

# WASHINGTON BIRDS 4



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## WASHINGTON BIRDS

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## BIRDS OF THE MONTLAKE FILL, SEATTLE, WASHINGTON (1979-1983)\*

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### INTRODUCTION

The Montlake Fill has harbored many species of birds, including some that have rarely been found in the region. This locale contains habitats that are uncommon in western Washington, and is small enough that one person can see it all closely in a few hours. I found 157 species at the site during frequent censuses from 1979 through 1983. I summarize these records here and supplement them with those of 17 additional species from other sources.

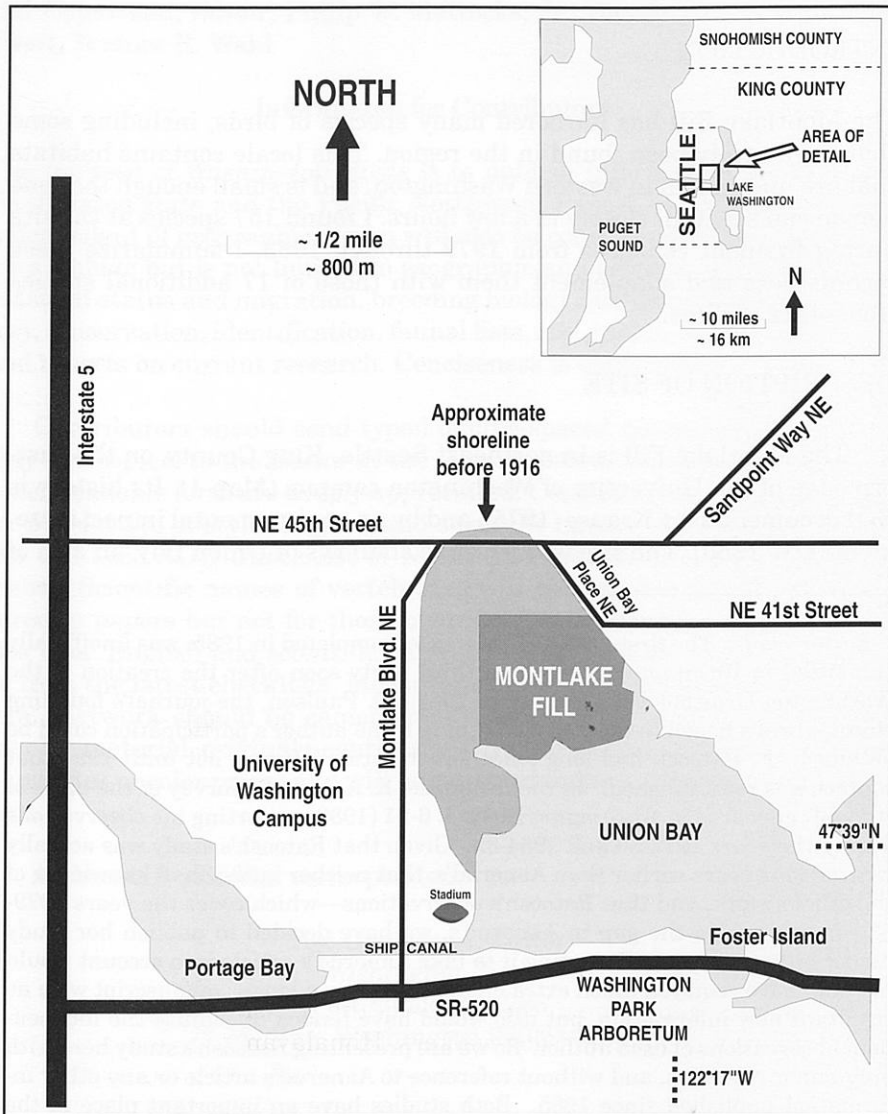
### DESCRIPTION OF SITE

The Montlake Fill is in northeast Seattle, King County, on the eastern edge of the University of Washington campus (Map 1). Its history is well documented by Krause (1975), and by an environmental impact statement (UW 1980). The site was first the shallows of Union Bay, an arm of

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\* *Editor's note:* The first draft of this article, completed in 1985, was unofficially submitted to *Washington Birds* by a third party soon after the creation of the Washington Ornithological Society in 1988. D. Paulson, the journal's founding editor, always hoped to publish it, but only if the author's participation could be obtained. E. Ratoosh had long since left the state. It was not until 1994 that contact was reestablished. In the meantime K. Aanerud's survey of the birds of "the fill" appeared in *Washington Birds* 1: 6-21 (1989), reporting his observations during the years 1972-80 and 1984-89. Given that Ratoosh's study was actually written four years earlier than Aanerud's, that neither author had knowledge of the other's work, and that Ratoosh's observations—which cover the years 1979-83—neatly bridge the gap in Aanerud's, we have decided to publish her study essentially as written. Recasting it to take Aanerud's article into account would not only have required much extra effort to produce a longer manuscript with no resultant new information, but also would have tended to confuse the independent observations of each author. So we are presenting Ratoosh's study here with only minor revisions, and without reference to Aanerud's article or any other information published since 1985. Both studies have an important place in the ongoing literature about Washington's most frequented birding site.

Lake Washington fed by Ravenna Creek. In 1916 the completion of a canal linking the lake to Puget Sound caused the water level to drop 3.3 m, creating an extensive marsh on the peat bottom of the bay. From 1925 until 1966, the marsh was progressively filled with garbage, drainage



Map 1. Montlake Fill and vicinity, Seattle

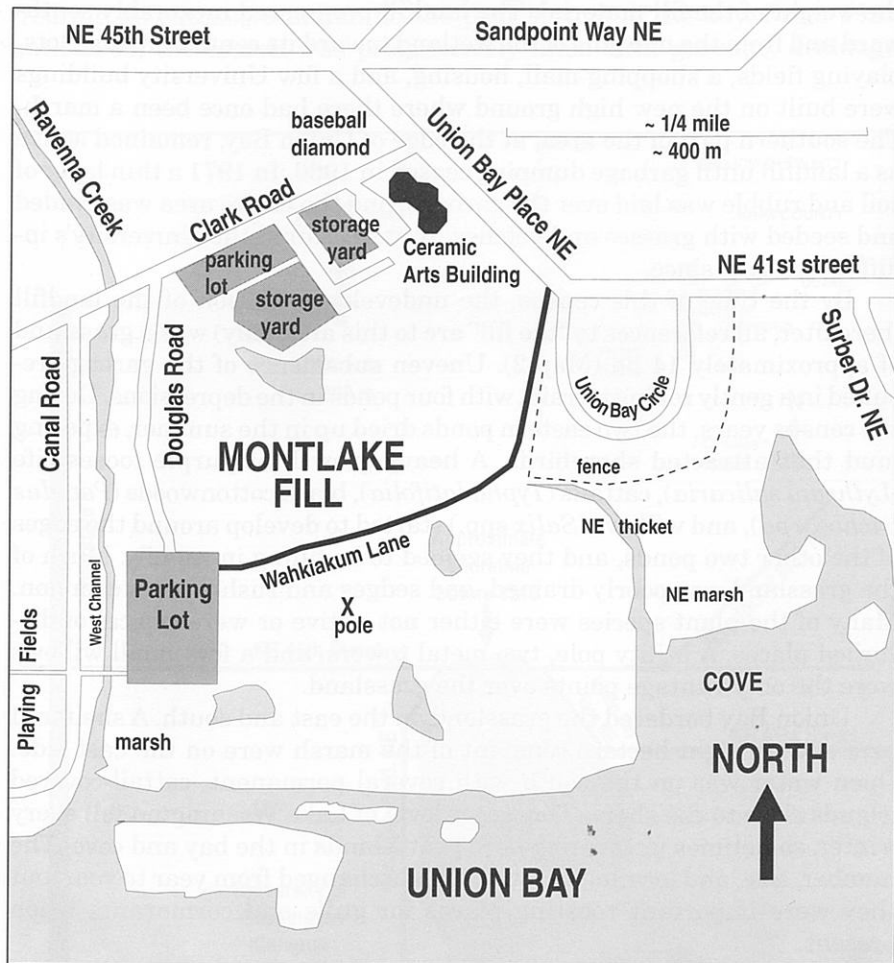
channels were dredged, and wooden dikes were placed in a partly successful attempt to prevent the peat from being forced out into the lake by the weight of the fill material. The landfill progressed inexorably southward and from the margins of the wetland toward its center. Parking lots, playing fields, a shopping mall, housing, and a few University buildings were built on the new high ground where there had once been a marsh. The southern part of the area, at the edge of Union Bay, remained active as a landfill until garbage dumping ceased in 1966. In 1971 a thin layer of soil and rubble was laid over the garbage, and the entire area was graded and seeded with grasses and vetches. It has endured the University's indifference ever since.

By the time of this census, the undeveloped section of the landfill (hereafter, all references to "the fill" are to this area only) was a grassland of approximately 14 ha (Map 2). Uneven subsidence of the garbage resulted in a gently rolling terrain, with four ponds in the depressions. During the census years, the two eastern ponds dried up in the summer, exposing mud that attracted shorebirds. A heavy growth of purple loosestrife (*Lythrum salicaria*), cattails (*Typha latifolia*), black cottonwoods (*Populus trichocarpa*), and willows (*Salix* spp.) started to develop around the edges of the other two ponds, and they seemed to be filling in rapidly. Much of the grassland was poorly drained, and sedges and rushes were common. Many of the plant species were either not native or were typical of disturbed places. A utility pole, two metal towers, and a few small willows were the only vantage points over the grassland.

Union Bay bordered the grassland on the east and south. A sheltered cove and an eight-hectare remnant of the marsh were on the east side. Open water was on the south with several permanent, cattail-covered islands close to the shore. The water level of Lake Washington fell every winter, sometimes uncovering bare peat islands in the bay and cove. The number, size, and location of these islands changed from year to year, but they were important roosting places for gulls and cormorants when present.

On the west side of the fill there was a channel draining Ravenna Creek into Union Bay. It was bordered by cattail marsh and by a row of non-native birches (*Betula* sp.) and Lombardy poplars (*Populus nigra* cv. 'Italica'). A four-hectare gravel parking lot in the grassland was connected to the campus by a footbridge over this channel. There were a few paths along the edge and through the middle of the grassland that were kept open by bird-watchers and dog-walkers. Himalayan blackberry (*Rubus discolor*) and Scot's broom (*Cytisus scoparius*) thickets encroached on the paths, and a few small stands of cottonwoods and willows grew along the fill edges. Many of the trees showed signs of beaver work. The only dense





Map 2. Detail of the Montlake Fill, circa 1980

stand of willows, red alders (*Alnus rubra*), and cottonwoods grew in the northeast corner between the marsh, the grassland, NE 41st Street, and Surber Drive NE. Some of the trees in this area were mature, and there were several tall snags. This thicket and the marsh were difficult to penetrate, and so I rarely went far into the northeast corner. There were a few small, non-native conifers planted about the fill, but those typical of western Washington were entirely absent.

## METHODS AND TERMINOLOGY

I visited the fill and counted birds on 517 dates between April 1979 and December 1983. Most of the visits (93%) were in 1980, 1981, and 1982 (all but 14 in 1979 and 21 in 1983). Dates were distributed throughout the year, peaking in April and May (average 75 visits each), with 54 in June and an average of 35 in each of the other months. On a typical visit, I walked a specific route around the fill. I tried to identify and count every bird I saw or heard. The duration of these visits ranged from 30 minutes to six hours, with most just over two hours long. Visits were made at all times of daylight, but fewer than ten were made before dawn or after dusk. I saw an average of 32 species during a visit, with the greatest number of species seen daily during the spring migration period, and the least during the winter. The inner parts of the northeast thicket and marsh, the north end of the west channel, the south side of Union Bay, and the northwest corner of the grassland were checked only sporadically. I consistently covered the rest of the grassland, the ponds, channels, thickets, marsh edges, cove, and the near part of the bay.

The main supplement to my own records in the species accounts that follow is the "Bird Sightings" column written by P. Mattocks in *Seattle Audubon Notes* (later, *Earthcare Northwest*) and abbreviated SAN hereafter. I often met other bird-watchers and learned of their sightings. D. Beaudette and P. Mattocks generously contributed many of their personal records, which are marked in the species accounts by their initials. I have included sightings from all these sources only when they supplement my own records. All unattributed sightings in the species accounts are mine.

The census data were in the form of daily lists, which were collated by a computer program. This program sorted the data by species and produced a two-page report for each, with the census numbers arranged in a calendar format.

The following terminology is used in the species accounts:

Abundant = usually found, in large numbers

Common = usually found, in smaller numbers

Uncommon = found half the time or less, usually in small numbers

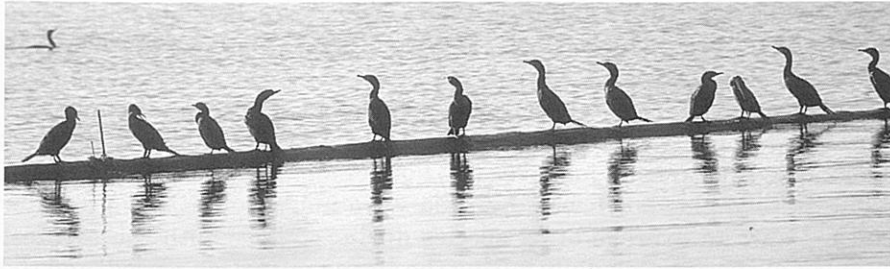
Occasional = found two to five times a year, on average

Rare = found at most once a year

Each species is also classified by its status at the fill: resident, migrant, or visitor. For nomenclature and order of species, I have followed the American Ornithologists' Union *Check-list* (1983 and supplements).



