Jun	LALO	1	FY		1	1		50	NE, Light	30	Wet plot.
R5	39	2	26-Jun	KIEI	1	INC		1	1		50	NE, Light	30	
R5	20	2	26-Jun	LALO	1	DI	1		1		50	NE, Light	30	
R5	40	2	26-Jun	LBDO	1	FD			1		50	NE, Light	30	
R5	31	2	26-Jun	LALO	1	FD	1		1		50	NE, Light	30	
R5	1	2	26-Jun	LALO	1	INC		1	1		50	NE, Light	30	
R6	25	2	1-Jul	SESA	1	INC			1		40s	E, 10	<10	
R6	16	2	1-Jul	SESA	1	FD			1		40s	E, 10	<10	
R6	17	2	1-Jul	ROPT	1	ST	1		1		40s	E, 10	<10	
R6	10	2	1-Jul	PESA	1	INC		1	1		40s	E, 10	<10	
R6	38	2	1-Jul	LALO	3	FD	1	2	3		40s	E, 10	<10	
R6	34	2	1-Jul	LALO	1	DI	1		1		40s	E, 10	<10	
R6	26	2	1-Jul	LALO	2	FD	1	1	2		40s	E, 10	<10	
R7	18	2	1-Jul	SESA	1	INC			1		40	E, 5-8	10	
R7	21	2	1-Jul	SESA	1	INC			1		40	E, 5-8	10	
R7	21	2	1-Jul	SESA	1	AL			1		40	E, 5-8	10	
R7	25	2	1-Jul	LALO	1	FLY	1		1		40	E, 5-8	10	
R7	23	2	1-Jul	LALO	1	FD	1		1		40	E, 5-8	10	
R7	25	2	1-Jul	SESA	2	FD			2		40	E, 5-8	10	
R7	25	2	1-Jul	LALO	1	FD	1		1		40	E, 5-8	10	
R7	29	2	1-Jul	CAGO	1	INC			1		40	E, 5-8	10	
R7	34	2	1-Jul	LALO	1	INC		1	1		40	E, 5-8	10	
R7	40	2	1-Jul	LALO	3	FD	2	1	3		40	E, 5-8	10	
R7	34	2	1-Jul	SESA	1	INC			1		40	E, 5-8	10	
R7	34	2	1-Jul	LALO	1	FD	1		1		40	E, 5-8	10	
R7	26	2	1-Jul	LALO	1	PR		1	1		40	E, 5-8	10	
R7	22	2	1-Jul	LALO	1	DI	1		1		40	E, 5-8	10	
R7	14	2	1-Jul	BBSA	1	INC			1		40	E, 5-8	10	
R7	6	2	1-Jul	LALO	1	INC		1	1		40	E, 5-8	10	
R7	4	2	1-Jul	LALO	2	FD	1	1	2		40	E, 5-8	10	
R7	19	2	1-Jul	LALO	1	DI	1		1		40	E, 5-8	10	
R8	1	2	25-Jun	LALO	1	DI	1		1		Low 40s	NE, 5-10	>10	
R8	2	2	25-Jun	LALO	1	DI	1		1		Low 40s	NE, 5-10	>10	
R8	3	2	25-Jun	PESA	1	FD		1	1		Low 40s	NE, 5-10	>10	
R8	11	2	25-Jun	LALO	1	DI	1		1		Low 40s	NE, 5-10	>10	
R8	13	2	25-Jun	LALO	1	DI	1		1		Low 40s	NE, 5-10	>10	
R8	12	2	25-Jun	PESA	1	FD		1	1		Low 40s	NE, 5-10	>10	
R8	29	2	25-Jun	LALO	2	DI	2		2		Low 40s	NE, 5-10	>10	
R8	31	2	25-Jun	WIPT	2	ST	1	1	2		Low 40s	NE, 5-10	>10	
R8	14	2	25-Jun	PAJA	1	HU			1		Low 40s	NE, 5-10	>10	
R9	36	2	5-Jul	LALO	1	FY		1	1		Low 30s	NE, Light	100	Fresh snow on ground.
