Connecticut Warbler, *O. agilis*
Mourning Warbler, *O. philadelphia*
Yellowthroat, *Geothlypis trichas*
Yellow-breasted Chat, *Icteria virens*
Hooded Warbler, *Wilsonia citrina*
Canada Warbler, *W. canadensis*
American Redstart, *Setophaga ruticilla*
Yellow-headed Blackbird, *Xanthocephalus xanthocephalus*
Baltimore Oriole, *Icterus galbula*
Brown-headed Cowbird, *Molothrus ater*
Western Tanager, *Piranga ludoviciana*
Scarlet Tanager, *P. olivacea*
Summer Tanager, *P. rubra*
Rose-breasted Grosbeak, *Pheucticus ludovicianus*
Blue Grosbeak, *Guiraca caerulea*
Dickcissel, *Spiza americana*
Purple Finch, *Carpodacus purpureus*
Rufous-sided Towhee, *Pipilo erythrophthalmus*
Lark Bunting, *Calamospiza melanocorys*
Savannah Sparrow, *Passerculus sandwichensis*
Lark Sparrow, *Chondestes grammacus*
Slate-colored Junco, *Junco hyemalis*
Chipping Sparrow, *Spizella passerina*
Clay-colored Sparrow, *S. pallida*
White-crowned Sparrow, *Zonotrichia leucophrys*
White-throated Sparrow, *Z. albicollis*
Song Sparrow, *Melospiza melodia*

Norman Bird Sanctuary, Third Beach Road, Middletown, R. I.; Farm Street, Dover, Mass.; 19 Wendell Street, Cambridge, Mass.; Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior, Patuxent Research Refuge, Laurel, Md.

OBSERVATIONS OF DIURNAL MIGRATION IN THE NARRAGANSETT BAY AREA OF RHODE ISLAND, IN FALL 1958

By JAMES BAIRD and IAN C. T. NISBET

INTRODUCTION

In spite of its great development in Europe, the study of the diurnal migration of passerines has been badly neglected in North America. Indeed, we have found only the most casual references to it in the literature of New England birds. Nevertheless, while the east coast of North America has nothing to rival the vast finch migrations of Europe, visible migration is a conspicuous phenomenon in New England and can at times be quite spectacular.

In this paper we describe intermittent observations of diurnal migration made during the fall of 1958 in the Narragansett Bay area of Rhode Island. The geography of this area (Fig. 1) raises problems of special interest in regard to the behavior of migrating birds faced with a water crossing. Birds flying west along the coast must make several water crossings of a mile or more in order to pass through the area, while even those flying further inland, away from the coast, encounter wide stretches of open water in the upper bay. Observations at Brenton Point in 1956 and 1957 (Baird *et al.*, 1958) had shown that many coasting birds, particularly Eastern Kingbirds *(Tyrannus tyrannus)*, Bobolinks *(Dolichonyx oryzivorus)* and Redwinged Blackbirds