An Appendix presents an annotated list of 18 additional bird species that have been recorded at the fill before the period of my census and after, through June 1985.



Double-crested Cormorants (D. Paulson)

#### SPECIES ACCOUNTS

**Common Loon.** Rare visitor. One in winter plumage was in the cove 17 Apr 1982. The breeding-plumaged bird that flew over 16 Jul 1980 was unexpected, as they were not known to breed in King County, and there were few July records (Hunn 1982).

**Pied-billed Grebe.** Common resident and breeder. Up to 22 were seen, although these are easily undercounted. The first young hatched in June, and the latest was a downy chick on 29 Sep 1983. They preferred the channels and cove but occasionally visited the ponds.

**Horned Grebe.** Uncommon winter resident. Ten or fewer were found on Union Bay between 13 Sep and 24 Apr. Most were in breeding plumage after 1 Apr.

**Red-necked Grebe.** Rare visitor. One was in breeding plumage on the bay on 7 Jun 1982, and another was in winter plumage in November 1979 (S. Atkinson pers. comm.). There were few county records for the summer (Hunn 1982). Red-neckeds were local and uncommon elsewhere on Lake Washington in the winter.

**Eared Grebe.** Rare visitor. T. Schooley saw one on the bay on 28 Feb 1981 (SAN). This was the least numerous of the grebes in King County, although a few usually wintered in the south part of Lake Washington.

**Western Grebe.** Uncommon migrant on Union Bay. Fall records were from 2 Sep through 21 Dec, concentrated between 21 Sep and 16 Oct. The highest count was 13 on 10 Oct 1982. One or two at a time were also present from 4 Mar to 5 May, with most sightings in April. All were of the dark form, not the light form (see Ratti 1981). [These two forms

were subsequently split by the AOU into Western Grebe and Clark's Grebe, respectively.]

**Double-crested Cormorant.** Common winter resident. Up to 45 were seen from the end of September until mid-May. There were late records of single birds on 27 May 1981 and 12 Jun 1981. They roosted and sunned themselves on the log booms and peat islands, and when these were scarce, so were the cormorants.

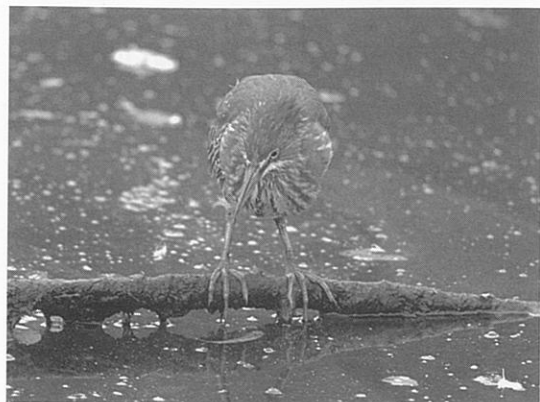


American Bittern  
(D. Paulson)

**American Bittern.** Probably an occasional resident and breeder. This species is one of the chief victims of the landfill. In the 1940s, they were commonly found in what was then an extensive marsh (Higman and Larrison 1951). They may still breed some years. In 1980, one or two called from 29 May to 18 Jun. I saw singles also once in July, twice each in August, September, and November, and once in December. There were two records for January (SAN 1979). F. Krause (pers. comm.) saw a courtship display on 24 May 1978.

**Great Blue Heron.** Uncommon non-breeding resident. One or two often hunted from the log booms on the edge of the marsh. Three once crowded the western pond. They were present all year, with the fewest from March through June. The nearest heronry known to me was about 16 km south of the fill.

**Green Heron.** Uncommon summer resident and breeder, seen from 12 Apr through 15 Oct. A pair resided at the fill each summer. In 1981, one sat on a nest in a willow over one of the channels on 30 Apr. Two herons attended the nest for another week, and then deserted it. One of the first sight and nesting records of this species in the state was



Green Heron  
(J. Pruske)

here in the marsh in the 1940s (Higman and Larrison 1951: 197-210).  
 Mute Swan. Occasional introduced visitor. These were probably locally released birds, although there was an established population on Vancouver Island. Three were in the cove on 15 May 1980. Three appeared again on 29 Sep and 1 Nov 1980, and two were seen on 11 Dec 1980. They weren't recorded at all in 1981, but two with four young were on Union Bay on 27 May 1982 (SAN). The only other record for the year was of four on 27 Dec 1982. There was one on 8 Apr 1983, and a pair with two young was on the bay on 11 Jun 1983 (SAN).

Greater White-fronted Goose. Rare winter resident and spring migrant. Single birds spent the winter with the resident flock of Canada Geese during 1978-79 (Hunn 1982) and 1979-80. The 1979-80 bird, an immature, was last seen on 24 Apr 1980. One joined the Canadas on 30 May 1981. This was at the end of their normal migration period in western Washington.

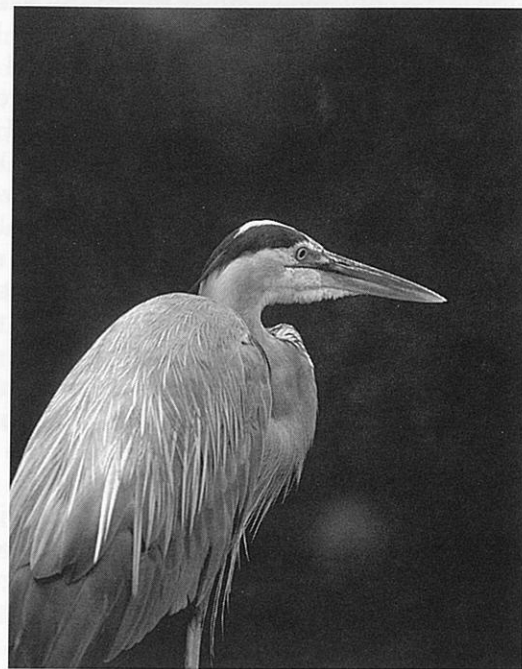
Snow Goose. Rare winter resident and spring migrant. One wintered with Canada Geese and a White-fronted in 1978-79 (Hunn 1982). A flock of 60 flew over, from south to north, on 19 May 1982.

Canada Goose. Abundant winter resident, and common summer resident and breeder. Non-resident subspecies were rare winter visitors and spring migrants. There was an introduced, non-migrating flock that moved about on Lake Washington, probably of the subspecies *moffittii* (Hunn 1982). Numbers grazing on the fill varied up to 250. They nested on the peat islands just off the fill. A pair nested for three years on a beaver lodge along the south channel. The flock was often joined by one or more domestic-type geese, with which they sometimes hybridized, and occasionally by a White-fronted or Snow Goose. On 20 Dec 1982 and 19 Jan 1983, they were joined by a Canada Goose of the *minima*

subspecies. D. Paulson and D. Beaudette saw two flocks of about 290 birds of the subspecies *parvipes* flying north on 16 Apr 1983 (DB).

Wood Duck. Rare visitor. There were five records: single males on 2 May 1979 and 22 May 1980, one in flight on 9 Jul 1980, one on 9 Aug 1983 (F. Krause pers. comm.), and one male on 2 Sep 1983 (DB). They formerly nested in the trees just southwest of the fill (Higman and Larrison 1951: 79), but were not recently known to breed on Lake Washington. The three birds I saw were quite wary, but the September bird was very tame and allowed close approach. The status of this species in Seattle was complicated by the presence of individuals that had escaped from local captive stocks.

Green-winged Teal. Abundant winter resident from September until the middle of May, and an occasional to uncommon summer visitor from



Great Blue Heron  
(C. Escott)

mid-May through August. In winter, flocks of up to about 60 were found on the ponds and in the more sheltered inlets of the bay. Green-wingeds have nested elsewhere in the county, but not at the fill. Most summer records are of one or two birds. Since the 1978-79 season, one or two male "Common Teal," *A. c. crecca*, the nominate Eurasian subspecies, have wintered each year with the "Americans," *A. c. carolinensis*. Their earliest arrival date was on 11 Dec, with latest departure on 26 Apr.



American Black Duck. Occasional introduced visitor. A male appeared on and off from 29 Dec 1979 through 10 Jun 1980, and again on 7 Nov 1981. All western Washington occurrences of this species were assumed to be from the small introduced population in Snohomish County (Hunn 1982).

Mallard. Abundant resident and breeder. There were usually around 40 in the winter, although there were 200 on 24 Oct 1982. The earliest young were on 19 Apr 1981, within the next week in other years, and continued to appear until the beginning of July.

Northern Pintail. Uncommon visitor, mostly in winter; records for all months but March. A fourth of the sightings, and the largest numbers, occurred in December. The high count was four males and three females on 27 Dec 1982. A male molting into basic plumage 2-4 Jul 1983 was the only mid-summer record (SAN, D. Paulson pers. comm., DB).

Blue-winged Teal. Common resident from late April to the end of June, uncommon after June through the end of the summer. The earliest sighting was on 22 Apr 1980. Blue-wingeds were thought to be mostly gone from King County by mid-August (Hunn 1982). The highest numbers were in the spring of 1980, with 20 males and six females on 30 and 31 May. The high numbers in 1981 were 13 males and four females on 28 May and 14 males and three females on 2 Jun, while there were even fewer in 1982, with a high of six males and two females on 14 May. Males usually outnumbered females three to one. There were no records of breeding at the fill, although there were a few elsewhere in the county. These and Cinnamons showed a strong preference for the ponds, and were rarely found in the bay.

Cinnamon Teal. Common resident from mid-April to late June, uncommon from July through September, rare winter visitor. The high numbers were five males and five females on 15 Apr 1981. Blue-wings were about four times more common than Cinnamons in the spring. Over the season, male Cinnamons outnumbered females two to one. A single male appeared on 16 Mar 1981. It was gone the next day, and the species wasn't seen again until the normal arrival date of 13 Apr. There were no breeding records. This species more often lingered into September than the other, and teal records through 22 Sep were likely to be Cinnamons (Hunn 1982). A female-plumaged bird in the west channel on 11 Dec 1982 was the only winter record (DB).

Northern Shoveler. Common winter resident, sometimes abundant, and uncommon summer resident and breeder. About 30 usually wintered, with a high count of 65. Migrants left by the beginning of June. The sex ratio became skewed in April and May, with many more males seen than females. This was probably not due to incubation since there were

only three or four broods a year. A female was on a nest with ten eggs in the grassland on 13 May 1983 (DB). The earliest young appeared on 4 Jun 1982, and the latest seen were two on 27 Jul 1980. Shovelers were scarce from July until September, and wintering birds became common again in October. This was the only duck that preferred the extremely shallow ephemeral pond beside the bike path.

Gadwall. Abundant resident and breeder. This was the most numerous duck at all times of year. There were about 1000 present on 1 Jan 1983, and there were usually several hundred on the bay from November through January. Their numbers declined to 50 or fewer in May, and then rose with the addition of young after mid-June. This species nested in the grassland as well as on the islands, and I was often able to follow the progress of a nest from the first few eggs. The earliest nest I found held four eggs on 1 May 1982. Raccoons and crows preyed on the eggs, and dogs often flushed the incubating females. Nevertheless, many nests succeeded: there were at least six different broods on 6 Jul 1982. Young continued to appear until mid-July. Gadwalls were only discovered nesting in western Washington in 1967 (Larrison and Sonnenberg 1968), which made their abundance at the fill all the more remarkable.

Eurasian Wigeon. Rare to uncommon winter resident. While they were regular at Green Lake, two miles away, there were few records at the fill. In 1980, one male was in the flock of American Wigeons on 18 Feb (PM) and on six dates in March, and there were two males on 24 Mar. In 1981, there was one male on 5 Apr, one each on 20 Oct (DB) and 23 Dec, and two on 27 Dec. One was present on two dates in January and on six dates in February 1982. To my knowledge, no one has ever picked out a female at the fill, although these were seen occasionally at Green Lake.

American Wigeon. Abundant winter resident, rare summer visitor. Up to 300 grazed on the fill during the winter, or rested on the bay with the Gadwalls. Most were gone by May, but each year singles or pairs remained into the summer. The latest records were of a pair on 4 Jul 1981, and a male on 4 Jul 1983 (DB). There was no evidence of nesting. The earliest fall record was of two on 19 Aug 1980. They became common again in the latter half of September.

Canvasback. Uncommon winter resident from 1 Oct through 8 May. These were usually found in the cove with other diving ducks, but occasionally visited the ponds. Females outnumbered males three to one overall. The largest number was 17 on 24 Oct 1982.

Redhead. Rare visitor. S. Atkinson saw an adult male in the cove in mid-April 1981 (pers. comm.). This species was found regularly during the fall in the early 1970s, and at that time seemed to be increasing in the



Seattle area (Krause 1975).

**Ring-necked Duck.** Uncommon winter resident, rare summer visitor. They appeared in numbers after 25 Nov, although there were sightings on three dates in September and on seven dates in October. A few singles and pairs usually stayed on after mid-April, with the latest date 22 May 1980. One female appeared 20 Jun 1980, and there was an eclipse-plumaged male present on 30 Aug 1981 (SAN). Females outnumbered males almost three to one. The largest concentration was between 27 Dec 1982 and 1 Jan 1983, with 65 on 27 Dec, 110 on 28 Dec, 50 on 30 Dec, and 72 on 1 Jan. Most records were of fewer than 15. Ring-neckeds were the *Aythya* species most often found in the ponds and channels. When in the bay, they preferred the shallow edges of the cove.

**Greater Scaup.** Occasional winter visitor. There were eight definite records of them rafting with the Lesser Scaups. The largest number was a flock of 90 that flew into the cove on 2 Apr 1983. The latest spring record was a pair on 27 Apr 1982.

