

SHOREBIRD MIGRATION AT NORMAN, OKLAHOMA: 1961-63

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REPEATED censusing of a limited area provides a valuable source of quantitative migration data despite the many variables involved. Though several such studies of shorebirds have been conducted on or near the Atlantic and Pacific coasts (Urner, 1929; Urner and Storer, 1949; Storer, 1951; Dyke, 1955) no comparable data are available from the central flyway region. This report is a result of observations made from 1 March 1961 to 15 November 1963 at a small impoundment in Norman, Oklahoma.

DESCRIPTION OF AREA

Norman, Oklahoma is adjacent to the floodplain of the Canadian River. The river flows generally from west to east across the state, but follows a northwest to southeast direction for a considerable distance on both sides of Norman. Native woody vegetation near the city is limited to areas along the river and other streams.

Max Westheimer Airfield was developed as a military base in 1942, and is presently operated by the University of Oklahoma. More than 200 acres of asphalt remain, considerable portions of which are not used as runways or taxiways. One such unused area has been the site of a pond since 1949 or 1950. At that time a drainage ditch was dammed in the pasture adjacent to the west edge of the airfield. Except for periods of extreme drought, the pond extends from the pasture onto the airfield as a shallow pool having a maximum depth of about two feet, a length of about 300 yards, a width of about 70 yards, and an area of about three acres. Maximum size is not regularly maintained, however, as an extremely high evaporation rate prevails in Oklahoma from April to October. During these months of 1961-63 the average dimensions of the pond were 150×40 yards and the average surface was 1.4 acres. The broad, shallow portion of the impoundment, in contrast to the deeper and narrower section in the pasture, has proved quite attractive to migrant shorebirds despite its small size and lack of sandy or muddy shores.

When first laid, the asphalt that underlies and nearly surrounds the pond constituted a primary bare area. This area has been invaded for some years by a vigorous plant growth distributed linearly along the seams and cracks of unused areas. Such growth invades the pond at a few points. For about 100 yards along the southwest shore of the pond the asphalt was broken up and hauled away several years prior to this study. This section constitutes the

major site of both submerged and emergent vegetation and is the only area of the pond in which an automobile cannot be driven.

COVERAGE

Censuses were usually taken at least once daily from 1 March to 31 October of all three years. At times, however, a day was missed and on three occasions (1–8 April 1961; 25–30 August 1962; and 26 August to 3 September 1963) both observers were absent from the study area for about a week. From 1 March 1961 to 31 May 1961 daily visits were made at 0600 and 1800 CST. Throughout the remainder of the study the time of day at which observations were made was variable. Observation periods averaged about an hour, but some lasted from three to six hours in May and September.

INFLUENCE OF WEATHER

During the frequent spring periods of clear skies and strong southerly winds we experienced a rather uniform pattern of migration and found few rare species, whereas at times of heavy cloud cover, fog, or northerly winds, migrants were grounded and we regularly found uncommon species and larger numbers of individuals. It seems likely that a relatively constant flow of shorebirds passes through central Oklahoma during the height of the northbound migration but that many of these birds are seen only when forced to the ground by inclement weather.

Occasionally an extended wet spell occurred in spring. Concurrently there was a reduction in the shorebird population due apparently to two factors: (1) an increase in feeding sites caused by accumulation of water in fields and on the runway, and (2) the reduction of available food at the pond due to the elevated water level.

During very heavy rain or hail only the largest shorebirds remained at the pond—others went to less exposed areas away from the water. Shelter was also sought when the wind velocity reached about 30 mph. At these times we found large flocks of many species running about far from the water feeding voraciously on grounded insects and seeds.

Summer in Oklahoma is characterized by an almost continuous span of variably intense southerly winds and clear skies. During such periods the number of southbound migrants changed little from day to day. But when the first cold snap arrived with strong northerly winds, usually sometime in September, a great variety of shorebirds suddenly appeared; and this phenomenon was repeated to a lesser degree with each ensuing north wind until the supply of migrants was exhausted sometime in November. Our observations of fall migrants are thus consistent with the findings of Brooks (1965)

for shorebirds and Hassler et al. (1963) for passerines in that they considered the shift of wind to the north to be the primary weather stimulus for south-bound migration.

The paucity of migrants during the days just after an extended stormy period was also notable. In spring this may have been due to the reluctance of birds to leave the Gulf Coast or other areas of concentration during times of weather disturbance. In summer and fall it may have been due to the small number of birds physiologically ready to migrate that still remained at northern "staging points" following a storm front.