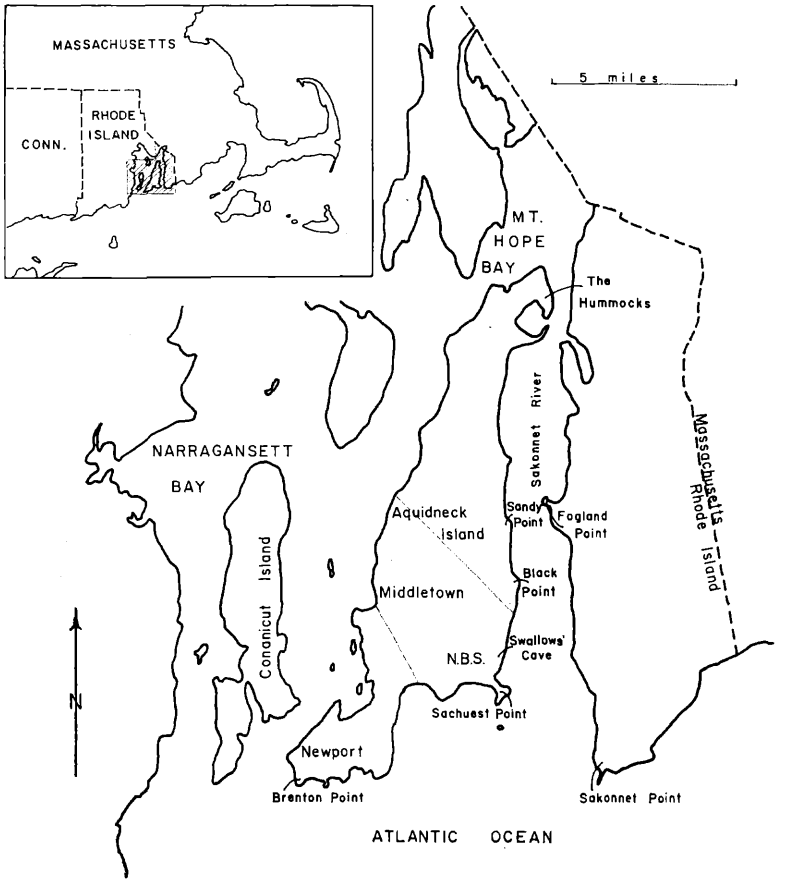

Fig. 1. The Narragansett Bay area of Rhode Island, showing places referred to in the text. The area consists largely of agricultural and suburban land, with a few extensive areas of woodland, and lies mainly below 200 feet above sea level.

(Agelaius phoeniceus), departed northwest rather than continuing due west towards the southern tip of Conanicut Island. The observations made in 1958 were designed to show whether this curious behavior is shared by other species, and whether it takes place also at Sakonnet Point. In addition, we were interested to find out to what degree the coast formed a line of concentration for migrating birds and to what extent migration took place farther inland.

Our observations are also relevant to the divergent results obtained by Ball (1952) in the Gaspé Peninsula, Quebec, and by Stone (1937) at Cape May, New Jersey. While Ball stated that diurnal migrants were deflected for several miles by even small stretches of water, Stone thought that birds coasting southward normally cross the 13 mile mouth of Delaware Bay unless the wind is in the northwest, when they turn into the wind and form spectacular concentrations. Further comparative observations of the same species in different geographical situations are needed before such behavior can be understood.

TABLE 1. *Summary of observations, 1958.*

Date	Place	Time (E.S.T.)	Wind
Aug. 19	Brenton Point	0649-0725	Strong NNW
Aug. 20	Swallows' Cave	0725-0750	Calm
Aug. 22	Brenton Point	0755-0900	Light S
Aug. 27	Brenton Point	0845-0920	Light NE
Sept. 2	Sakonnet Point	0445-0745	Moderate to fresh NNW
	Swallows' Cave	0500-0810	
Sept. 3	Sakonnet Point	0520-0735	Light NNE
	Swallows' Cave	0500-0735	
Sept. 8	Swallows' Cave	0610-0920	Light NW
Sept. 28	Brenton Point	1200-1235	Strong NE
Sept. 29	Swallows' Cave	0525-0705	Light to mod. N
Oct. 2	Swallows' Cave	0615-0640	Mod. to fresh NW
Oct. 4	Swallows' Cave	0540-0615	Moderate NW
Nov. 2	Sakonnet Point	0555-0830	Mod. to fresh NNW
Nov. 7	Swallows' Cave	0830-0900	Light NW
Nov. 8	The Hummocks	0605-0755	Light W
	Sandy Point	0815-0845	
	Swallows' Cave	0630-0745	
		0900-0915	
Nov. 12	The Hummocks	0640-0830	Moderate SW

OBSERVATIONS

The observations we made in 1958 are summarized in Table 1, place names used there and elsewhere in the text being marked in Figure 1. The observations were necessarily discontinuous, and were confined largely to the days following the passage of cold fronts, so that the weather during each observation period was similar: usually cool, with little or no cloud cover and with variable north to northwest winds (the latter also given in Table 1). Observations in previous years have shown that comparatively little passerine diurnal migration takes place in other weather conditions. Also, field work of a different kind was carried out throughout the period at the Norman Bird Sanctuary (hereafter referred to as N. B. S.) in Middletown, and it is unlikely that any large movements could have been missed, except during the period Oct. 11th-19th. Thus, although we have little information on the day-to-day fluctuations in migration, our observations probably coincided with the heaviest migration periods.