**Lesser Scaup.** Common winter resident. There were usually 20 or fewer, although there were flocks of about 60 several times in early April. Scaups tended to feed farther out in Union Bay than the other diving ducks, and they were rarely found in the ponds. They were usually gone by mid-May, although one male lingered through 11 Jun 1982. The earliest fall scaup was on 11 Oct 1981.

**Oldsquaw.** Rare visitor. W. Beecher saw one on Union Bay on 26 Mar 1981 (SAN).

**Surf Scoter.** Rare visitor. This duck appeared twice on Union Bay: an adult male on 11 Feb 1980, and an immature male on 7 Oct 1980.

**Common Goldeneye.** Uncommon winter resident, and rare summer visitor. They were found from mid-November to early April. The high count was six on 4 Feb 1980. Females outnumbered males three to one. There were two records for June: a female from 5-9 Jun 1981, and an immature male from 14-26 Jun 1983 (DB).

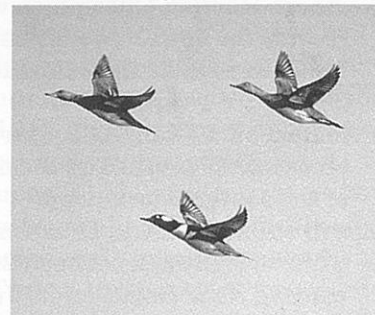
**Barrow's Goldeneye.** Rare visitor. There was one record of a female with a completely yellow bill on 21 Jan 1981.

**Bufflehead.** Abundant winter resident and occasional summer visitor. Winter birds arrived in mid-October and left by the end of May. Numbers up to 80 were regular through the winter until April, when they sometimes increased dramatically. There were 188 on 10 Apr 1983, of which 106 were in female plumage. There were 305 on 13 Apr 1983 (DB). During the first half of May female-plumaged birds outnumbered adult males five to one. The latest spring adult male was on 19 May 1982. Female-plumaged birds sometimes appeared in the summer. One stayed until 15 Jun 1981, and another was seen 16 Jun 1983. A male on 21

Jun 1982 was just beginning to molt from definitive alternate plumage into basic (DB). In 1980, one in female plumage was present 29-30 Jun, and 30-31 Jul. Another appeared 12 Aug 1982, and two were there on 29 Sep 1983.

**Hooded Merganser.** Uncommon winter resident, rare summer resident and breeder. Wintering birds were recorded between 19 Oct and 5 Apr, in numbers up to 15. They were most numerous from November until mid-February, and males outnumbered females three to two. A female was present on 2 May 1979, but they apparently did not breed until 1982, when there was a female 17-22 Apr and 4 Jun, and a male on 9 May. On 10 Jun a female and eight tiny young appeared on the south-eastern pond. The closest trees suitable for nesting were in the northeast corner, deep in the marsh, so the family must have traveled some distance to reach the pond. The female kept her brood in the pond through 12 Jun. On 16 Jun, all nine were in the west channel. On 23 Jun, the female and three young were back in the pond. One of the young was in the west channel on 29 Jun trying to follow a brood of Gadwalls, whose mother kept driving it away. There were no further sightings of this species that summer. In 1983, there was a female on 13 Apr, and one with six young was found in the same pond from 30 May to 6 Jun (SAN).

Hooded Mergansers (D. Paulson)



**Common Merganser.** Occasional winter visitor. While there have been several hundred at a time at Green Lake in the winter, they visited the bay on only 13 dates from November to February, no more than three birds at a time, and all males.

**Red-breasted Merganser.** Rare spring migrant on Union Bay. There was a female 5-8 Apr, a male on 11 Apr, a pair on 18 Apr, and a male on 27 Apr, all in 1982.

**Ruddy Duck.** Abundant winter resident, occasional summer visitor. Winter birds started to arrive in September, and numbers usually peaked at about 300 in January. At the beginning of January 1983, there were about 500, most of them rafting in the cove. By April, females outnumbered males three to one. Most left by the beginning of May, although in 1982 a single female remained until 31 May. Although Ruddies nested in a few places in western Washington, summer birds were scarce here: a male was seen 5-26 Jul 1980, two males and one female on 5 Aug

- 1982, a female on 12 Aug 1982, and a male 19-29 Aug 1980.
- Turkey Vulture. Rare visitor. D. Boulton saw one overhead on 7 May 1983 (SAN).
- Osprey. Rare summer visitor. Single birds were reported on 23 May 1980 and 18 Jun 1979 (SAN), and one flew over, calling, on 31 Jul 1980.
- Bald Eagle. Occasional visitor. There were single adults on 20 and 23 Feb 1982 and 28 Feb 1983, a subadult on 9 May 1982, an adult and a subadult on 14 May 1983 (DB), an adult on 20 May 1983 (seen by I. and C. Brown, D. Paulson pers. comm.), an adult on 31 May 1981, and subadults on 31 Aug 1982 and 28 Oct 1981. Most were in flight, although a few perched in the tall cottonwoods on the south side of the bay. Bald Eagles were increasingly common in Seattle during this period and were known to nest along the shores of Lake Washington.
- Northern Harrier. Uncommon winter visitor, rare in summer. There were records for one or two immatures on 29 dates from 13 Sep to 10 Feb. There were also single immatures present on 20 Apr 1982, 14 Jul 1980, 25 Jul 1981 (SAN), and 19 Aug 1980. The only adult harrier was a female on 10 Jan 1982. Harriers hunted low over the grassland, and occasionally perched on the metal posts that protruded from the middle of the southeastern pond.
- Sharp-shinned Hawk. Occasional winter visitor, rare in summer. There were 12 sightings between 29 Oct and 19 Apr, and one of an immature chasing Rock Doves on 20 Jun 1983. Sharp-shinneds usually perched in the alders and cottonwoods at the northeast corner of the fill.
- Cooper's Hawk. Uncommon winter visitor. There were 38 sightings between 13 Oct and 2 May. There were two on 13 Feb 1981, and three on 2 Jan 1982. Immatures outnumbered adults three to one. Like the Sharp-shinneds, these frequently perched in the trees in the northeast corner, but they also sat atop the utility pole in the middle of the fill, which the Sharp-shinneds never did. On one occasion, one swooped at a covey of California Quail and missed. Another time, one flushed off the ground in the middle of a thicket of Scot's broom where it had been eating a male Green-winged Teal.
- Northern Goshawk. Rare winter visitor. There were several sightings in the winter of 1981-1982. E. Hunn saw one 18 Oct (SAN) and an immature male on 11 Dec (pers. comm.), and I saw one on 16 and 23 Dec and 3 Feb. S. Atkinson saw an adult perched in the cottonwoods in the northeast thicket in mid-March (pers. comm.). M. Donahue saw what was probably the same bird in the Washington Park Arboretum, south of Union Bay, on 7 Nov (SAN).
- Red-tailed Hawk. Uncommon winter visitor. One or two flew over or perched in the trees along the cove on 35 dates from 25 Sep to 31 May.

- About half were adults. Although Red-taileds have nested in the city about 1.6 km from the fill (Hunn 1982), I had no summer records.
- Rough-legged Hawk. Rare visitor. One flew over on 3 Feb 1982. Habitat for this grassland bird was scarce in Seattle, and city records were few.
- American Kestrel. Occasional spring and rare summer visitor, uncommon fall resident. There were six spring records for single birds of both sexes from 22 Feb to 23 Apr. P. Mattocks saw a male on 14 Jul 1983 (pers. comm.), for the only summer record. There were 19 fall records between 31 Aug and 25 Nov. Most of these were single males, with single females on two dates, pairs on two dates, and one male and two females on 4 Sep 1982 (DB). On 17 Oct 1980, a male was plucking a Savannah Sparrow atop one of the steel towers by the parking lot. These towers and the utility pole in the middle of the grassland were their preferred perches.
- Merlin. Occasional winter visitor. Most sightings were in October, with one each in November, December (S. Atkinson pers. comm.), and March.
- Ring-necked Pheasant. Common introduced resident and breeder. The size of the fill population was probably 10-20 birds, although these were hard to see in the tall grass. The earliest nest contained one egg on 11 Apr 1982. The earliest young were seen on 23 May 1983. Crows often found pheasant nests and scattered the eggshells around the fill.
- California Quail. Common introduced spring and summer resident and breeder, uncommon fall and winter. Two or three coveys frequented the blackberry tangles on the edges of the fill. Young were occasionally seen from 11 Jul to 29 Sep.
- Virginia Rail. Uncommon resident and breeder. They were heard all year, although least often from November to March. It was hard to judge the size of the population, but they called from every little stand of cattails. At least six answered a tape recording on 31 Aug 1980 (PM). Chicks have been seen as early as 10 May (1981; SAN), and I saw one on 26 Jul 1980.
- Sora. Uncommon summer resident and breeder, rare in winter. I recorded them 20 times, compared to 120 for Virginia Rails. However, I actually saw them almost as often, so they may be equally numerous, at least in the summer, just quieter (E. Hunn pointed this out to me). There were records of one or two from 27 Apr to 2 Oct, and there were young after 12 Jul. On 3 and 28 Feb 1982, single Soras sang. They may have wintered more regularly than these records show.
- American Coot. Abundant winter resident, common summer resident and breeder. From September until May, coots were overwhelmingly numerous. There were 1000-2000 from December 1982 through February 1983. Most mixed with the Gadwalls in the cove and open water of the



- bay. Coots nested all over the marsh, and also nested in the two deeper ponds as the vegetation grew up around them in the last few years of my census. W. Hill had found 14 nests as of 27 May 1980 (pers. comm.), which was also the earliest date for chicks.
- Sandhill Crane. Rare visitor. Two flew over, calling, on 12 Oct 1980. This was one of six records for the county, with two other records also in 1980 (Hunn 1982).
- Black-bellied Plover. Rare spring and fall migrant. Singles visited the ponds 6 and 9 (SAN) Apr 1983, and 5 May 1980, and there were two on 14 May 1979 (SAN). There were three records for fall: single birds on 1 and 8 Aug 1983 (both SAN), and in the first week of September 1983 (S. Atkinson pers. comm.).
- Lesser Golden-Plover. Rare migrant. A most unexpected spring bird was seen on 6 May 1979, and a juvenile appeared on 14 Sep 1981 (both SAN). [It was not recorded whether these sightings pertained to *Pluvialis d. dominica* or *P. d. fulva*, subsequently accorded full species status by the AOU.]
- Semipalmated Plover. Occasional spring and fall migrant. There were six spring sightings, between 30 Apr and 18 May, and seven in the fall, from 22 Jul through 4 Sep.
- Killdeer. Common resident and breeder February through October, uncommon resident November through January. The earliest nest held three eggs on 26 Mar 1983 (DB). The earliest chicks appeared on 18 Apr 1979. The nesting population was usually four or five pairs. Nests were often destroyed by crows, people, or trucks, and were sometimes replaced on the same spot within a few weeks. Winter Killdeer were usually fewer than ten, but there were 50 on 2 Jan 1982.
- American Avocet. Rare visitor. One spent the day at the southeastern pond on 28 May 1980. It was found at 13:00 by P. Mattocks. I watched it until 18:30, but it was gone by 07:00 the next day. There was only one other record for the county (Hunn 1982).
- Greater Yellowlegs. Occasional spring migrant, uncommon fall migrant. The spring sightings were from 11 Apr to 27 May. Fall migrants appeared from 27 Jun to 17 Oct. A single bird on 19 Jun 1980 falls neatly in between. After 9 Aug, there were no sightings until 30 Aug. The largest numbers were five on 27 May 1982 and 14 Jul 1982 (DB).
- Lesser Yellowlegs. Occasional spring migrant, uncommon fall migrant. Spring migrants appeared one or two at a time from 16 Apr to 14 May (1983; SAN). Fall migration ran from 25 Jun through 2 Sep. One was also present 13-15 Jun 1981. Fall sightings were in three groups: up to four a day from 25 Jun to 16 Jul, more frequent and numerous sightings from 25 Jul to 15 Aug, and single birds on five dates from 24 Aug to 2

- Sep. The high count was nine on 4 Aug 1982. Lessers were half as numerous as Greater in spring migration, and twice as numerous as Greater in the fall.
- Solitary Sandpiper. Rare spring migrant, occasional fall migrant. Individuals visited the ponds on six dates from 30 Apr to 19 May. There were 20 fall records between 12 Jul and 3 Sep. All were lone birds except for two on 9 Aug 1980 (SAN).
- Spotted Sandpiper. Common summer resident and breeder, from 5 May to 9 Sep. The fill supported three or four nesting pairs, and up to 15 birds a day during migration in late May. Nesting began during the first week of June: the earliest nest held four eggs on 9 Jun 1980. Hatch dates were from 1 to 23 Jul. The nests were in the grass near the ponds, and the young hid in the loosestrife around the ponds until they could fly. Although Spotted were regular in a few other places on Lake Washington in winter, there were no winter records at the fill.
- Whimbrel. Rare visitor. S. and M. Horn found one on 3 May 1981 (SAN).
- Semipalmated Sandpiper. Rare spring and uncommon to occasional fall migrant. The only spring record was of a single, breeding-plumaged bird on 8 May 1982. Fall migration dates were from 29 Jun to 10 Sep. Most records were from 1980, when they were seen on 19 dates from 29 Jun to 31 Aug (PM), with none between 12 Jul and 29 Jul. Ten on the edge of the southeastern pond on 30 Jul (D. Paulson pers. comm.), six on 9 Aug, and five on 12 Aug (PM) were the highest numbers recorded. During the other years, all records were of single birds except for two on 3 Aug 1982 (DB). Two sightings in 1981 were on 17 and 25 Jul (both SAN), seven records for 1982 were from 17 Jul to 4 Aug (DB), and seven for 1983 (all DB) were from 17 Jul to 10 Sep. An adult male and female that were at the fill on 2 Jul 1975 are now in the collection of the Burke Museum, University of Washington. These are two of the only three Semipalmateds that had ever been collected in western Washington (D. Paulson pers. comm.).
- Western Sandpiper. Common spring and abundant fall migrant. Spring birds visited the ponds from 9 Apr to 27 May, although most were found between 18 Apr and 11 May, in numbers up to 33 a day. There was also a single bird on 6 Jun 1983 (DB). Fall birds dated from 23 Jun (1979; SAN) to 22 Sep, with most between 4 Jul and 15 Aug. High numbers of juveniles moved through in 1980 and 1983, with peaks of 130 on 5-6 Aug 1980 and 129 on 8 Aug 1983 (DB). In contrast, the peak for 1982 was of 75 adults on 11 Jul, and the highest number of juveniles seen was 11 on 15 Aug.
- Least Sandpiper. Common spring and fall migrant, occasional winter visitor. Up to 30 spring migrants a day were seen from 16 Apr to 16 May.