R9	28	2	5-Jul	LALO	3	FD	3		3		Low 30s	NE, Light	100	
R9	25	2	5-Jul	SESA	2	DI			2		Low 30s	NE, Light	100	
R9	37	2	5-Jul	LALO	1	FD	1		1		Low 30s	NE, Light	100	
R9	13	2	5-Jul	LALO	1	FD		1	1		Low 30s	NE, Light	100	
R9	9	2	5-Jul	PESA	1	INC		1	1		Low 30s	NE, Light	100	
R9	11	2	5-Jul	LALO	1	ST				1	Low 30s	NE, Light	100	
T1	27	2	2-Jul	LALO	1	INC		1	1		45-50	E, Light	15	
T1	23	2	2-Jul	DUNL	1	ST			1		45-50	E, Light	15	

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T1	21	2	2-Jul	PESA	1	ST		1	1		45-50	E, Light	15	
T1	26	2	2-Jul	LALO	1	INC		1	1		45-50	E, Light	15	
T1	28	2	2-Jul	LALO	1	FD	1		1		45-50	E, Light	15	
T1	28	2	2-Jul	SESA	1	FD			1		45-50	E, Light	15	
T1	16	2	2-Jul	KIEI	1	INC		1	1		45-50	E, Light	15	
T1	39	2	2-Jul	LALO	2	FD	2		2		45-50	E, Light	15	
T1	39	2	2-Jul	PAJA	1	HU			1		45-50	E, Light	15	
T1	19	2	2-Jul	PESA	1	FD		1	1		45-50	E, Light	15	
T10	19	2	29-Jun	LALO	2	FY	1	1	2		40	ENE, 5-10	100	
T10	33	2	29-Jun	LALO	1	FY		1	1		40	ENE, 5-10	100	
T10	39	2	29-Jun	LALO	2	FY	1	1	2		40	ENE, 5-10	100	
T10	27	2	29-Jun	LALO	1	DI	1		1		40	ENE, 5-10	100	
T10	25	2	29-Jun	LALO	1	INC		1	1		40	ENE, 5-10	100	
T10	25	2	29-Jun	HOLA	1	FD			1		40	ENE, 5-10	100	
T10	U	2	29-Jun	PAJA	1	HU			1		40	ENE, 5-10	100	
T10	23	2	29-Jun	LALO	1	DI	1		1		40	ENE, 5-10	100	
T10	7	2	29-Jun	LALO	1	INC		1	1		40	ENE, 5-10	100	
T10	9	2	29-Jun	LALO	1	DI	1		1		40	ENE, 5-10	100	
T10	1	2	29-Jun	LALO	1	DI	1		1		40	ENE, 5-10	100	
T10	14	2	29-Jun	LALO	1	FD	1		1		40	ENE, 5-10	100	
T11	35	2	30-Jun	SESA	1	INC			1		40	NE, 2-4	100	
T11	22	2	30-Jun	PESA	1	INC		1	1		40	NE, 2-4	100	
T11	39	2	30-Jun	LALO	1	FD		1	1		40	NE, 2-4	100	
T11	38	2	30-Jun	LALO	1	INC		1	1		40	NE, 2-4	100	
T11	37	2	30-Jun	LALO	1	DI	1		1		40	NE, 2-4	100	
T11	34	2	30-Jun	LALO	1	DI	1		1		40	NE, 2-4	100	
T11	30	2	30-Jun	LALO	1	FD		1	1		40	NE, 2-4	100	
T11	26	2	30-Jun	SESA	1	FD			1		40	NE, 2-4	100	
T11	26	2	30-Jun	LALO	2	FD	1	1	2		40	NE, 2-4	100	
T11	22	2	30-Jun	DUNL	2	LD			2		40	NE, 2-4	100	
T11	21	2	30-Jun	LALO	1	FD		1	1		40	NE, 2-4	100	
T11	21	2	30-Jun	LALO	1	DI	1		1		40	NE, 2-4	100	
T11	1	2	30-Jun	LALO	1	DI	1		1		40	NE, 2-4	100	