We are greatly indebted to Dr. David B. Peakall and Mr. Richard Ferren for their assistance with field work on Sept. 2-3 and Nov. 12.

NOTES ON SPECIES

This section discusses the migration and behavior of the nine most frequently observed species, excluding water birds. A list of the other species of land birds noted during the season, with their observed directions of flight, is given in the Appendix.

Chimney Swift *(Chaetura pelagica)*

Swifts were seen migrating as early as Aug. 22 and as late as Sept. 28. The only sizable movement was on Sept. 2 when 22 passed Sakonnet

Point, mainly flying northwest, and 39 were seen at Swallows' Cave, mainly flying in from the east and continuing south or southwest. This movement continued throughout the day at the N. B. S., where another lighter movement was seen on Sept. 8.

Tree Swallow *(Iridoprocne bicolor)*

The only sizable movement observed was on Sept. 2. On this day 101 were seen passing Sakonnet Point, of which only 31 set out across the river, flying northwest or west with Barn Swallows. The remainder followed the coast northward, joining others arriving from the east, and a considerable portion of this coasting stream crossed the river from Fogland Point, where a flock of 320 were seen flying northwest. Later in the morning small numbers of Tree Swallows were seen flying west across the middle of Aquidneck Island, and birds were noted passing over the N. B. S. until late afternoon. However, during the early morning watch at Swallows' Cave only one Tree Swallow was seen, coasting north.

Tree Swallows have never been seen leaving Brenton Point in any numbers. Their apparent reluctance to make these short water crossings (at least at low altitude) is in direct contrast to the behavior of the Barn Swallow *(q.v.)*, and is interesting in view of the regular fall concentrations of this species at Middletown (near the N. B. S.) and at the southern end of Conanicut Island.

Barn Swallow *(Hirundo rustica)*

Barn Swallows were seen migrating on each count from Aug. 19 to Sept. 8. Generally they showed little hesitation on reaching the sea, a few remaining at the points for a short time and feeding, the majority setting directly out across the water. Most birds leaving Sakonnet and Brenton Points flew west or west-southwest, not always flying directly towards the nearest land; for example, some birds leaving Sakonnet Point on Sept. 2 headed directly towards the headlands of Point Judith, clearly visible some twenty miles away, and some on Aug. 22 were noted flying west far to the south of Brenton Point. Only on Sept. 2, in a stiff north-northwest wind, were any seen flying north of west; about half those seen leaving Sakonnet Point were flying northwest on the short crossing towards Sachuest Point.

On two occasions birds were seen from Swallows' Cave crossing the river on a broad front, a moderate movement on Aug. 20 and a smaller movement on Sept. 2, when 39 arrived from the east and joined others coasting south. During the same period on the 2nd, 88 were seen leaving Sakonnet Point, and a further 36 the next day, when only 17 coasting birds were seen at Swallows' Cave. Movements at Brenton Point were on a similar scale, 71 in 40 minutes on Aug. 19, 30 in an hour on Aug. 22 and 24 in 35 minutes on the 27th of August.

Barn Swallow movement took place mainly in the first three hours after dawn, and much less was seen in the afternoon than in the Tree Swallow or the Chimney Swift. As has been noted by many others, swallows flying with a head- or cross-wind flew low, often within a foot of the water, while those with a following wind (Aug. 27) were flying noticeably higher.