Spring migration went a little later in 1983, with four birds on 21 May 1983 and one on 25 May 1983 (both DB). Fall migrants were seen from 21 Jun to 26 Sep, with 30 again the high count. An adult remained late with the juveniles in 1982. It was seen 10 Aug through 4 Sep, and was undergoing wing molt. There were also records of one on 9 Oct 1982 (DB) and of two on 8 Nov 1982. A single bird was in the company of Killdeer on 9 Jan and 5-9 Feb 1982.

**Baird's Sandpiper.** Rare fall migrant. E. Hunn found the only adult on 7 Jul 1981 (SAN). Single juveniles were seen on 6 and 12-16 Aug 1980, and on 12 (DB) and 31 Aug 1983.

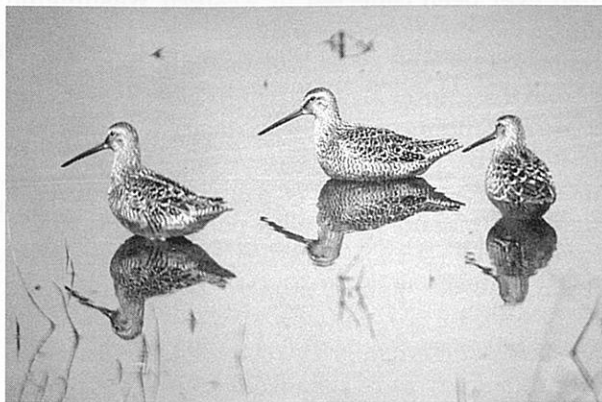
**Pectoral Sandpiper.** Rare spring and uncommon fall migrant. One on 12-13 May 1983 was the only spring record (SAN, DB). Fall migrants were seen from 28 Jul (DB) to 24 Oct. Records were concentrated between 4 Sep and 7 Oct, with a high count of five on 9-10 Sep 1982.

**Dunlin.** Occasional winter visitor, sometimes in large numbers, and occasional spring migrant. Winter Dunlin often came in flocks: 250 roosting on a peat island on 21 Dec 1982 was the high count. There were records for 15 days from 24 Oct to 16 Mar. Spring migrants in breeding plumage were seen on 19 days from 5 Apr to 24 May, up to four a day.

**Stilt Sandpiper.** Rare visitor. One was found by J. O'Connell on 30 Aug 1981. It remained until 8 Sep, and on that day was joined by a second one (SAN). This was the third county record of this species (Hunn 1982).

**Short-billed Dowitcher.** Rare spring and occasional fall migrant. One on 24 Apr 1980, two on 7 May 1980 (SAN), and one on 25 May 1982 were the spring records. Seven fall records were from 5 to 27 Jul, for one or two a day. There was also one on 4 Sep 1982 (DB).

**Long-billed Dowitcher.** Uncommon spring and common fall migrant, rare winter visitor. Spring birds were usually fewer than ten a day, and appeared between 25 Apr and 25 May, but often for only one week dur-



Long-billed  
Dowitchers  
(D. Paulson)

ing this period. On 13 May 1981, 200 flew in from the south. The flock circled the southeastern pond twice, 50 landed, and the rest flew off to the north. Fall migration was from 4 Jul to 15 Oct, with few records from 15 Aug to 15 Sep, and up to 29 a day. The only winter record was of two on 21 Dec 1982.

**Common Snipe.** Uncommon winter resident, common spring and fall migrant, rare summer visitor. Snipe could be flushed from the grass from late July to mid-May. There were usually one or two from late October through March, but there were eight on 9 Dec 1980. I saw them almost daily in April, early May, and August through October. Ten on 21 Sep 1980 was the high count. Summer records were of one on 25 and 30 May 1983 and 29 Jun 1983 (all DB), and one on 7 Jul 1981 (SAN).

**Wilson's Phalarope.** Uncommon spring visitor. Up to four visited the ponds from 5 May to 12 Jun. Of the sighting dates where sex was noted, there were 15 females and 11 males.

**Red-necked Phalarope.** Rare spring and fall migrant. A flock of 65 twirled on the southeastern pond on 20 May 1980, a rainy, blustery day. They were half each male and female, and all but two females were gone by the next day. A male was in the company of Wilson's Phalaropes on 24 May 1982, and a male was seen on 1 Jun 1983 (DB). G. Karges saw a male in breeding plumage on 22 Jul 1982, E. Hunn saw one in flight on 7 Aug 1980, and F. Krause saw one in winter plumage on 9 Aug 1983 (all pers. comm.).

**Bonaparte's Gull.** Rare spring and fall migrant. Although this species was common elsewhere in Seattle, there were only five records at the fill. There were six on 16 Apr 1981, one on 9 May 1980, 14 on 4 Aug 1980, one or two in the first week of September 1983 (S. Atkinson pers. comm.), and seven on 18 Oct 1980.

**Mew Gull.** Uncommon winter resident. Flocks of up to 60 birds were found sporadically from 31 Aug through 22 Apr. They were sometimes absent for several weeks at a time during this period.

**Ring-billed Gull.** Uncommon visitor, rare in spring. Most records, for up to ten a day, were in September and October, with few sightings from March to the end of July.

**California Gull.** Common resident from June through October, uncommon November through February, and rare visitor March through May. Most summer records were of immatures.

**Herring Gull.** Uncommon winter visitor, September to mid-April.

**Thayer's Gull.** Occasional winter visitor, rare in spring. An adult was perched on a peat island on the extremely late date of 31 May 1982.

**Glaucous-winged Gull.** Abundant winter and common summer resident. In winter, there were up to 50 present. Many roosted on the log booms

- across Union Bay with the cormorants and crows. Numbers were much lower in the summer, but at least one or two were usually present. In the summers of 1984 and 1985, L. Erckmann observed a nest on the pilings on the south side of Union Bay, by Foster Island (P. Mattocks pers. comm.).
- Caspian Tern. Occasional but increasingly common summer visitor. Records were from 2 Jun to 10 Aug. While four 1980 occurrences were all of single birds, 1982 was a boom year. On 10 Jul of that year, 12 were feeding over the bay, and there were five other sightings of up to three terns a day. During 1983, at least one was present 8-17 Jul (SAN). These were not known to nest in the Seattle area, but seemed to be turning up with increasing frequency (Hunn 1982).
- Common Tern. Rare fall migrant. Like Bonaparte's Gulls, they were common elsewhere in Seattle but did not linger at the fill. There were three records: 18 on 19 Aug 1980, two on 2 Sep 1980, and 25 on 13 Sep 1982.
- Black Tern. Rare visitor. B. Mulligan saw one over a pond on 8 Jun 1980 (SAN).
- Rock Dove. Common introduced summer and fall resident, uncommon visitor winter and spring. Up to 50 fed on the fill from June through November. The rest of the year they were fewer, more sporadic, and usually seen flying over.
- Band-tailed Pigeon. Uncommon spring, summer, and fall visitor, absent from 17 Oct to 23 Jan. Sightings peaked from late May to mid-June, and again from mid-September to early October. Most were of birds in flight, although they occasionally landed in the northeast alders. The high count was ten.
- Mourning Dove. Uncommon summer visitor. One or two flushed from the grass between 6 May and 21 Oct; high count was five on 25 Sep 1981.
- Barn Owl. There were two fall and two spring records. On 4 and 16 Sep 1980, C. Wentworth and I saw one fly from the northeast thicket at dusk. E. Spragg reported one on 26 Mar and two on 4 May, both in 1981 (SAN). They were thought to have nested under the NE 45th Street viaduct and at Husky Stadium, within 800 m of the fill (P. Mattocks pers. comm.). The true status of this species remained a mystery: few people who ventured out on the fill at night contributed bird records.
- Snowy Owl. Rare visitor. E. Spragg found one from 3 to 9 Mar 1979 (SAN). One or two were often reported at the fill during the winter of 1973-74 (Krause 1975), but they have been rare in Seattle since.
- Short-eared Owl. Occasional fall and rare spring visitor. There were records for single owls from 25 Sep to 27 Dec. Most sightings were in October and November, and birds on 12 Apr 1980 and 20 Apr 1982 were the only spring records.

- Common Nighthawk. Rare fall migrant. There were seven records of one to four birds at a time from 11 Aug (DB) through 16 Sep. One of these sightings was at dawn, all the others were at dusk. The scarcity of records may have been due to a lack of observers in the twilight hours, although the Seattle nighthawk population seemed to have decreased alarmingly (Hunn 1982). They nested on the fill in the early 1970s (Krause 1975).
- Black Swift. Occasional summer visitor. Flocks of up to 20 were seen feeding over the fill, usually on heavily overcast days. There were records on ten dates from 26 May to 14 Aug (DB).
- Vaux's Swift. Uncommon summer visitor, with early and late sightings of one on 9 Apr 1983 and of seven on 10 Oct 1981 (both SAN). Most were in May and June. This species nested and roosted in chimneys about three kilometers north of the fill, and was seen by the hundreds there in migration. The largest numbers at the fill were 50 on 22 Sep 1982, and 54 on 13 Sep 1983 (DB). There were usually fewer than ten a day.
- Anna's Hummingbird. Occasional visitor. There was one record each for December and January. Four birds on three dates in July 1982 were feeding on purple loosestrife.
- Rufous Hummingbird. Rare summer visitor. One in April and one in July were the only records for this species.
- Belted Kingfisher. Uncommon visitor. There was at least one record for every month except March, always for singles or pairs. Most records were for October and November.
- Red-breasted Sapsucker. Rare visitor. J. Rienzo (pers. comm.) saw one in the northeast thicket in early November 1982.
- Downy Woodpecker. Uncommon resident and probable breeder. Up to three were recorded all year, usually in the northeast-corner grove.
- Northern "Red-shafted" Flicker. Common winter resident, uncommon summer visitor. Most records, for up to four a day, were from late Sep-



Downy Woodpecker  
(I. Ulsh)



tember to early May, with few in early summer, and none in August. A female of the "Yellow-shafted" race was seen on 19 Apr 1981, and one showing mixed characteristics was present 5 Feb 1982.

Olive-sided Flycatcher. Rare visitor. On 20 May 1981, one perched on the tip of a willow over the southwest marsh.

Western Wood-Pewee. Occasional spring migrant. There were records from 3 May to 18 Jun, usually for one or two birds. In 1980, an unusually large number occurred after 22 May: one or two were present each day, with six on 6 Jun.

Willow Flycatcher. Uncommon summer resident, may breed. Records dated from 31 May to 12 Jul. One called from a snag in the northeast marsh nearly every day from 16 Jun to 12 Jul in 1980. In 1983, one sang daily in the same area from 26 Jun to 4 Jul (DB). There were fewer records in the other years.

Say's Phoebe. Rare spring migrant. Single birds were found on 12 Mar 1983, 21 Mar 1980, and 28 Mar 1982 (all SAN).

Western Kingbird. Rare summer visitor. There were six records between 23 Apr and 14 Aug (none in June), for one or two birds at a time.

Eastern Kingbird. Rare summer visitor. One perched on a stake in the grassland on 17 Jun 1982. On 25 Jun and 6 Jul 1982, single birds were reported anonymously to the local rare-bird alert (P. Mattocks pers. comm.). There were few other Seattle records of this species.

Horned Lark. Rare visitor. G. Karges saw one in September 1980 (pers. comm.).

Purple Martin. Rare spring and occasional fall migrant. One male flew over on 23 May 1980, F. Krause saw one on 4 Aug 1979 (P. Mattocks pers. comm.), and four were reported on 17 Aug 1983 (P. Mattocks pers. comm.). Fall records were more frequent in 1977 and 1978, of up to five a day between 16 Aug and 4 Sep (all P. Mattocks pers. comm.).



Tree Swallows  
(C. Escott)

Tree Swallow. Common summer resident and breeder. The earliest record was of one on 21 Feb 1983 (DB). The latest record was of an immature on 19 Aug 1980. They were most plentiful from April into early July, with up to 50 feeding over the bay and fill. Nest boxes were placed along the channels in 1982, and many were used that year and in 1983. The young fledged in mid-June.

Violet-green Swallow. Abundant spring migrant, common summer resident and breeder. Most records fell between 27 Feb and 26 Sep, although an early bird arrived on 9 Feb 1980 (SAN), and a late one was seen on 10 Oct 1981 (S. Atkinson pers. comm.). These could be abundant in April: there were over 100 on four dates in that month. They usually nested on buildings near the fill, although there was one family in a Tree Swallow box in 1982. Young appeared in the last week of June. Violet-greens were scarce after July.