RESULTS

Thirty of the 39 species of shorebirds recorded from Oklahoma were seen in the study area. Of the nine unrecorded species (Piping Plover, *Charadrius melodus*; Mountain Plover, *Eupoda montana*; Ruddy Turnstone, *Arenaria interpres*; Woodcock, *Philohela minor*; Eskimo Curlew, *Numenius borealis*; Knot, *Calidris canutus*; Short-billed Dowitcher, *Limnodromus griseus*; Black-necked Stilt, *Himantopus mexicanus*; and Red Phalarope, *Phalaropus fulicarius*), the Knot and Red Phalarope have never been collected in Oklahoma and only the turnstone is of more than accidental occurrence in the central part of the state.

The Whimbrel (*Numenius phaeopus*), White-rumped Sandpiper (*Erolia fuscicollis*), Marbled Godwit (*Limosa fedoa*), Hudsonian Godwit (*L. haemastica*), Sanderling (*Crocethia alba*), and Northern Phalarope (*Lobipes lobatus*) were recorded from only the northward migration whereas the Snowy Plover (*Charadrius alexandrinus*), Dunlin (*Erolia alpina*), and American Avocet (*Recurvirostra americana*) were seen only during the south-bound season. Despite increased populations following the reproductive season, the Golden Plover (*Pluvialis dominica*), Spotted Sandpiper (*Actitis macularia*), Greater Yellowlegs (*Totanus melanoleucus*), Pectoral Sandpiper (*Erolia melanotos*), Baird's Sandpiper (*E. bairdii*), Buff-breasted Sandpiper (*Tryngites subruficollis*), and Wilson's Phalarope (*Steganopus tricolor*) were all much less common during southward than northward migration. Our coverage of the study area and its apparent attractiveness to shorebirds were relatively constant throughout the year and thus cannot account for this paradox. Conversely, the Western Sandpiper (*Ereunetes mauri*) was numerous during the southward migration, but recorded on only four dates in spring. The Upland Plover (*Bartramia longicauda*), Solitary Sandpiper (*Tringa solitaria*), Least Sandpiper (*Erolia minutilla*), Long-billed Dowitcher (*Limnodromus scolopaceus*), and Stilt Sandpiper (*Micropalama himantopus*) were also much more common in fall than in spring. Among these, only the Solitary and Western sandpipers showed an increase in numbers greater than

TABLE 1
RANKING OF SHOREBIRDS BY ABUNDANCE IN NORTHWARD MIGRATION, 1961-63

Species	Rank	Total dates	Total individuals	Maximum daily totals
Baird's Sandpiper	1	146	2,553	150
White-rumped Sandpiper	2	86	1,524	105
Semipalmated Sandpiper	3	76	900	145
Buff-breasted Sandpiper	4	46	1,027	215
Wilson's Phalarope	5	56	1,071	140
Pectoral Sandpiper	6	117	857	75
Least Sandpiper	7	73	877	75
Lesser Yellowlegs	8	104	848	64
Greater Yellowlegs	9	64	587	50
Golden Plover	10	36	269	35
Stilt Sandpiper	11	31	88	17
Long-billed Dowitcher	12	31	95	11
Upland Plover	13	23	79	15
Spotted Sandpiper	14	39	68	6
Semipalmated Plover	15	14	29	7
Common Snipe	16	18	22	3
Hudsonian Godwit	17	6	14	5
Willet	18	6	13	6
Sanderling	19	6	13	4
Black-bellied Plover	20	2	13	7
Marbled Godwit	21	4	8	3
Western Sandpiper	22	4	5	2
Solitary Sandpiper	23	5	5	1
Long-billed Curlew	25	1	1	1
Whimbrel	25	1	1	1
Northern Phalarope	25	1	1	1

that explainable by the addition of offspring to the population. The Semipalmated Plover (*Charadrius semipalmatus*), Killdeer (*C. vociferus*), Common Snipe (*Capella gallinago*), Lesser Yellowlegs (*Totanus flavipes*), and Semipalmated Sandpiper (*Ereunetes pusillus*) were about as common during the northward as during the southward migration.

The relative abundances (after Urner and Storer, 1949) of 26 species of shorebirds found in northward migration, and of 23 species seen in southward migration are presented in Tables 1 and 2. The Killdeer is excluded from this comparison because of its year-round presence. Seasonal extreme dates for the three-year span are given below for each species. Migration peaks and dates of maximum counts for both northward and southward seasons are given where data are adequate.