The numbers which we saw were comparatively small, in contrast to the vast migrations that have been seen further down the Atlantic coast (Stone, 1937; Nisbet, in press). This suggests that comparatively few Barn Swallows pass through southern Rhode Island, but it also is due in part to the fact that the swallow migration in the Narragansett Bay area takes place on a broad front: we found that there was no tendency for the birds to concentrate along the "guiding line" formed by either the southern coast or the shores of the river.

Common Crow *(Corvus brachyrhynchos)*

On Nov. 2 ninety-three were seen leaving Sakonnet Point in directions between west and northwest, the majority showing little hesitation over making the crossing. However on Oct. 25, 1957, under similar weather conditions, Crows left Brenton Point heading for Conanicut Island only after much hesitation and circling, and eight of the 35 birds eventually turned north along the coast. Two other significant movements were seen in 1958: one on Nov. 7 when 31 flew west-northwest across the Sakonnet River towards Black Point; the other on Nov. 8 when 40 flew west-southwest across the upper part of the river.

Robin *(Turdus migratorius)*

The Robins' diurnal movement was almost confined to the first hour after dawn. On Nov. 2 at Sakonnet Point 60 flew in from the east but turned north before leaving the point, and none were seen to cross. At the Hummocks 27 were seen on Nov. 8 coasting north on the east side of the river but 40 were seen on Nov. 2 flying northwest, crossing Mt. Hope Bay, with an additional 21 coasting south.

Starling *(Sturnus vulgaris)*

A large movement was seen on Nov. 8 when one observer, watching first at the Hummocks and later at Sandy Point, counted 43,228 between 0605 and 0845[1]. All of the birds were flying west-southwest into a light westerly wind, not being deflected by the river until the movement was almost over. At first they were in small scattered parties flying under 200 feet, but as the morning wore on the flocks observed became progressively higher, some passing at nearly 1,000 feet, and larger, containing up to 2,300 birds. Before 0700 the birds were passing on a broad front over the northern half of the Sakonnet River and Mount Hope Bay, while during the same period (0630 to 0745) only 800 were seen at Swallows' Cave. However, as the morning progressed the Starling stream narrowed and moved south, and by 0830 most of the birds were passing in the vicinity of Black Point. At 0900 a check at Swallows' Cave revealed that flocks of up to 1,500 birds were still crossing near Black Point, but the movement appeared to have stopped by 1000. Towards the end of the passage some large flocks were seen flying south on the east side of the river before crossing, and by midday large flocks were accumulating in the extensive thickets of Arrowwood *(Viburnum dentatum)* at the south end of Aquidneck Island, where aggregations of 10,000 or more birds remained for five days.

1.) All times given are in Eastern Standard Time

A somewhat similar movement had been seen on Nov. 2, when 3,334 Starlings were seen leaving Sakonnet Point between 0600 and 0830, mainly flying directly west towards Newport and not taking the short crossing to Sachuest Point. It is possible that on this occasion the migration was concentrated at Sakonnet Point, but one flock of at least 2,000 birds seen crossing the river in the vicinity of Black Point leads us to suspect that the bulk of the migration, as on Nov. 8, was passing well to the north of our observation point. Again similar to the events of the 8th, large numbers of Starlings appeared in the southeastern part of Aquidneck Island, and these flocks were evidently composed of different individuals from those seen leaving Sakonnet Point.

No significant Starling movements were seen before Nov. 2, and records at the N. B. S. in previous years have suggested that the main Starling migration is concentrated in the last week of October and the first half of November. However, diurnal migration of Starlings had not previously been reported from this area, except for a few birds seen at Brenton Point in 1957.

Myrtle Warbler *(Dendroica coronata)*

On Nov. 2 seventy-one birds were seen at Sakonnet Point, of which six flew out to the west, 20 to the northwest, and the remainder flew north along the coast after considerable hesitation. The only other definite record of birds crossing the lower part of the Sakonnet River is of three at Swallows' Cave on Nov. 7, but larger numbers were seen crossing at the Hummocks: 57 on Nov. 8 and 53 on the 12th. Most of the latter continued west or northwest, but a number were also seen coasting southwest along the northwest shore of the island.