Northern Rough-winged Swallow. Occasional summer visitor. The earliest record was 16 Apr 1982. Most records were of one or two from April through June. Single birds on 14 Jul 1982 (DB) and on 2 Aug 1982 were the only records outside that period.

Bank Swallow. Rare spring and fall migrant. A. Richards found one on 24 Apr 1981 (SAN), I saw one from 30 May through 4 Jun 1980, and D. Paulson heard one overhead on 4 Sep 1980 (pers. comm.).

Cliff Swallow. Abundant summer resident, from the first week of April to mid-August. The earliest arrival was on 30 Mar 1980 (SAN), and the latest record was of two on 3 Sep 1980. They nested on the nearby athletic buildings and stadium, and on the freeway overpass across the bay. The young fledged in mid-June and numbers increased to about 250 in early July.

Barn Swallow. Abundant summer resident and breeder. Most records were from 10 Apr to 11 Oct, with early and late sightings on 1 Apr 1981 and 3 Nov 1981 (both SAN). A pair raised two broods each year in a nest under the west channel footbridge. The young began to fledge in the last week of June. Normal high counts were of 100-200 in July, but in 1980, C. Wentworth discovered a night roost in the southwest marsh. It lasted from at least 14 Aug to 16 Sep, and peaked at about 10,000 swallows from 20-23 Aug. All of them packed into a small patch of cat-tails at dusk, after first circling the marsh in a noisy, swirling cloud.

Steller's Jay. Occasional winter visitor. Four on 21 Sep 1980 was the earliest record and four on 22 Apr 1982 was the latest. Records on 22 other dates were for one or two at a time. Of these, nine records were in October, and six were in February.

American Crow. Abundant resident. The fill and adjacent playing fields were a gathering site on winter afternoons for groups on their way to a



night roost, and this was the source of high numbers of up to 200 crows. The winter daytime population was of about 30, with fewer from April to August.

**Black-capped Chickadee.** Common resident and breeder. They nested in snags in the northeast thicket. There were usually fewer than 10, but there were 20 on 30 Sep 1980.

**Bushtit.** Common resident and breeder. Nesting started in early March and the young fledged beginning in mid-April. Three flocks containing up to 60 birds were often present during the winter.

**Bewick's Wren.** Common resident and breeder. Usually just one or two scolded from the thickets, but there were sometimes up to six present. I saw a fledgling on 17 Jul 1982. They most often sang from the northeast thicket.

**Winter Wren.** Rare winter visitor. There were single birds in the blackberry tangles on 21 Oct 1980, 2 Jan 1982, and 4 Apr 1982.

**Marsh Wren.** Common winter resident, abundant summer resident and breeder. They started singing at the beginning of February, and so became very noticeable then. The population increased in April, and the first young appeared in mid-May. Numbers declined in August. There were at least 15 wintering birds, and a summer population of more than 40.



Marsh Wren  
(I. Ulsh)

**Golden-crowned Kinglet.** Occasional winter visitor. Up to three fed in the alders on six dates in October, once each in November and December, twice in February, and once in April.

**Ruby-crowned Kinglet.** Uncommon winter resident, from 24 Sep to 28 Apr. There were usually just one or two, but sometimes up to five.

**Swainson's Thrush.** Rare visitor. Two on the late date of 29 Sep 1980 were the only ones recorded.

**Hermit Thrush.** Rare visitor. One was in the northeast thicket on 2 Oct 1981.

**American Robin.** Abundant resident and breeder, in numbers up to 100. They were generally scarcest in September and November, and most regularly abundant from mid-February through June. Nesting activity was evident in April, and the young fledged beginning in early May. Very few nests actually produced young: many that I observed had their eggs punctured, presumably by Marsh Wrens.

**Varied Thrush.** Rare visitor. On 15 Oct 1980, a male was perched in a willow, and the fresh, partially eaten remains of another were nearby in the grassland, for the only record.

**American Pipit.** Common spring migrant, uncommon fall migrant, and rare winter visitor. Spring migrants walked the pond edges from 5 Apr to 7 Jun, with high counts of up to 35 a day in the last two weeks of April. There were fewer records of fall migrants from 7 Sep to 27 Nov. Fall pipits were usually ten or fewer, but there were 30 on two September dates. The two winter records were of 18 on 2 Jan 1982, a day marked also by an unusual abundance of Killdeer, and of 12 on 11 Dec 1982 (DB).

**Cedar Waxwing.** Uncommon summer visitor May through October, rare winter visitor. Most sightings were from 29 May to 20 Jun. Summer records were of flocks of up to ten. Flocks were larger in winter: 25 on 7 Oct 1980, 45 on 2 Nov 1980, and 40 on 16 Feb 1983 were recorded.

**Northern Shrike.** Uncommon winter resident. One usually wintered at the fill, using the blackberry thorns and the barbed-wire fence next to the northern pond to impale its prey. They were seen from 9 Oct to 10 Apr. Most sightings were of singles, but there were two immatures and one adult on 15 Oct 1980, and two adults on 30 Oct 1980.

**European Starling.** Abundant introduced resident and breeder. Flocks of up to 350 frequented the fill. Numbers varied greatly from day to day, with no apparent seasonal pattern. The din of the fledglings began the last week of May.

**Solitary Vireo.** Rare migrant. One sang from the northeast thicket on 1 May 1981.

**Warbling Vireo.** Uncommon spring and rare fall migrant. Spring records

- for up to five birds were from 30 Apr to 24 May. Single birds were found 8 Aug 1982 and 31 Aug 1983. S. Atkinson saw three on the very late date of 29 Sep 1982 (SAN).
- Orange-crowned Warbler. Uncommon spring and fall migrant, rare winter resident. Records for up to five a day fell from 6 Apr to 21 May, and from 26 Aug (PM) to 9 Oct. In 1981, a single bird was found on 21 and 28 Feb (SAN) and on 12 Mar. S. Atkinson (pers. comm.) found one on 6 Dec 1981 that stayed through January 1982.
- Yellow Warbler. Common spring migrant, uncommon summer and fall visitor. These were regularly found in small numbers from 6 May to 5 Jun. Single birds were found each year on scattered summer dates through 22 Sep, but nesting was unconfirmed.
- Yellow-rumped Warbler. Common spring migrant, common to abundant fall migrant, occasional winter resident. From mid-March to mid-May, up to 20 were often found, with fewer "Myrtle" than "Audubon's" overall. They were most common during the last two weeks of April. The latest spring record was 21 May, and the first fall one was 15 Sep. Fall brought up to 50 a day through mid-October. A few were sometimes seen during the winter.
- Black-throated Gray Warbler. Rare spring and fall migrant. There was a male present on 25 Apr 1983, and T. Schooley saw one in early September 1980 (pers. comm.).
- Townsend's Warbler. Rare visitor. A single bird in the northeast alders on 13 Oct 1981 was the only one recorded.
- MacGillivray's Warbler. Rare spring and fall migrant. Singing males were found on 30 Apr 1981 (S. Atkinson pers. comm.), 3 May 1981 and 18 May 1982. T. Schooley saw one in early September 1980 (pers. comm.), and one was present on 21 Sep 1980.
- Common Yellowthroat. Uncommon summer resident and breeder. They were found from 17 Apr to 9 Oct. The breeding population was probably one or two pairs. Fledglings appeared from 8 Jul through August. Ten birds on 21 Sep 1980 was the high count.
- Wilson's Warbler. Common spring and rare fall migrant. Up to seven a day moved through from 30 Apr to 5 Jun. There were three fall records of singles on 26 Aug 1982, 25 Sep 1981, and 11 Oct 1981.
- Western Tanager. Rare spring migrant. There were three records, all of single males, on 27 Apr 1982, 13 May 1982, and 25 May 1981.
- Black-headed Grosbeak. Rare summer visitor. Singing males were in the northeast thicket on 9 May 1982 (S. Atkinson pers. comm.), 27 May 1981, 2 Jun 1979 (F. Krause pers. comm.), and 29 Jun 1982.
- Lazuli Bunting. Rare summer visitor. Several observers saw a male on 29 Jun and 9 Jul 1983 (SAN).

- Rufous-sided Towhee. Occasional winter visitor. Records were of singles from October to early February, with two on one date.
- American Tree Sparrow. Rare winter visitor. Single birds were found on 15 Oct and 7 Nov 1981, and on 11 and 15 Jan 1981.
- Vesper Sparrow. Rare visitor. T. Weir and S. Atkinson found single birds on 23 and 29 Sep 1981 (SAN).
- Sage Sparrow. Rare visitor. B. and P. Evans found one 17-19 Feb 1980 (SAN). This was the only county record, and the third for western Washington (Hunn 1982).
- Savannah Sparrow. Abundant summer resident and breeder. Earliest and latest dates were 18 Mar 1981 and 7 Nov 1980. The first fledglings appeared on 21 May (DB). They were most common from mid-April to mid-August, up to 100 birds a day. Numbers then decreased until mid-September to early October, when they increased again. A few sometimes wintered in other places in Seattle, but there were no winter records at the fill.



Savannah Sparrow  
(J. Pruske)

- Fox Sparrow. Uncommon winter resident. Records were from 30 Sep to 18 Apr, with few in March and April. All records were of one or two. One was singing on 28 Feb 1983.
- Song Sparrow. Common resident and breeder. They were most numerous in winter, up to 30 a day, and they could be scarce in late August. Young appeared after 1 May. I twice saw them feeding young cowbirds.
- Lincoln's Sparrow. Uncommon spring and fall migrant, winter resident some years. Up to ten a day were found from 30 Aug to 17 Oct. In the winter of 1980-81, three were often seen from November to mid-February. In 1981-82, there were two during the same period. Spring migrants came through from mid-March to mid-May, one or two at a time.



- White-throated Sparrow. Rare visitor. S. Atkinson saw one with White-crowneds on 4 Oct 1981 (SAN).
- Golden-crowned Sparrow. Common spring and fall migrant, uncommon winter resident some years. Up to ten associated with the White-crowneds from mid-April to mid-May. Fall migration was from late September to early November, and involved fewer birds than in the spring. Two immatures stayed through the winter in 1980-81, and one immature was present 30 Dec 1981, but not thereafter.
- White-crowned Sparrow. Common spring and fall migrant, uncommon summer resident and breeder, uncommon winter resident some years. There were up to ten from the beginning of April to the beginning of May, and fewer than five were evident through the summer. I usually saw young by the end of June. Fall migrants were present in flocks of up to 20 from September through mid-October. From November 1980 through mid-March 1981, there were up to ten, but I saw none in the other winters. Winter birds were subspecies *gambelii*, and summer breeders were *pugetensis* (P. Mattocks pers. comm.).
- Dark-eyed Junco. Occasional winter visitor from 21 Sep to 21 Apr. Most records were of five or fewer, but there was one record of 20.
- Lapland Longspur. Rare spring and uncommon fall migrant. A male appeared 6 Apr 1983, one to three were present 9-15 May 1981, and a female was seen 14 May 1983 (SAN). From one to four appeared on 17 dates from 9 Sep to 10 Nov.
- Bobolink. Rare spring visitor and fall migrant. Single males were found on 25 May 1979 (SAN) and 26 May 1981. A female was seen late on 2 Jun, and until 07:30 on 3 Jun 1980. Single fall birds (all SAN) were reported on 15 Aug 1982, 3 and 14 Sep 1981, and 10 Oct 1983. These were the only records for King County, and there were only two records for other sites in western Washington (P. Mattocks pers. comm.).
- Red-winged Blackbird. Abundant resident and breeder. Flocks of up to 50 males joined the starlings in the winter. Females returned in late February, and about 50 birds stayed to nest. Fledglings appeared in early June. A color-banded male returned to the same spring territory in 1980, 1981, and 1983.
- Western Meadowlark. Uncommon winter resident and rare summer visitor. A flock of up to 12 was usually present between 27 Sep and 21 Apr. Summer sightings were of singles on 16 May 1979, 22 May 1980, 11 Jun 1982, 20 Jun 1983 (DB), 4 Jul 1982 (DB), and 19-20 Aug 1980.
- Yellow-headed Blackbird. Uncommon spring and occasional summer visitor. From 16 Mar (1979; SAN) to 24 Jun, from one to eight were often found, usually at the edge of the southeastern pond. About a fifth of these were adult males. Summer records were of two on 29 Jun and

- three on 2 Jul 1982, singles on 8 Aug 1980 and 22 Aug 1982, and an immature on 26 Aug 1979 (PM).
- Brewer's Blackbird. Rare visitor. D. Beaudette and D. Paulson saw a female on 26 Mar 1983 (DB).
- Brown-headed Cowbird. Common summer resident and breeder. Up to 20 arrived as early as 16 Apr and stayed as late as 8 Sep. I saw fledglings fed by Song Sparrows at the end of June and the beginning of August.
- Northern "Bullock's" Oriole. Common spring migrant and uncommon summer resident and breeder. From 2 May to the end of June, up to four orioles brightened the cottonwoods. There were fewer records in July, but in 1982 there was at least one successful nest and I last saw one on 27 Jul.
- Purple Finch. Occasional winter visitor. Up to five visited the northeast thicket, from 1 Jan to 2 Mar.
- House Finch. Common summer resident and breeder, uncommon winter resident. They were found almost every day from mid-February to mid-October. There were usually fewer than ten until mid-May. Numbers increased to about 30 with the addition of young in July and August. They were seen less often and in smaller numbers through the winter, although there were 50 on 16 Feb 1983.
- Common Redpoll. Rare visitor. A flock of 28 fed in the birches along the west channel on 3 Feb 1982.
- Pine Siskin. Uncommon winter and rare summer visitor. Flocks fed in the alders from 13 Oct to 25 May. There were usually from 20 to 50 in a flock, but 300 flew out of the northeast thicket on 11 Dec 1981. Summer records were of one to three from 10-19 Jun 1982, one on 30 Jul 1980, and two on 8 Sep 1982.
- American Goldfinch. Uncommon winter resident, abundant summer resident and breeder. Winter for this species was from December through March, when up to 20 were present sporadically. Numbers increased steadily through the summer, peaking in September at up to 200 a day. A bountiful supply of thistles made the fill attractive.
- Evening Grosbeak. Uncommon spring migrant. All records were of birds in flight over the fill, up to 15 a day, from 20 May to 3 Jun.
- House Sparrow. Occasional introduced visitor. This species was common around the buildings just off the fill, but didn't venture away from them very often. The housing project on Union Bay Circle that was demolished in the summer of 1981 removed the main source of the wanderers, and the construction of the University's Center for Urban Horticulture there in 1984 probably brought them back again. In the meantime, they were most often found along the access road near the north pond, not on the fill itself.