It must be remembered that our area does not provide optimum habitat for all species of shorebirds. Common Snipe and Solitary Sandpipers are more

TABLE 2
RANKING OF SHOREBIRDS BY ABUNDANCE IN SOUTHWARD MIGRATION, 1961-63

Species	Rank	Total dates	Total individuals	Maximum daily totals
Least Sandpiper	1	207	1,892	51
Lesser Yellowlegs	2	123	652	70
Western Sandpiper	3	96	429	30
Semipalmated Sandpiper	4	106	336	23
Pectoral Sandpiper	5	74	300	30
Baird's Sandpiper	6	69	350	21
Buff-breasted Sandpiper	7	30	246	50
Long-billed Dowitcher	8	49	153	29
Stilt Sandpiper	9	57	174	14
Upland Plover	10	49	113	11
Solitary Sandpiper	11.5	44	71	4
Wilson's Phalarope	11.5	16	52	10
Greater Yellowlegs	13	24	38	6
Semipalmated Plover	14	10	16	3
Common Snipe	15	18	26	3
Golden Plover	16	15	21	4
Dunlin	17	4	14	7
American Avocet	18	3	9	7
Spotted Sandpiper	19	9	9	1
Black-bellied Plover	20	6	7	2
Willet	21.5	7	7	1
Long-billed Curlew	21.5	2	5	4
Snowy Plover	23	1	1	1

common along marshy lake edges and streams; Upland Plovers are abundant in alfalfa and plowed fields; and Snowy Plovers are regular along sandy riverbeds. All of the larger forms—Marbled Godwit, Hudsonian Godwit, Long-billed Curlew (*Numenius americanus*), Whimbrel, Willet (*Catoptrophorus semipalmatus*), and American Avocet, as well as Black-bellied Plover (*Squatarola squatarola*), Dunlin, and Sanderling—are more regular at the larger reservoirs. This may be due to the differences in sample sizes. For the remaining species the study pond appears quite suitable and for some, e.g., Buff-breasted Sandpiper, superior.

In the height of spring migration it was obvious that most flocks were restless and little inclined to linger more than a few hours. According to our observations, few birds other than Baird's Sandpipers and Upland Plovers remained longer than a day. During most of the southward migration, however, migrants faced a head wind and under such conditions often lingered several days.

Determination of which birds were new to the census and which had al-

ready been counted was complicated by the fact that certain birds circulated back and forth between the study area and another nearby pond. In this regard, we depended upon flock size, direction of departing and arriving groups, and presence of crippled, banded, or otherwise marked individuals.

SPECIES STATUS

Semipalmated Plover.—Extremes: 17 April–6 May and 26 July–25 September. One recorded 11 June 1962. Maximum counts: 25 April 1963 (7) and 22 April 1963 (5). Most common at pond but also noted on runway far from water.

Snowy Plover.—Observed only once, 19 July 1963, despite its breeding three miles south of the study area at the Canadian River. Migrants were often seen at river in April and May.

Killdeer.—Nests commonly, winters sparingly. Peak migration: 2–18 March and 5 August–1 November. Maximum counts: 14 March 1961 (40), 16 March 1961 (11), 16 March 1962 (8), 29 August 1961 (125), 5 August 1961 (45), and 20 August 1961 (40). Seemingly migratory flocks in summer were noticeably larger during midday. One adult banded 13 May 1962 remained at least until 8 September 1962.

Golden Plover.—Extremes: 26 March–22 May and 20 July–11 November. Peak migration: 10–27 April. Maximum counts: 15 April 1961 (41), 10 April 1961 (40), 16 April 1961 (35), and 8 September 1963 (4). In fall larger numbers were seen in plowed fields three miles northwest of study area. In spring it was most common in evening and early morning. They favor a small section of pond shore that has scattered chunks of broken asphalt; also frequent nearby fields and runway. Only two of 269 in spring were in complete breeding plumage—one 18 May 1961, the other 21 May 1961.

Black-bellied Plover.—Extremes: 18 and 19 May; and 2 August–20 October. Maximum counts: 18 May 1961 (7) and 19 May 1961 (6). Both spring flocks were seen at day-break; all birds were in full breeding plumage.

Common Snipe.—Extremes: 26 March–28 April and 23 September–31 October. Peak migration: 3–20 April and 23 September–31 October. Winters near Norman in favorable habitats.

Long-billed Curlew.—Single birds were observed 25 April and 4 September 1961; flock of four 19 July 1963.

Whimbrel.—A single bird was observed 1 June 1961.

Upland Plover.—Extremes: 11 April–18 May and 6 July–18 October. Four mid-June records of single birds indicate possible local nesting. Peak migration: 12–30 April and 2 August–24 September. Maximum counts: 12 April 1963 (15), 30 April 1962 (7), 24 and 28 April 1961 (6), 9 September 1962 (11), 3 September 1961 (8), 3 August and 7 September 1963 (7). First southward movement, as determined by nocturnal flight calls, 6 July. Usually seen in fields near pond, but occasionally seen feeding or bathing at water. Much more numerous in alfalfa and plowed fields west of Norman.