Bobolink *(Dolichonyx oryzivorus)*

Although Bobolinks were prominent migrants at Brenton Point in 1956 and 1957, comparatively few were seen during our watches in 1958. A single flock of 30 was seen coasting north at Swallows' Cave on Sept. 2. The next morning (Sept. 3), with cloudless skies and a light northerly wind, none were seen or heard at Sakonnet Point, but two small flocks were seen at Swallows' Cave crossing the river at a great height, and a further five flocks were heard but were too high to be spotted easily. This suggests that there may have been many birds crossing the river too high to be seen from the ground. However, previous observation at Brenton Point in similar weather (e.g. on Sept. 4, 1956) has shown that the birds *start* the crossing at a low level, and if they were behaving similarly on Sept. 3, 1958 they must have avoided passing Sakonnet Point and crossed the river further to the north.

The dearth of migration in 1958 could also have been the result of a predominantly nocturnal migration: large flocks of restless Bobolinks were seen on Aquidneck Island at dusk on Sept. 1. Bobolinks were also heard a number of times at night during August and September, and on several occasions in Middletown have been observed to start their migration at dusk.

Brown-headed Cowbird *(Molothrus ater)*

On Nov. 2 at Sakonnet Point 153 flew out to the west and a further flock of 120 which arrived from the east circled and landed north of the point.

DISCUSSION

Reaction to water crossing

One of the most noteworthy results of our observations was the difference in behavior shown by different species when confronted with a water crossing. Some species, such as the Starling and the Barn Swallow, evinced little or no reaction to the shoreline; others showed marked hesitation and still others refused the crossings altogether. Since some of the species in the latter group (e.g. the Robin and the Eastern Meadowlark *Sturnella magna)* are primarily nocturnal migrants, it is possible that their movement in the early morning is merely a low intensity continuation of their nocturnal flight. Ball (1952), in studying the diurnal movements of Robins and other nocturnal migrants in the Gaspe Peninsula, observed still greater reluctance to cross very small stretches of water, and such behavior is hardly consistent with migration at full intensity. However, this would not explain one of the most prominent contrasts we observed—that between the behavior of the Barn and Tree Swallows—for both are exclusively diurnal migrants.

Of those species which refused the crossing at Sakonnet Point and turned north up the river, a few (e.g. the Robin) appeared to stop after flying a few miles inland, without having crossed at all. Others (e.g. the Myrtle Warbler) appeared to continue as far as the Hummocks, where the crossing is very narrow, but the Tree Swallows and some Yellow-shafted Flickers *(Colaptes auratus)* eventually crossed the river at Fogland Point or Swallows' Cave, where the crossing is almost as wide as at Sakonnet Point! Similar behavior has been noted in spring among Brown-headed Cowbirds and Blue Jays *(Cyanocitta cristata)*, which cross in largest numbers due east from Black Point. It thus seems likely that the factor deterring these species from crossing the river at its mouth is not solely the breadth of the water crossing, but the sight of the open ocean to one side. It is possible that the strength of the northerly wind (with its threat of blowing the birds out over the sea) might act as an additional deterrent, as has been noted in similar situations in Europe; so far we have no evidence for this.