## DISCUSSION

I collected records for 174 species of birds at the fill from 1979 through 1983. There are three groups among these that stand out as unusual: the large number of species of waterfowl and shorebirds; those species that were much more common in eastern Washington than in western; and the several species that were common elsewhere in Seattle, but were scarce or absent at the fill.

The fill hosted 29 species of ducks, geese, and swans, and 22 species of shorebirds, in these five years. Species that prefer salt water or rocky shore were mostly absent. The abundance of ducks was surely due to the mix of open and sheltered water, and to the proximity of the main stretch of Lake Washington. The number of shorebirds was also due to available habitat. Most species were seen only on the exposed mud around the receding ponds. Ephemeral ponds were even scarcer than grassland in King County, and they gave the fill its unusual numbers and variety of shorebirds.

Wilson's Phalarope, Bobolink, and Yellow-headed Blackbird were the most striking examples of eastern Washington species that were rare in western Washington but regularly seen at the fill. The phalarope and blackbird appeared often enough and in large enough numbers to suggest the potential for nesting. Bobolinks, appearing one at a time in migration, were recorded nowhere else in the county and only two times elsewhere in Washington west of the Cascade range. American Avocet, Black Tern, Say's Phoebe, Western and Eastern Kingbirds, Bank Swallow, and Vesper and Sage Sparrows are other species that were usual east of the mountains and unexpected visitors here.

The absence of coniferous trees and the dearth of woods in general explains the depauperate list of common passerines. There were no records for Chestnut-backed Chickadee, Red-breasted Nuthatch, or Hutton's Vireo, all of which were common in the Arboretum on the south side of Union Bay. Species typical of most of western Washington, such as Steller's Jay, Winter Wren, Golden-crowned Kinglet, Varied Thrush, Rufous-sided Towhee, and Dark-eyed Junco, were scarce. Numbers and variety of migrating passerines were poor compared to nearby wooded areas.

Two aspects of the fill contributed to the unusually long species list. Regular observation is one reason why such a small site has such a list. During spring migration, at least one bird-watcher visited every day and many were there on weekends. Coverage was less constant during other seasons, but I believe this may be the most thoroughly watched site in the state. The fill is in the city, easily accessed by public transport, bicycle, car, or on foot from campus and the surrounding neighborhoods. Also,

most of the fill was open grassland, with long sight lines, so that I and other lone female bird-watchers could feel reasonably safe.

Habitat diversity is the other, perhaps more important reason for the long species list. In about 40 ha, there were grassland, shrubs, deciduous woods, marsh, mud flat, and a variety of types of fresh water: open, sheltered, shallow, and deep. Each of these patches of habitat was apparently large enough to attract and, in some cases, sustain those species that prefer it.

The Montlake Fill is significant beyond its long species list for those who are interested in urban wildlife. Its history and bird life have been so well documented that we can attempt to draw correlations between the human actions on the site and the changing avifauna. The birds of the site have been catalogued repeatedly over the decades as it changed from marsh to dump to grassland. When Larrison studied the marsh in 1939, and Miller and Curtis wrote about the birds of the campus in 1940, only a small part of the marsh had been filled. The filling had accelerated by 1951, but Higman and Larrison still wrote of seeing several bitterns in a typical day's canoeing. By 1975, the filling was over and Krause saw many of the same birds that I did, although a careful comparison of his species accounts with mine reveals that the avifauna of the site continued to change.

A few examples from Krause's species accounts are illustrative of these changes. Northern Shovelers and Hooded Mergansers did not nest in the early 1970s, but Cinnamon Teal did. Redheads were seen several times each fall, Bald Eagles were rare, there was only one record of Solitary Sandpiper, and Wilson's Phalarope had only just begun to appear in the spring. Common Mergansers, Common Terns, and Common Nighthawks were all actually common, the nighthawk even nesting on the fill, and there was only one record of Caspian Tern. There were no records of Anna's Hummingbird, or Eastern and Western Kingbirds. Horned Larks, Purple Martins, and Snow Buntings were more common than they were during my census; Common Yellowthroats were less so. Brewer's Blackbirds were common during fall migration, but I had only one spring record during my census.

The most obvious physical changes in the site from 1975 to 1985 were the increase in woody plants in the grassland, and the development of vegetation in and around the ponds. The much maligned growth of purple loosestrife around the pond edges attracted hummingbirds, provided territories for Common Yellowthroats and Marsh Wrens, and probably decreased predation on young Spotted Sandpipers, Killdeer, and ducklings. If the loosestrife has continued to proliferate, the ponds will have become unattractive to migrant shorebirds that prefer open mud. The plants of

the grassland were taller in the 1980s than in the early 1970s, and that may account for the decreased occurrence of Horned Larks and Snow Buntings. There is no obvious explanation for the changed status of some other species, such as Brewer's Blackbird and Common Merganser.

The hydrology of the site was also changing, as the garbage continued to settle and decompose. The two eastern ponds were ephemeral during the first four years of my census, with the other two holding some water all year, but the northern pond dried up completely in the summers of 1983 and 1984, and the southeastern pond never did. There is a striking diagram in the environmental impact statement discussion of the site (UW 1980: 56), which projects that a large part of the grassland will be under water by the year 2025. So, in the long term, the blackberries, loosestrife, and broom may lose out to the lake.

It is beyond the scope of this paper to detail all the changes that have occurred during the recorded evolution of the site or to try to project what will happen next. I left Seattle in 1985 and have not returned, and so am unable to comment on the events of the last decade. The University's plans were to preserve most of the fill as a wildlife area (UW 1980). However, the continuing subsidence of the garbage and the ongoing plant succession ensure that there will be more change in the site, and with it will come more changes in the animals that use it. The fill will continue to be of interest to those who are concerned with the human impact on urban wildlife. This paper's significance, therefore, is as a chapter in the continuing story of an urban place.

## APPENDIX

Listed here are 18 bird species that have appeared at the fill but were not found during the period of my census. These, taken with the 174 species discussed above, constitute a complete list of all species for which I could find records at the fill through the spring of 1985.

**Red-throated Loon.** An immature was shot and killed in Union Bay on 20 Mar 1943 and is now in the collection of the Burke Museum, University of Washington (Higman and Larrison 1951: 162; D. Paulson pers. comm.).

**Black-crowned Night-Heron.** A single bird was seen in the northeast marsh on 5 Dec 1974 (Krause 1975). There was another sighting of an adult during football season in the 1940s (Higman and Larrison 1951: 156).

**Tundra Swan.** An immature was present from late October through mid-November 1970 (Krause 1975). They were also found for several years

in the 1940s (Higman and Larrison 1951: 82, 162).

**Trumpeter Swan.** K. Aanerud saw an adult and an immature fly from the cove on 15 Dec 1984 (pers. comm.).

**White-winged Scoter.** A flock of nine flew over Union Bay on 22 Sep 1939 (Miller and Curtis 1940).

**Peregrine Falcon.** One flew over the fill on 15 Jan 1975 (Krause 1975).

**Buff-breasted Sandpiper.** One was seen for eight days during fall migration in the 1940s (Higman and Larrison 1951: 156).

**Franklin's Gull.** An immature flew over on 9 Sep 1984 (pers. obs.). Krause (1975) lists this species as an occasional visitor from late August to October, and the first county record was from the marsh in the 1940s (Higman and Larrison 1951: 159).

**Lewis' Woodpecker.** An immature perched on the pole in the middle of the grassland, caught insects, and ate blackberries during the week of 3-10 Sep 1984 (pers. obs.).

**Hairy Woodpecker.** Frequently seen in the second-growth trees on the edge of the marsh in the 1940s (Higman and Larrison 1951: 172).

**Pacific-slope Flycatcher.** One called in the northeast thicket on 15 May 1985 (pers. obs.).

**Ash-throated Flycatcher.** C. Wentworth found one on 31 Aug 1975 (Hunn 1982).

**Chestnut-backed Chickadee.** E. Norwood found one in the willows of the northeast thicket on 4 Jun 1985 (pers. comm.).

**Mountain Bluebird.** E. Norwood found a female-plumaged bird in the grassland on 18 Oct 1984 (pers. comm.).

**Loggerhead Shrike.** One was seen on 25 May 1975 (Krause 1975).

**Harris' Sparrow.** One was found on 10 Nov 1974 (Krause 1975).

**Snow Bunting.** Krause (1975) lists this species as a rare to occasional winter visitor.

**Gray-crowned Rosy-Finch.** A flock of nine was seen on 30 Nov 1973 (Krause 1975).

## ACKNOWLEDGMENTS

I am grateful to the many people who offered advice, encouragement, and bird records. A few were especially helpful. R. Furuta did the computer work that compiled the census records and always seemed interested in what I had seen. F. Krause introduced me to the fill and his book was my inspiration. P. Mattocks made many editorial suggestions and answered numerous questions about Washington records. D. Paulson answered my identification questions and was instrumental in finally bringing the paper to print.





Song Sparrow  
(I. Ulsh)

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*Manuscript received 26 August 1994*

## PIED-BILLED GREBES NESTING ON GREEN LAKE, SEATTLE, WASHINGTON

Martin J. Muller

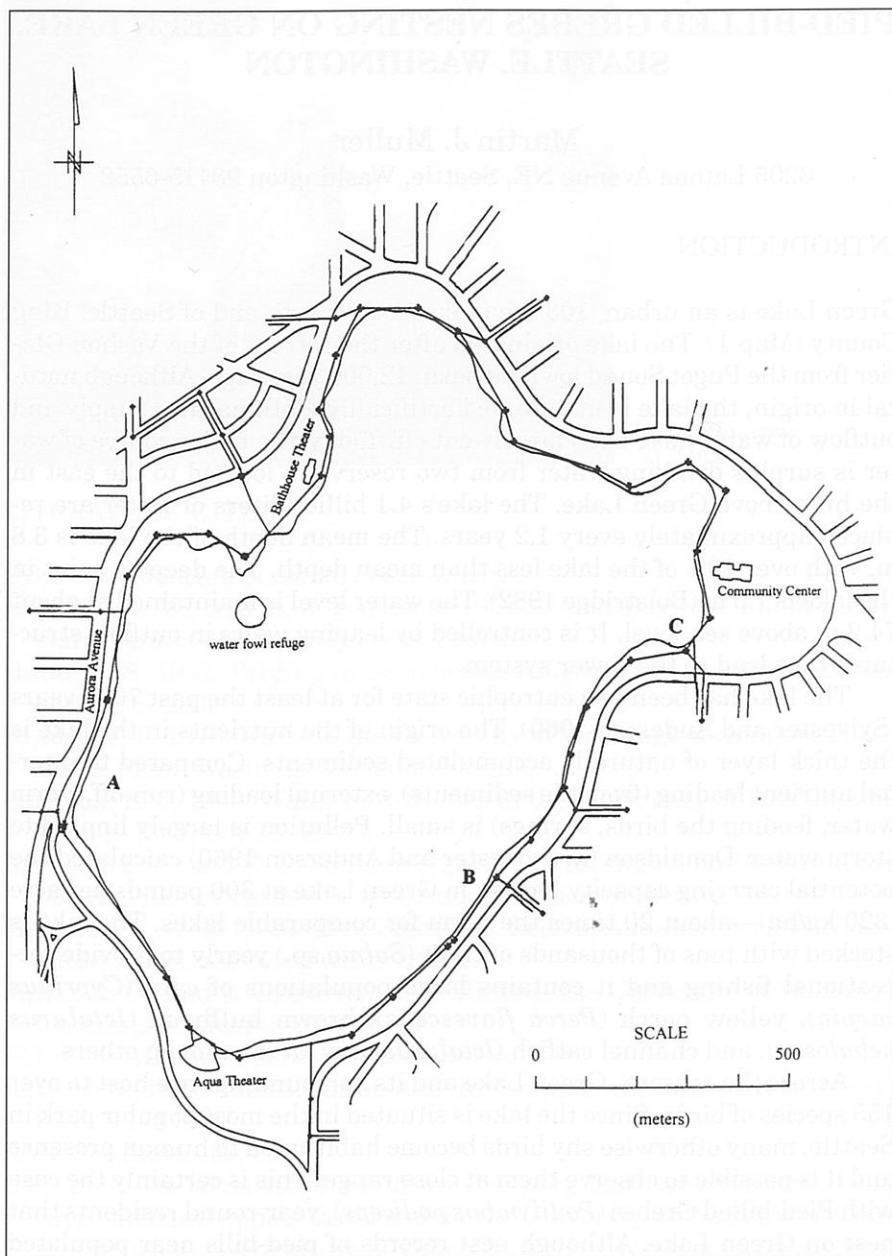
6205 Latona Avenue NE, Seattle, Washington 98115-6552

#### INTRODUCTION

Green Lake is an urban, 103.5-ha lake in the north end of Seattle, King County (Map 1). The lake originated after the retreat of the Vashon Glacier from the Puget Sound lowland basin 12,000 years ago. Although natural in origin, the lake is maintained artificially. Both natural supply and outflow of water have been largely cut off. Today, the major source of water is surplus drinking water from two reservoirs located to the east in the hills above Green Lake. The lake's 4.1 billion liters of water are replaced approximately every 1.2 years. The mean depth of the lake is 3.8 m, with over 80% of the lake less than mean depth. The deepest point in the lake is 7.5 m (Bolstridge 1982). The water level is maintained at about 74.2 m above sea level. It is controlled by leaping weirs in outflow structures that lead to the sewer system.