Spotted Sandpiper.—Extremes: 19 April–31 May and 12 July–12 September. Peak migration: 27 April–23 May. Maximum count: 13 May 1963 (6). Only singles observed in summer. Seen several times resting on the asphalt far from water.

Solitary Sandpiper.—Extremes: 9 April–24 May and 6 July–25 August. Maximum count: 24 August 1963 (4).

Willet.—Extremes: 27 April–6 May and 30 June–4 September. Maximum count: 27 April 1963 (6). Summer observations were all of single birds.

Greater Yellowlegs.—Extremes: 8 March–7 May and 9 July–12 October. Peak mi-

gration: 25 March–20 April and 15 July–9 September. Maximum counts: 9 April 1962 (50), 6 April 1962 (49), 7 April 1962 (42), 9 September 1962 (6), 20 July 1962 (4), and 26 July 1961 (3). Most common during April, in unmixed flocks arriving at or after sunset. In contrast to Lesser Yellowlegs it was never seen away from water.

Lesser Yellowlegs.—Extremes: 7 March–3 June and 21 June–28 October. Peak migration: 29 March–12 May and 26 July–6 September. Maximum counts: 24 April 1963 (64), 28 April 1963 (63), 25 April 1963 (41), 3 September 1961 (70), 4 September 1961 (55), and 9 September 1962 (28). Usually observed wading in water but frequently seen in sheltered areas far from water during storms or strong winds.

Pectoral Sandpiper.—Extremes: 2 March–3 June and 9 July–17 October. Peak migration: 10 April–26 May and 26 July–6 September. Maximum counts: 4 May 1961 (75), 30 April 1963 (36), 27 March 1961 (28), 3 September 1961 (31), 5 September 1961 (30), and 25 August 1963 (16). A single bird, apparently male, seen 23 June 1962 was presumed to be an early southward migrant. Usually they favor the pond shore although large numbers land on the runway or in the adjacent pasture. After rain they often visit puddles along the runway. The sexes rarely migrate together in spring. In 1961, Dan R. Harlow collected 124 Oklahoma specimens for parasitological analysis (81 in spring; 43 in summer and fall). His data are as follows: to 5 April—27 males, 0 females; 9 April—11 males, 1 female; 11 April to 25 April—5 females, 4 males; and 27 April to 2 June—33 females, 0 males. Extreme dates for sexes during spring migration in study area (as verified by specimens) are as follows: males 16 March to 6 May; females 9 April to 3 June. Data from 50 fall Oklahoma specimens (including Harlow's 43) yield the following date extremes by sex: males 25 July to 26 October; females 31 July to 26 October. All of Harlow's fall specimens were osteologically immature. This, coupled with the decrease in total Pectorals observed in southward migration, suggests that part or all of the adult population follows a different southward path and that the flocks found here during summer and fall contain juvenile birds of both sexes.

White-rumped Sandpiper.—Extremes: 27 April–21 June. No fall records. Peak migration: 3–26 May. Maximum counts: 16 May 1963 (105), 20 May 1963 (65), and 20 May 1962 (54). Most common at midday. Frequents pond shore most often but also regular on the runway and in the plowed fields. Sexes tend to migrate separately. In Oklahoma, males collected from 2 May to 26 May; females from 17 May to 6 June (data gathered by University of Oklahoma Museum of Zoology).

Baird's Sandpiper.—Extremes: 3 March–31 May and 20 July–13 October. Peak Migration: 12 April–24 May and 20 July–24 September. Maximum counts: 10 May 1963 (150), 9 May 1963 (145), 17 May 1963 (135), 4 September 1961 (21), 3 September 1961 (20), and 25 July 1962 (20). This species often remains several days and in spring some may remain a week or longer. Often seen on runway or in adjacent fields, especially when standing water is widespread or when winds are exceptionally strong.

Least Sandpiper.—Extremes: 27 March–24 May and 4 July–1 November. Peak migration: 22 April–18 May and 8 July–22 October. Maximum counts: 1 May 1961 (75), 8 May 1961 (65), 8 May 1963 (58), 6 October 1961 (51), 4 September 1961 (50), and 8 October 1961 (41). Most common during midday. Usually found at pond's edge but seek sheltered areas in heavy winds.

Dunlin.—Extremes: 9–29 October. Four records only: 9 October 1961 (7), 10 October 1961 (5), 11 October 1961 (1), and 29 October 1961 (1).