Flight directions on Aquidneck Island

Once the Sakonnet River was crossed, many of the birds (e.g. Starlings and Tree Swallows) continued west across Aquidneck Island. We have not yet studied their behavior on reaching the west shore, but many of the Starlings seen on Nov. 8 from the Hummocks appeared to continue directly west-southwest. However, some species (Myrtle Warblers, etc.) were seen flying southwest down the northwest shore of the island on Nov. 12, and many of the birds that arrived at Swallows' Cave from the east also turned south down the coast, joining others that had presumably crossed the river farther north. Other species, such as the Starlings on Nov. 2 and 8, or the Tree Swallows on Sept. 2, although not coasting, turned south down the middle of the island to arrive in large numbers at the southern end. Indeed, this must be the normal

behavior of some species, for birds such as the Tree Swallow regularly occur at the N. B. S. in large numbers, although they rarely, if ever, cross the river so far south. Even such notoriously land-bound species as the *Buteo* hawks occur regularly in small numbers at the N. B. S. and Brenton Point, and we suspect that the concentrations of Bobolinks and Eastern Kingbirds at Brenton Point may arise from a similar migration pattern.

Guiding Lines

Using the European terminology (Van Dobben, 1953; etc.), the turning by birds to follow the shores of the Sakonnet River (in either direction) is an excellent example of the use of "guiding lines": the turning from the "standard direction" to follow well-marked topographical features. It is therefore remarkable that no species appears to have been concentrated significantly along the most important guiding line of all—the sea coast. On Sept. 2, for example, only about twice as many Barn Swallows passed Sakonnet Point as were seen crossing the river at Swallows' Cave, and although 3,334 Starlings were seen at Sakonnet Point on Nov. 2 there is some evidence that even larger numbers were passing farther to the north on this date. Even on these occasions the slight concentration at the coast may have been due to the drifting effect of the strong northerly wind. If many birds had been flying south or even southwest one would expect them to have "piled up" against the guiding line of the coast and have produced a large concentration there (Van Dobben, 1953). It seems more likely that the standard direction of the birds in this area is west-southwest and that comparatively few ever reach the coast.

Magnitude of the coastal migration

Except for one or two species, such as the Starling, or in previous years the Bobolink, the numbers we saw on the coast, even in ideal weather, could hardly be called large. Species such as the Bobolink and Eastern Kingbird, which were prominent in the fall migrations of 1956 and 1957, failed to appear in numbers in 1958. Moreover, other common diurnal migrants, such as the Blue Jay and the American Goldfinch *(Spinus tristis)*, passed only in very small numbers, and indeed are never abundant as fall migrants on Aquidneck Island.

As has already been suggested, the small numbers of a few of these species might be due to the fact that they are primarily nocturnal rather than truly diurnal migrants. In addition, there were indications that the Bobolink may at times migrate too high to be seen from the ground, and high level passage cannot be discounted for other species. However, the main migration route of the Starling undoubtedly lay several miles inland, and particularly in view of the absence of a concentration at the coast, as discussed under "guiding lines," we believe that the migration pattern of other species was similar. In some cases, of course, birds following a southwesterly trend through New England might be expected to pass well inland and avoid southeast Massachusetts and Rhode Island altogether. This is certainly true of the Blue Jay, which is always much more abundant in migration, both in spring and fall, farther to the west than in the Narragansett Bay area.

Northwestward flight at the water crossing

Special interest is attached to the northwestward departure of some passerine species (notably the Eastern Kingbird and the Bobolink) from Sakonnet and Brenton Points, although other species leaving these points depart in a west or southwest direction, following the trend of the coast. At Sakonnet Point this northwest flight effects the shortest crossing, but this is not the case at Brenton Point and another explanation is necessary.

If, as we have suggested for other species, the main migration route of these birds lies a little distance inland, this northwest flight might be interpreted as a "redirection" of migrants that have been led away from this route, and which are attempting to return. This phenomenon would then be analogous to the northwest flight of nocturnal migrants from outlying islands after offshore drift (Baird and Nisbet, in prep.). Additionally, such behavior upon reaching the coast would serve as a useful safety reaction by leading the birds away from the coast and the concomitant danger of offshore drift.

In either case it remains to be explained why this behavior is more highly developed in some species than in others, when it would appear to be equally useful to all. While much more work is needed on the migration of these species before their behavior can be fully understood, there is evidence that the Eastern Kingbird, Redwinged Blackbird, and Bobolink are more affected by guiding lines than some of the other species, and it may be that the northwest redirection has been developed in response to their greater need for protection against offshore drift.