T11	13	2	30-Jun	LALO	3	FD	2	1	3		40	NE, 2-4	100	
T11	11	2	30-Jun	LALO	1	INC		1	1		40	NE, 2-4	100	
T11	20	2	30-Jun	LALO	1	DI	1		1		40	NE, 2-4	100	
T11	20	2	30-Jun	LALO	2	FD	2		2		40	NE, 2-4	100	
T12	39	2	24-Jun	LALO	1	INC		1	1		30s	ENE, 10-15	0	
T12	37	2	24-Jun	LALO	1	DI	1		1		30s	ENE, 10-15	0	
T12	33	2	24-Jun	LALO	1	DI	1		1		30s	ENE, 10-15	0	
T12	31	2	24-Jun	DUNL	1	FD			1		30s	ENE, 10-15	0	
T12	2	2	24-Jun	LALO	1	DI	1		1		30s	ENE, 10-15	0	
T12	36	2	24-Jun	SESA	1	INC			1		30s	ENE, 10-15	0	
T13	37	2	24-Jun	LALO	1	DI	1		1		40-43	NE, 15-18	0	
T13	33	2	24-Jun	LALO	1	DI	1		1		40-43	NE, 15-18	0	
T13	27	2	24-Jun	LALO	1	INC		1	1		40-43	NE, 15-18	0	
T13	22	2	24-Jun	LALO	1	INC		1	1		40-43	NE, 15-18	0	
T13	36	2	24-Jun	PESA	1	FD		1	1		40-43	NE, 15-18	0	
T13	38	2	24-Jun	SESA	1	INC			1		40-43	NE, 15-18	0	
T13	38	2	24-Jun	PESA	1	FD		1	1		40-43	NE, 15-18	0	
T13	8	2	24-Jun	LALO	1	DI	1		1		40-43	NE, 15-18	0	
T13	10	2	24-Jun	DUNL	1	ST			1		40-43	NE, 15-18	0	
T13	17	2	24-Jun	LTDU	2	SW	1	1	2		40-43	NE, 15-18	0	
T13	17	2	24-Jun	PESA	1	ST	1		1		40-43	NE, 15-18	0	
T13	17	2	24-Jun	DUNL	1	FD			1		40-43	NE, 15-18	0	
T13	13	2	24-Jun	LALO	2	FD	1	1	2		40-43	NE, 15-18	0	
T14	40	2	30-Jun	LALO	2	FD	2		2		38-40	NE, 5-7	100	
T14	40	2	30-Jun	LALO	2	FD		2	2		38-40	NE, 5-7	100	
T14	37	2	30-Jun	CAGO	2	WA			2		38-40	NE, 5-7	100	
T14	24	2	30-Jun	PESA	1	ST	1		1		38-40	NE, 5-7	100	
T14	26	2	30-Jun	LALO	1	FD		1	1		38-40	NE, 5-7	100	
T14	22	2	30-Jun	LALO	2	FD	2		2		38-40	NE, 5-7	100	
T14	22	2	30-Jun	LALO	1	FD		1	1		38-40	NE, 5-7	100	
T14	19	2	30-Jun	SESA	1	WA			1		38-40	NE, 5-7	100	
T14	15	2	30-Jun	ROPT	2	ST	1	1	2		38-40	NE, 5-7	100	

Appendix Table D1. continued

											Estimated Weather Conditions			
Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T14	25	2	30-Jun	LALO	1	FD		1	1		38-40	NE, 5-7	100	
T14	1	2	30-Jun	PESA	1	FD		1	1		38-40	NE, 5-7	100	
T14	2	2	30-Jun	LALO	1	FD		1	1		38-40	NE, 5-7	100	
T14	1	2	30-Jun	PESA	1	DI	1		1		38-40	NE, 5-7	100	
T14	2	2	30-Jun	SESA	1	FD			1		38-40	NE, 5-7	100	
T14	11	2	30-Jun	LTDU	2	SW	1	1	2		38-40	NE, 5-7	100	
T14	13	2	30-Jun	NOHA	2	HU			2		38-40	NE, 5-7	100	