Long-billed Dowitcher.—Extremes: 16 March–18 May and 10 July–20 October. Peak migration: 6 April–8 May and 26 July–18 October. Maximum counts: 29 April 1962

(11), 27 April 1962 (7), 22 April 1963 (6), 6 October 1961 (29), 18 October 1961 (11), and 23 September 1961 (10). On a few occasions the presence of Short-billed Dowitchers was suspected

Stilt Sandpiper.—Extremes: 20 April–25 May and 6 July–25 September. Peak migration: 25 April–16 May and 2 August–25 September. Maximum counts: 10 May 1963 (6), 9 May 1963 (6), 11 May 1962 (5), 5 September 1962 (14), 3 September 1961 (10), and 12 August 1961 (10).

Semipalmated Sandpiper.—Extremes: 8 April–30 May and 24 June–13 October. Singles observed 11 and 16 June 1963. Peak migration: 18 April–26 May and 12 July–3 September. Maximum counts: 25 April 1961 (145), 26 May 1961 (68), 4 May 1962 (57), 30 August 1961 (23), 1 September 1961 (18), and 3 September 1961 (15). Most common at midday. Occasionally seen on the runway and in plowed fields.

Western Sandpiper.—Extremes: 16 April–27 April and 30 June–9 October. Peak migration: 2 July–3 September. Maximum counts: 29 August 1961 (30), 27 August 1961 (25), and 17 July 1963 (20).

Buff-breasted Sandpiper.—Extremes: 17 April–3 June and 23 July–4 October. Peak migration: 4–19 May and 9 August–8 September. Maximum counts: 9 May 1962 (215), 10 May 1962 (117), 12 May 1962 (98), 9 August 1963 (43), 5 September 1962 (29), and 8 September 1963 (26). Most common at midday. They feed mainly in nearby fields and on the runway, but bathe and display at the pond. Flocks in April and early May contained a preponderance of males while those after the middle of May often were composed solely of females.

Marbled Godwit.—Extremes: 26 March–1 May. Four records only: 26 March 1961 (3), 9 April 1961 (1), 24 April 1963 (3), and 1 May 1963 (1).

Hudsonian Godwit.—Extremes: 15 April–20 May. Maximum counts: 15 April 1961 (5), and 17 May 1963 (4). All birds were in breeding plumage

Sanderling.—Extremes: 7–26 May. Maximum counts: 14 May 1961 (4), 11 May 1961 (3), and 8 May 1961 (3). No fall records despite their being regular at a large reservoir 30 miles north of Norman.

American Avocet.—Extremes: 5 July–4 October. Four records only: 5 July 1962 (1), 29 July 1961 (7), 24 September 1961 (1), and 4 October 1961 (1). No spring records despite several occurrences near Norman. Nine of ten southbound birds lacked breeding dress.

Wilson's Phalarope.—Extremes: 10 April–28 May and 16 July–24 September. Peak migration: 22 April–17 May and 12 August–4 September. Maximum counts: 28 April 1962 (140), 22 April 1963 (125), 29 April 1962 (111), 13 August 1961 (10), 12 August 1961 (8), and 4 September 1961 and 1962 (8). Most numerous at midday. In spring, very common for only a few days. Flocks usually are seen at the pond's edge, but sometimes they swim in deep water and, at times, feed on dry land. Both sexes migrate together but flocks during April contain a great preponderance of females, while those in early May often contain pairs, and flocks in mid- and late May contain more males than females.

Northern Phalarope.—Single female in breeding plumage seen on 17 May 1963.

SUMMARY

A study of shorebird migration was conducted at Norman, Oklahoma, from 1 March 1961 to 15 November 1963. A total of 30 species was observed including 27 during the northward and 24 in southward migration. Baird's Sandpiper was by far the most abun-

dant species during the northward migration; Least Sandpiper was the most abundant during the southbound season. White-rumped Sandpipers were common in spring but unrecorded after 21 June. Likewise, all six Sanderling records were in the spring. Species that were definitely more common in spring than in fall included the Golden Plover, Spotted Sandpiper, Greater Yellowlegs, Pectoral Sandpiper, Baird's Sandpiper, Buff-breasted Sandpiper, and Wilson's Phalarope. The Western Sandpiper was numerous during the southward migration but only five individuals were recorded during spring. The Dunlin was seen only four times, all in fall. The following species were also much more common in fall than in spring: Upland Plover, Solitary Sandpiper, Least Sandpiper, Long-billed Dowitcher, and Stilt Sandpiper. Only the Solitary and Western sandpipers, however, showed an increase in numbers greater than that explainable by the summer's reproduction.

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