SUMMARY

1. Intermittent observations were made of diurnal migration of landbirds in the Narragansett Bay area of Rhode Island during the fall of 1958. Particular attention was paid to the behavior of migrating birds confronted with water crossings.
2. Some species showed no reaction to the open waters of the lower bays, crossing without hesitation, others crossed only after much hesitation, while still others refused the crossing and turned north along the shore to cross farther inland. So far as we observed, wind strength had little effect on behavior.
3. Evidence for high level migration of at least one species was obtained.
4. After crossing the Sakonnet River many birds turned south down Aquidneck Island, leading to a concentration at its southern end.
5. There was no evidence for any significant concentration of migration along the sea coast, and larger numbers were seen inland.
6. With the exception of the Starling, the numbers seen were not large, and it is suggested that the main migration routes of the species concerned lie away from the coast.
7. Some species flew northwest when crossing the open water of the lower bays instead of following the trend of the coast WSW. It is suggested that these birds may have been redirecting their flight after wandering south of their inland migration routes, thereby reducing the risk of offshore drift.

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APPENDIX: OTHER SPECIES SEEN MIGRATING

The following table lists all those species not treated specifically above, which we saw migrating in 1958 (for completeness, a few records from 1956 and 1957 are also included). The flight directions past the point of observation are given where the species was seen to cross the Sakonnet River or the mouth of Narragansett Bay. If a species was seen to reach the shore and turn north it is marked "turn"; if it stopped, it is marked "stop."

	Brenton Point	Sakonnet Point	Swallows' Cave	Hummocks
Great Blue Heron *(Ardea herodias)*	W.	—	—	—
Cooper's Hawk *(Accipiter cooperii)*	Turn.	—	—	—
Sharp-shinned Hawk *(Accipiter striatus)*	W; turn.	—	W.	—
Red-tailed Hawk *(Buteo jamaicensis)*	Turn.	—	—	—
Red-shouldered Hawk *(Buteo lineatus)*	Turn.	—	—	—
Broad-winged Hawk *(Buteo platypterus)*	Turn.	—	—	—
Marsh Hawk *(Circus cyaneus)*	W; SW.	Turn.	—	—
Osprey *(Pandion haliaetus)*	NW; W; SW.	W; SW.	SW.	—
Pigeon Hawk *(Falco columbarius)*	W.	WSW; turn.	—	—
Sparrow Hawk *(Falco sparverius)*	NW; W; turn.	Turn.	W.	—
Semipalmated Plover *(Charadrius semipalmatus)*	W.	—	NW.	—
Killdeer *(Charadrius vociferus)*	W; WSW.	WSW; SW.	SW.	—
Whimbrel *(Numenius phaeopus)*	—	W.	W.	—
Greater Yellowlegs *(Totanus melanoleucus)*	SW.	—	—	—
Lesser Yellowlegs *(Totanus flavipes)*	—	—	SW.	—
Pectoral Sandpiper *(Erolia melanotos)*	SW.	—	—	—
Semipalmated Sandpiper *(Ereunetes pusillus)*	—	W.	—	—
Mourning Dove *(Zenaidura macroura)*	—	NW; stop; turn.	NW; W.	—
Ruby-throated Hummingbird *(Archilochus colubris)*	NW; S.	—	SE.	—
Belted Kingfisher *(Megaceryle alycon)*	—	—	SW.	—
Yellow-shafted Flicker *(Colaptes auratus)*	—	Stop; turn.	NW; W.	SW.
Yellow-bellied Sapsucker *(Sphyrapicus varius)*	—	—	W.	—
Hairy Woodpecker *(Dendrocopos villosus)*	Stop.	—	—	—
Downy Woodpecker *(Dendrocopos pubescens)*	—	—	—	SW.
Eastern Kingbird *(Tyrannus tyrannus)*	NW; WNW; W; turn.	—	W.	—
Western Kingbird *(Tyrannus verticalis)*	Stop.	—	—	—
Horned Lark *(Eremophila alpestris)*	—	NW.	NW.	W.
Bank Swallow *(Riparia riparia)*	W; turn.	—	W.	—
Rough-winged Swallow *(Stelgidopteryx ruficollis)*	W; turn.	—	—	—