The lake has been in a eutrophic state for at least the past 7000 years (Sylvester and Anderson 1960). The origin of the nutrients in the lake is the thick layer of naturally accumulated sediments. Compared to internal nutrient loading (from the sediments), external loading (run-off, storm water, feeding the birds, springs) is small. Pollution is largely limited to storm water. Donaldson (*in* Sylvester and Anderson 1960) calculated the potential carrying capacity for fish in Green Lake at 300 pounds per acre (320 kg/ha)—about 20 times the norm for comparable lakes. The lake is stocked with tens of thousands of trout (*Salmo* sp.) yearly to provide recreational fishing and it contains large populations of carp (*Cyprinus carpio*), yellow perch (*Perca flavescens*), brown bullhead (*Ictalurus nebulosus*), and channel catfish (*Ictalurus punctatus*), among others.

Across the seasons, Green Lake and its surroundings are host to over 155 species of birds. Since the lake is situated in the most popular park in Seattle, many otherwise shy birds become habituated to human presence and it is possible to observe them at close range. This is certainly the case with Pied-billed Grebes (*Podilymbus podiceps*), year-round residents that nest on Green Lake. Although nest records of pied-bills near populated areas are far from new (Abbott *in* Bent 1919, Miller 1942), nesting in a heavily used park is not the norm. The pied-bill is described as shy and



Map 1. Green Lake, Seattle

secretive (Bent 1919, Chabreck 1963), leaving the nest at the slightest disturbance (Deusing 1939).

## METHODS

This study is based on data gathered from January 1988 through April 1992. The nesting season for pied-bills on Green Lake runs from late March (earliest nest building activity 25 Mar 1992; earliest egg date 2 Apr 1992) to early November (latest hatching date 6 Oct 1991). During this four-year span I made as many visits as possible to areas with known nests. For instance, out of 213 days between 1 Apr 1989 and 31 Oct 1989, I visited the lake on 144 separate days.

I used 7x50 binoculars and a 25x spotting scope. I used a small tape-recorder to record observations and transcribed them later. I also photographed many aspects of the grebes' life. I documented the situation at each nest area, and once the nests had been abandoned, continued to attempt to locate the birds and their offspring elsewhere on the lake. Visits to the lake varied in length from 20 minutes to four hours.

I tried to disturb the birds as little as possible. This means that some scientifically interesting data are not available. Measurements of eggs and lake depth beneath a nest are available for one nest only. I observed this nest daily and collected the eggs from the lake bottom after wind-generated waves destroyed the nest. While I feel that the lack of more detailed data sometimes detracts from the value of my observations, the knowledge that my influence on the birds' behavior was minimal more than makes up for it.

## NEST LOCATION

Most of the nests described in this article were located along the western shore of the lake ("A" in Map 1). There are two other spots on the lake where pied-bills nested. Along the southeastern shore ("B" in Map 1) one pair constructed four nests and produced three clutches of eggs during the 1991 nesting season. Data from these nests have been included in my study (see Replacement clutch production). Every year pied-bills attempted to nest near the main outlet of the lake in the northeastern sector ("C" in Map 1). Only in 1991 did a pair manage to raise young in this spot. My observations on this nest are far from complete; therefore they have not been taken into account here.

Nests were hidden among the mixed cattail (*Typha latifolia*) and yellow iris (*Iris pseudacorus*) reeds near the shore or anchored among fragrant white water-lilies (*Nymphaea odorata*). Those among the water-

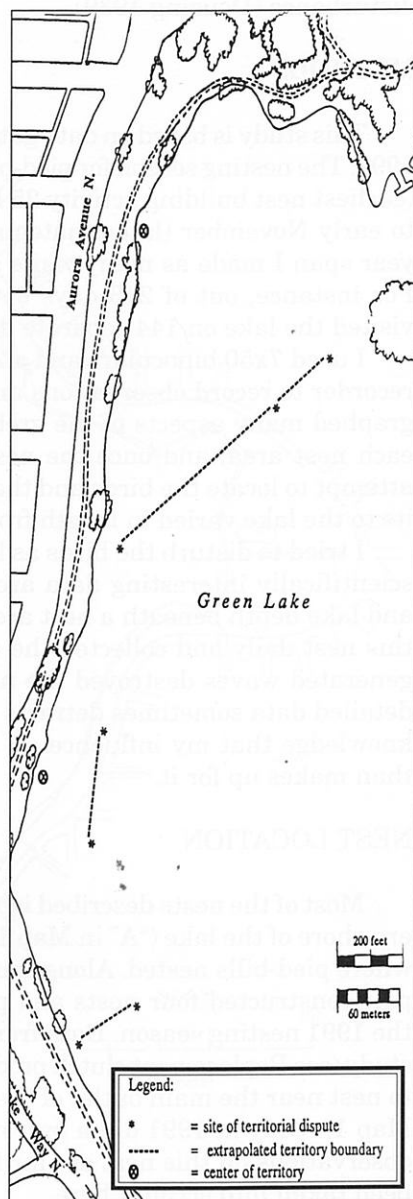


lilies were found either out in the lake or close to shore, underneath weeping willow (*Salix babylonica* x *Salix* sp.) branches. Most pied-bills' nests located in the cattails were not successful. Possible reasons include predation, disturbances, water level fluctuations, or relocation of the eggs. The patches of water-lilies, with the exception of the largest patch, were all smaller than the observed territories. The smaller patches offered little protection from wind-generated wave action.

I estimate the surface of the lake covered by water-lilies in 1989 (from aerial photographs I took) to be less than four per cent of the lake's total area. This is the same percentage reported in 1980 (Boston et al. 1980: 24-25). The location and relative size of patches of lilies are marked on Map 3. The largest patch of water-lilies measured approximately 280 by 60 m. Five of the eight nests considered in this study were located there.

I deduced lake depth underneath nests from a depth contour map of the lake, except in one instance when I measured the actual lake depth (56 cm) after waves destroyed the nest. Lake depth underneath nests in open water varied from 0.5 to 3.0 m. Nests in the reeds sometimes rested on lake bottom, depending on the water level in the lake. This agrees with Bent's (1919) and Glover's (1953) data.

Some pairs of pied-bills on Green Lake sit very tight on their nests, even when people stand still on the path near the nest. For two of the nests during the 1989 nesting season



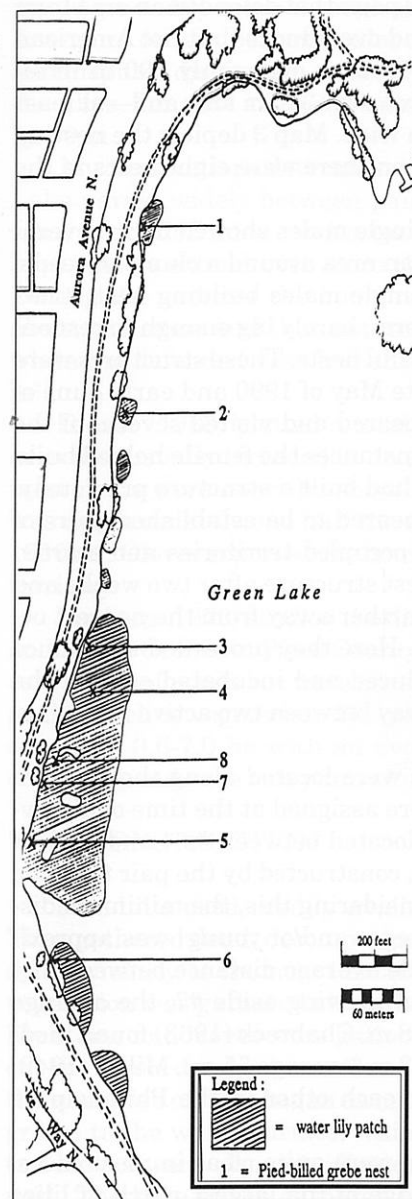
Map 2. Territorial boundaries, February 1989 ("A" on Map 1)

and two during 1991, the distance between observers and bird on nest was less than eight meters. Individual birds varied in behavior. In one nest the male would slip off the nest immediately when anyone approached the lake shore, while the female would stay on the nest until the intruder had left. In another nest, however, the behaviors were reversed and it was the male who remained while the female fled.

#### TERRITORY AND HOME RANGE

During three consecutive winters ice formed on most of Green Lake and persisted for about two weeks (February 1989, February 1990, January 1991). This forced all pied-bills to abandon their territories, some of which had been occupied until then. Within a week after the ice disappeared pairs of pied-bills returned to the same areas previously occupied on the lake. Since no birds were banded or otherwise marked it was impossible to tell whether the same birds returned to the same location on the lake.

Territories reestablished by pairs in February, after the thaw, encompassed a much larger area than later in the season, when more pairs "muscle in" and established territories. I determined territorial boundaries by noting the location of repeated clashes between adult birds and extrapolating in more-or-less straight lines between those points. Map 2 shows the situation in February of 1989 along the western shore



Map 3. Nest locations, June-September 1989 ("A" on Map 1)

of the lake. This is representative for the situation in February of all three years. Each year there were only two pairs that defended an area from other grebes (Pied-billed and Horned) and even ducks (but not American Coots). The pair to the north defended an area of roughly 200 m in all directions. The other pair defended an area over 300 m long and—at least near the previously used nest site—60 m wide. Map 3 depicts the nesting situation during the summer of 1989 when there were eight nests in the same area.

In April and May of 1990 and 1991 single males showed up in several spots on the lake and started defending an area around a clump of reeds. In three instances I even found these single males building nest structures varying in size from a simple platform, barely big enough to rest on, to structures equal in size to some successful nests. These structures were maintained for about three weeks. In late May of 1990 and early June of 1991 single females (two each year) appeared and visited several of the males' territories. In three of these four instances the female helped build a nest in the same spot where the male had built a structure previously.

In June and July of 1991, what appeared to be established pairs of pied-bills moved into areas adjacent to occupied territories and started building a nest. One pair deserted the nest structure after two weeks and subsequently built a second nest 50 m farther away from the nearest occupied nest (with newly hatched young). Here they proceeded to produce and incubate eggs. The other pair produced and incubated eggs in the single nest they constructed about halfway between two active nests (approximately 90 m from each).

In the summer of 1989, eight nests were located along the western shore (see Map 3). The nest numbers were assigned at the time of discovery, which explains why #s 7 and 8 are located between #s 4 and 5. Nest #7 in my opinion was a mating platform, constructed by the pair that one month later hatched eggs in nest #8. Considering this, the minimum distance found between active nests (with eggs and/or young) was approximately 35 m (distance from #3 to #4). The average distance between any nest and its nearest neighbor was 58 m. Leaving aside #7, the average distance between successful nests was 68 m. Chabreck (1963) found pied-bills nesting at a minimum distance of 23 m (average 55 m). Miller (1942) found pied-bills nesting within 17 m of each other in the Philadelphia region.

Territory boundaries on Green Lake were quite clear in most cases. For instance between #5 and #6, the edge of the largest patch of lilies formed the boundary. Disputes would take place on or near this edge. Between #5 and #4 (before #7 and #8 were established) many disputes took place on the southern edge of the small area of open water northeast

of #5 and south of #4. Sometimes the two birds involved in these disputes would gradually move through the patch of lilies out into open water on a line more or less perpendicular to shore. Out in open water boundaries and disputes dissipated, as nearly as I could estimate less than 30 m from the lilies. For nest #5 this results in a defended area of approximately 90 by 90 m.

My observations determined that home ranges for pied-bills on Green Lake varied widely between pairs and with the time of year. In spring, some pairs defended territories of roughly 4000 m<sup>2</sup>. Their home range appeared to extend over more than one third of the lake (up to 35 ha). During the summer the home range for the same pairs appeared to be about the same size (but not necessarily in the same part of the lake), while the defended area had shrunk to approximately 50 by 30 m (1500 m<sup>2</sup>).

Glover (1953) plotted a total of 44 territories in which the defended area was usually included in an arc of about 45 m around the nest. Since most nests were near the shoreline, this means that the defended area was approximately one half the area of a circle with a radius of 45 m, or 1600 m<sup>2</sup>. Glover reported the home range being about twice the size of the territory.

Faaborg (1976) studied the distribution of nesting Pied-billed, Horned and Eared Grebes in Ward County, North Dakota. Pied-bills used the largest variety of ponds but were always associated with dense stands of emergent shoreline vegetation. The pied-bills were found on ponds ranging in size from 0.6-7.0 ha with an average use of about 2.2 ha per pair. The smallest pond with two pairs of pied-bills was over three hectares.