T14	14	2	30-Jun	SESA	1	INC			1		38-40	NE, 5-7	100	
T14	4	2	30-Jun	SESA	1	INC			1		38-40	NE, 5-7	100	
T2	22	2	2-Jul	PESA	1	INC		1	1		55	NE, 2-3	0	
T2	32	2	2-Jul	LALO	1	FD		1	1		55	NE, 2-3	0	
T2	22	2	2-Jul	LALO	1	FD		1	1		55	NE, 2-3	0	
T2	24	2	2-Jul	LALO	1	FD	1		1		55	NE, 2-3	0	
T2	17	2	2-Jul	LALO	1	FD	1		1		55	NE, 2-3	0	
T3	39	2	2-Jul	KIEI	1	INC		1	1		50	NE, 4-6	10	
T3	22	2	2-Jul	LALO	1	FD		1	1		50	NE, 4-6	10	
T3	24	2	2-Jul	LALO	1	ST	1		1		50	NE, 4-6	10	
T3	27	2	2-Jul	PESA	1	FD		1	1		50	NE, 4-6	10	
T4	36	2	3-Jul	LALO	1	FD		1	1		60	0	2	
T4	36	2	3-Jul	LALO	1	DI	1		1		60	0	2	
T4	31	2	3-Jul	PESA	1	FLY		1	1		60	0	2	
T4	3	2	3-Jul	LALO	3	FLY	3		3		60	0	2	
T4	14	2	3-Jul	LALO	1	FLY	1		1		60	0	2	
T4	17	2	3-Jul	LALO	1	INC		1	1		60	0	2	
T4	20	2	3-Jul	PESA	1	LND		1	1		60	0	2	
T5	22	2	3-Jul	STSA	1	FL			1		60	N, 1-2	5	
T5	27	2	3-Jul	LALO	2	FD		2	2		60	N, 1-2	5	
T5	22	2	3-Jul	LALO	1	FD		1	1		60	N, 1-2	5	
T5	26	2	3-Jul	LALO	2	FD	1			1	60	N, 1-2	5	
T5	9	2	3-Jul	LALO	1	FL		1	1		60	N, 1-2	5	
T5	13	2	3-Jul	PAJA	2	HU			2		60	N, 1-2	5	
T6	22	2	29-Jun	PAJA	1	HU			1		40	NE, 5-10	100	
T6	24	2	29-Jun	LALO	1	FD	1		1		40	NE, 5-10	100	
T6	28	2	29-Jun	LALO	1	FD		1	1		40	NE, 5-10	100	
T6	22	2	29-Jun	LALO	1	FD		1	1		40	NE, 5-10	100	
T6	28	2	29-Jun	SESA	1	INC			1		40	NE, 5-10	100	
T6	1	2	29-Jun	LALO	1	DI	1		1		40	NE, 5-10	100	
T6	33	2	29-Jun	LALO	1	DI	1		1		40	NE, 5-10	100	
T6	40	2	29-Jun	LALO	1	FD		1	1		40	NE, 5-10	100	
T6	40	2	29-Jun	LALO	1	INC		1	1		40	NE, 5-10	100	
T6	1	2	29-Jun	DUNL	2	FLU			2		40	NE, 5-10	100	
T6	35	2	29-Jun	PESA	1	INC		1	1		40	NE, 5-10	100	
T6	6	2	29-Jun	LALO	1	ST	1		1		40	NE, 5-10	100	
T6	23	2	29-Jun	LALO	1	FLU		1	1		40	NE, 5-10	100	
T6	21	2	29-Jun	PESA	1	INC		1	1		40	NE, 5-10	100	
T6	20	2	29-Jun	SESA	1	FD			1		40	NE, 5-10	100	
T6	15	2	29-Jun	SESA	1	INC			1		40	NE, 5-10	100	
T6	1	2	29-Jun	SESA	1	FD			1		40	NE, 5-10	100	
T6	1	2	29-Jun	DUNL	1	INC			1		40	NE, 5-10	100	
T6	6	2	29-Jun	LALO	1	FD		1	1		40	NE, 5-10	100	
T6	10	2	29-Jun	DUNL	1	INC			1		40	NE, 5-10	100	
T6	12	2	29-Jun	SESA	1	FD			1		40	NE, 5-10	100	
T7	20	2	29-Jun	LTJA	1	HU			1		40	NE, 5-10	80	Partial fog lifting during survey.