Cliff Swallow *(Petrochelidon pyrrhonota)*	SW.	W.	—	—
Purple Martin *(Progne subis)*	Turn.	—	—	—
Blue Jay *(Cyanocitta cristata)*	—	W; turn.	—	W; SW.
Blue-gray Gnatcatcher *(Polioptila caerulea)*	—	—	W.	—
Water Pipit *(Anthus spinoletta)*	WNW; W.	WNW.	—	—
Cedar Waxwing *(Bombycilla cedrorum)*	NW; turn.	—	—	—
Black and White Warbler *(Mniotilta varia)*	Stop.	—	—	—
Yellow Warbler *(Dendroica petechia)*	Stop.	—	—	—
Magnolia Warbler *(Dendroica magnolia)*	—	—	NW.	—
Prairie Warbler *(Dendroica discolor)*	Stop.	—	—	—
Palm Warbler *(Dendroica palmarum)*	—	—	W.	—
Northern Waterthrush *(Seiurus noveboracensis)*	Turn.	—	—	—
Yellowthroat *(Geothlypis trichas)*	—	Stop.	W.	—
Eastern Meadowlark *(Sturnella magna)*	Turn.	Turn.	—	—
Redwinged Blackbird *(Agelaius phoeniceus)*	NNW; NW.	W.	W.	WSW; SW.
Baltimore Oriole *(Icterus galbula)*	Turn.	NW.	—	—
Rusty Blackbird *(Euphagus carolinus)*	Turn.	—	—	—
Dickcissel *(Spiza americana)*	NW; turn.	—	—	—
Purple Finch *(Carpodacus purpureus)*	—	—	—	SW.
Pine Siskin *(Spinus pinus)*	Turn.	—	—	—
American Goldfinch *(Spinus tristis)*	Turn.	NW; W; turn.	W.	NW; WSW.
Savannah Sparrow *(Passerculus sandwichensis)*	—	Turn.	—	—
Slate-colored Junco *(Junco hyemalis)*	—	—	—	NW.
Snow Bunting *(Plectrophenax nivalis)*	—	NW; W.	—	—

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GENERAL NOTES

A Method for Opening Nesting Holes.—The study of hole-nesting birds presents problems of access not met with among other species. Certain species nest in abandoned woodpecker holes which are normally too small to permit the insertion of a hand. Some recent workers in British Columbia have opened such nests by cutting a panel from the sill below the hole; such panels can be nailed into place again with little resultant change in the appearance of the nesting site. Repeated opening of the nest by this means, however, usually results in the panel becoming permanently loose, particularly if the wood is rotten or the sill thin. Dr. I. McT. Cowan suggested that a hole drilled from the back or side of the tree would avoid this difficulty.

Holes of a suitable size may be made with a brace and 3-inch expansion bit, and by preliminary measurement one can place the hole close above the eggs for more convenient observation. Sapwood often clogs the big bit; in such cases it was usually found more satisfactory to start with the big bit and continue with a smaller (½" or ⅝") bit, finishing up with a keyhole saw. The same modification was used when the wood was too rotten to hold the lead screw of the big bit. In all cases the round hole is readily plugged with a section of 3-inch dowel, and such plugs are usually covered with bark to render them less conspicuous.

The method was devised for use upon the nests of Bufflehead *(Bucephala albeola)*, but is of course applicable to those of any species using holes of Flicker *(Colaptes sp.)* size or larger. It has been used throughout the past summer and was generally found entirely satisfactory. The method was tested upon a nest of Common Sapsucker, but was considered less satisfactory with the smaller cavity excavated by that species.