T7	17	2	29-Jun	PESA	1	INC		1	1		40	NE, 5-10	80	
T7	U	2	29-Jun	LALO	1	LND	1		1		40	NE, 5-10	80	
T7	5	2	29-Jun	SESA	1	INC			1		40	NE, 5-10	80	
T7	26	2	29-Jun	BBSA	1	INC			1		40	NE, 5-10	80	
T7	26	2	29-Jun	SESA	1	INC			1		40	NE, 5-10	80	
T7	22	2	29-Jun	LALO	1	DI	1		1		40	NE, 5-10	80	
T7	24	2	29-Jun	DUNL	1	FD			1		40	NE, 5-10	80	
T7	40	2	29-Jun	BBSA	1	FD			1		40	NE, 5-10	80	
T7	40	2	29-Jun	PAJA	2	HU			2		40	NE, 5-10	80	
T7	40	2	29-Jun	SESA	1	AL			1		40	NE, 5-10	80	
T7	4	2	29-Jun	LALO	1	DI			1		40	NE, 5-10	80	

Appendix Table D1. continued

Plot	Grid	Period	Date	Species Code	Number Seen	Behav	Male	Female	Adult	Fledge	Estimated Weather Conditions: Temperature (degrees F)	Wind Direction and speed (MPH)	Percent Cloud Cover	Comments
T7	21	2	29-Jun	PAJA	2	HU			2		40	NE, 5-10	80	
T8	38	2	24-Jun	LALO	1	FLY	1		1		45	NE, 20	1	
T8	33	2	24-Jun	PESA	1	FD		1	1		45	NE, 20	1	
T8	29	2	24-Jun	DUNL	1	INC			1		45	NE, 20	1	
T8	17	2	24-Jun	PESA	1	INC		1	1		45	NE, 20	1	
T8	17	2	24-Jun	LALO	1	INC		1	1		45	NE, 20	1	
T8	15	2	24-Jun	LALO	1	DI	1		1		45	NE, 20	1	
T8	7	2	24-Jun	LALO	1	FLY			1		45	NE, 20	1	
T8	7	2	24-Jun	LALO	1	FLU		1	1		45	NE, 20	1	
T8	4	2	24-Jun	PESA	1	FD	1		1		45	NE, 20	1	
T8	2	2	24-Jun	LALO	2	FD	1	1	2		45	NE, 20	1	
T8	2	2	24-Jun	LALO	4	DI	1		4		45	NE, 20	1	
T8	14	2	24-Jun	LALO	1	INC		1	1		45	NE, 20	1	
T8	20	2	24-Jun	LALO	1	INC		1	1		45	NE, 20	1	
T9	38	2	30-Jun	LALO	2	FY	1	1	2		40s	ENE, 5-10	100	
T9	21	2	30-Jun	SESA	1	INC			1		40s	ENE, 5-10	100	
T9	21	2	30-Jun	SESA	1	U			1		40s	ENE, 5-10	100	
T9	14	2	30-Jun	SESA	1	INC			1		40s	ENE, 5-10	100	
T9	8	2	30-Jun	DUNL	1	INC			1		40s	ENE, 5-10	100	
T9	38	2	30-Jun	LALO	1	DI	1		1		40s	ENE, 5-10	100	
T9	28	2	30-Jun	LALO	1	FD		1	1		40s	ENE, 5-10	100	
T9	27	2	30-Jun	PESA	1	INC		1	1		40s	ENE, 5-10	100	
T9	21	2	30-Jun	LALO	1	INC		1	1		40s	ENE, 5-10	100	
T9	18	2	30-Jun	PESA	1	INC		1	1		40s	ENE, 5-10	100	
T9	16	2	30-Jun	LALO	1	FLU	1		1		40s	ENE, 5-10	100	
T9	16	2	30-Jun	LALO	1	INC		1	1		40s	ENE, 5-10	100	
T9	12	2	30-Jun	ROPT	1	ST	1		1		40s	ENE, 5-10	100	
T9	3	2	30-Jun	PESA	1	INC		1	1		40s	ENE, 5-10	100	
T9	17	2	30-Jun	LTJA	1	HU			1		40s	ENE, 5-10	100	
T9	21	2	30-Jun	LALO	2	DI	2		2		40s	ENE, 5-10	100	