## NEST CONSTRUCTION

Pied-bills used readily available plant material to construct nests. They gathered dead, decomposing vegetation from the lake bottom in the direct vicinity of the nest (usually no more than 50 m away). Emergent vegetation was gathered along the shoreline, as far as 20 m away. Water-lily stems and leaves were gathered from around the nest site. The birds cut the stems or tore them off under water and carried or dragged them to the nest. Use of lilies began as much as several weeks before the lilies had grown to the water surface, while the leaves were still quite small. Cattail leaves were also cut off under water and carried or dragged to the nest. The base of the gathered leaves looked slightly ragged, but often they were severed in a near-straight line. Pied-bills often dove while carrying nest material, before reaching the nest, surfacing on the opposite side of the nest.



Due to the soggy consistency of most of the nest material, nests were in constant danger of sinking. This was countered by adding material to the nest for as long as it was in use, or until it rested on lake bottom. During incubation nest material was placed on the rim of the nest, frequently by one bird while the other was on the nest. The incubating bird might distribute material around itself while seated on the nest. When the birds were frightened off the nest they often placed some of this material from the rim over the eggs with a few rapid movements. Later on when a bird returned to incubate, the material was again raked off the eggs onto the rim.

When the eggs were turned (see Fig. 1) the birds often took some plant material from the rim in the bill. With short jabbing movements they tucked it toward the center of the nest, underneath the eggs, adding material to the bowl of the nest while turning the eggs at the same time.



Fig. 1. Turning eggs on nest

Sometimes eggs were stacked on top of each other during this process. When the bird settled over the eggs they were pressed down in the nest by the weight of the incubating bird. That this means of increasing the height of the nest is quite effective was demonstrated many times. At the onset of incubation the eggs often

lay in a pool of water, practically level with the

water surface. Within the first week of incubation the eggs were raised, at times by as much as five to eight centimeters above the water surface.

Unlike those of Great Crested Grebes (Huxley 1914), pied-bills' separate nests and mating platforms were not usually present at the same time. Twice pied-bills built a structure that I believe functioned as a mating platform only. In these cases the birds later on built a nest near by. One other pair built a nest (no young were produced in it), and at the same time built a smaller structure nearby. No mating was seen in this pair so designation of the smaller structure as a mating platform cannot be confirmed. Of the observed copulations, most took place on the same structure that later held the eggs and young. The only exceptions were the nests to which the grebes moved eggs in an advanced stage of incuba-

tion (see Moving of eggs) and the aforementioned pairs that mated on one platform and laid eggs in a different nest.

In 1989 one pair of grebes had a nest amongst the water-lilies about 20 m offshore. On the day two of the four eggs hatched a boat entered the lilies and got to within 20 m of the nest. Both adults left the nest for half an hour, leaving the young and eggs unattended. The next day the birds started construction of a new nest, between the original nest and the shoreline, about seven meters offshore, close to where branches of a willow touched the water. The day the last egg hatched (four days after the first), the old nest was abandoned. The birds used the new nest for 20 days. While I suspect the disturbance by the boat may have had something to do with the move, I cannot be certain. Cross (1991) reports on finding a pair of grebes and their offspring using a second platform in a marsh in Snohomish County, Washington. This second nest existed at the same time as the first nest. It deteriorated faster than the original nest that had contained the eggs. A week after hatching of the eggs the birds stopped using both platforms.

#### EGG PRODUCTION

I have gathered the exact egg-production dates for 13 nests on Green Lake (see Table 1). Nine of those are for first clutches, the other four for

Table 1. Egg-production dates, Pied-billed Grebes, Green Lake, 1989-1992

Nest #	Date 1st Egg	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
*1	24.7.89	1	2	3	---	4						
2	29.7.89	1	---	2	3	4	---	5				
3	4.8.89	1	2	3	---	4						
4	11.5.90	1	---	2	---	3	4	5	6			
5	26.5.91	1	2	3	4	---	5	6	7			
6	4.7.91	1	2	---	3	4	5					
7	5.8.91	1	2	3	---	4	5					
8	21.8.91	1	2	3	---	4	5					
9	2.4.92	1	2	3	4							
†10	29.7.89	1	des	2	---	3	4	5				
11	1.8.89	1	---	---	---	---	---	---	---	2	3	4
12	23.7.89	1	2	3	des							
13	24.6.91	1	2	3	---	4	---	5	des			

\* nests 1-9 = first clutches

† nests 10-13 = replacement clutches

--- day skipped during egg production: see text

des nest or egg(s) destroyed

replacement clutches. The largest number of eggs a female produced on consecutive days was four. Fugle and Rothstein (1977) documented six eggs produced on consecutive days. As can be seen in the table, "skipping a day" during production of full clutches is quite common and varies greatly.

I have found no correlation between number of days skipped and total size of the full clutch. During production of one clutch of six eggs, two days were skipped. The next year a pair produced a clutch of seven eggs in eight days.

The most surprising find was one nest (#11) in August of 1989. A pair had been taking nesting material into the reeds. The pair then built a nest outside the reeds amongst the water-lilies. An egg was laid in this nest on August 1. The second, third and fourth eggs did not appear until the eighth, ninth and tenth days after the first. Instead of assuming that the bird skipped a full week between the first and subsequent eggs of the same clutch, I suspect they had a first nest in the reeds which was destroyed—perhaps by a predator—before laying of the first clutch could be completed. A new nest was hastily constructed, and the first egg deposited there was actually the final egg of the initial clutch. In this case the three eggs produced after the hiatus would be a replacement clutch, started a week after cessation of production of the first clutch (see also Replacement clutch production).

Allen (1939), Bent (1919), and Palmer (1962) all state that eggs are produced at a rate of no more than one per day. Glover (1953) writes: one egg a day, occasionally a day skipped towards completion of clutch. McAllister and Storer (1963) give egg dates for one nest they found with two eggs in it. Over the next five days, four more eggs were produced, with a possible gap of one day between eggs four and five.

Fugle and Rothstein (1977), in a study to determine whether pied-bills are determinate or indeterminate layers, removed eggs from nests near Santa Barbara, California at the same rate they were being produced. One female produced 13 eggs in 15 days (showing indeterminate laying) averaging 27.7 hours per egg. The researchers noted "skipping" on days seven and 12.

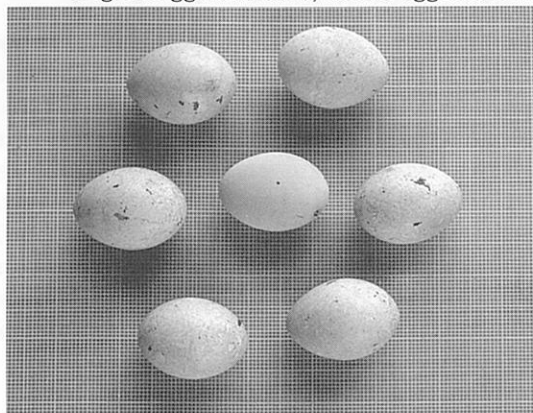


Fig. 2. Egg set (1991); center egg laid last

I found eggs produced in the morning (approximately 07:00, 10:00) during the middle of the day (12:00, 13:00, 14:00) or even in late afternoon (16:00, 18:00) and at night (between 20:30 and 06:00). In one nest a female relieved the male on the nest at 14:04. I watched her lay the third egg in her clutch 12 minutes later.

## REPLACEMENT CLUTCH PRODUCTION

During the 1991 season wind-generated waves destroyed a nest that contained seven fresh eggs (location "B" on Map 1). I collected all seven eggs from the lake bottom the next day (Fig. 2; see also Egg color and size). The same birds produced a replacement clutch of five eggs, the first egg of which appeared 20 days after destruction of the first nest. Again waves destroyed the nest and the clutch was lost. This time I found only two eggs on the lake bottom. The same birds built a new structure 15 m farther west, under almost identical conditions, but this time they managed to hatch five eggs. Unfortunately the nest was so well concealed that I did not get a good look until the egg had already hatched. At this point the young were less than a week old. Counting back, this means the third clutch was produced between 35 and 40 days after destruction of the second clutch.

Sealey (1978) in a study of 53 potholes in the Minnedosa, Manitoba area found six suspected replacement clutches with a mean size of 7.2 eggs. The average size of 22 completed first clutches in this study was 6.8 eggs. Miller (1942) found no decrease in size between first and first-replacement clutches. Even though both Palmer (1962) and Sealey (1978) report that Glover (1953) found no decrease in first clutch and replacement clutches, I was unable to find any reference to replacement clutches in Glover's original article. Chabreck (1963) studying pied-bills in a coastal marsh in Louisiana found a decrease in clutch size throughout the nesting season. Clutch size shrank from an average of 7.3 eggs in May to 5.0 in September.

## EGG COLOR AND SIZE

Newly produced eggs of pied-bills on Green Lake are almost turquoise. Within a few days they fade to a bluish-white color. After about a week in the nest the eggs start taking on brown stains from the decomposing plant material making up the nest. The clutch of seven eggs I collected from the lake bottom contains one egg that is still quite turquoise (at center in Fig. 2). It was two days old when waves destroyed the nest and was collected a



day later. The complete set of collected eggs is now part of the Burke Memorial Washington State Museum's egg collection.

**Table 2. Measurements of Pied-billed Grebe eggs, Green Lake**

Egg #	Length	Width	
1	43.1	31.8	
2	44.4	31.6	
3	43.0	31.7	
4	43.9	32.0	
5	42.7	31.8	
6	44.7	32.2	largest egg
7	42.9	30.8	smallest egg
average	43.5	31.7	

Pied-billed Grebe egg measurements in millimeters. Measured with dial calipers to the nearest 0.1 mm. Eggs were laid on 26, 27, 28, 29, 31 May and 1, 2 Jun (1991). Wind-generated waves destroyed the nest on 4 Jun. Eggs collected from the lake's bottom, in 55 cm of water, on 5 Jun. Eggs donated to the Burke Museum, Univ. Washington, Seattle.

As can be seen in Table 2, there is some size variation in this clutch. The largest egg measures 44.7 by 32.2 millimeters, the smallest 42.9 by 30.8. The smallest egg was the last to be laid.

#### PREDATION ON EGGS AND NEST DESTRUCTION

The cattails along Green Lake's shore harbor a large population of Norway rats and occasionally raccoons. While I did not witness predation by raccoons, Glover (1953) blamed them for about 25% of the nest destruction he observed. In one instance I saw a rat swim out into the lake, to a nest located eight meters offshore amongst water-lilies. The rat destroyed the two eggs present in the nest. Both adult pied-bills were near by but did not actively chase the rat off. Only after the rat had left did both birds approach the nest. They did not attempt to climb onto the nest. The next day the remains of the eggs were covered with a fresh layer of plant material and both birds were constructing a new nest three meters from the old one.

It seems reasonable to assume that any pied-bill's nest located directly amongst the cattails would be more susceptible to predation than the ones further out in the lake. This would, in part, explain why I saw much more indirect evidence of pied-bills nesting in the reeds (calling,

entering the reeds with nest material) than adults with young emerging from the reeds.

Burger (1973) saw American Coots eating eggs from pied-bills' nests in Minnesota. Coots are present on Green Lake and sometimes nest within the territory of pied-bills. I would describe the relationship between the two species as one of indifference. The birds seem to ignore each other, sometimes to the point that a coot and a grebe almost collide while preoccupied with foraging. On several occasions I have seen coots resting on partly constructed grebes' nests, or grebes sitting on a coot nest under construction. The interloper usually left unhurriedly and unmolested when one of the nest proprietors showed up. If coots were preying on eggs I would expect signs of unease in the grebes when coots come near a nest, just as high-flying eagles or low-flying gulls (both known pied-bill predators) elicit a nervous response in the pied-bills.

I have seen only two instances in which a grebe exhibited aggressive behavior toward a coot foraging within the grebe's territory. In the first instance the grebe had been chasing Mallards from its territory. Returning to its nest, it dove and attacked the coot (which had been unconcerned about the grebe's behavior up to this point) under water. The coot jumped clear of the water and came down, looking underneath it. The coot then jabbed with its bill under water in what appeared to be an attempt to ward off the grebe. The grebe surfaced a few feet from the coot and continued toward its nest. The second incident involved a female grebe from a pair that had produced its fourth egg that day. After the male relieved her from incubating the eggs the female dove and attacked a coot, foraging ten meters from the nest, without any initial threat behavior. The coot jumped clear of the water, apparently trying to escape, but the female had one of the coot's feet in her bill. The coot repeatedly jabbed at the grebe and fled about 20 m when the grebe finally let go of its foot.

After the water-lilies emerge, the pied-bills start building nests away from the reeds. Often, these first nest structures out in the open are destroyed by large carp, during spawning activities. In April and May many carp swim together, their backs above the water surface. They often splash around and may even jump completely clear of the water during their courtship activities. I have seen three pied-bill nests destroyed by carp. On two occasions grebes, while on their nest incubating eggs, were thrown clear off the nest by carp surfacing below the nest.

#### INCUBATION

During the 1989, 1990, 1991, and early 1992 nesting seasons, I made daily visits to nest areas during the time of egg production whenever I

could. In 13 out of 19 nests I was able to determine the exact day when each egg was produced.

If during a continuous 45-minute observation no bird was present on the nest, I inferred that incubation had not begun. During advanced stages of incubation (second week) I never saw the nest unattended for more than 25 minutes, usually far less (two or three minutes). Of the 13 nests with known laying dates, incubation started after production of the first egg in 11 cases and after the second in the remaining two cases.

Chabreck (1963) noticed similar behavior. However, Glover (1953), describing pied-bills nesting in prairie pothole marshes in Palo Alto County, Iowa, stated that the adults gave slight attention to the nest in the early stages of incubation, no longer than eight minutes at a time. Allen (1939) states that incubation doesn't start until the clutch is full, but that heat from the sun and decaying nest material may start incubation, which would explain why the eggs never hatch at the same time. Unfortunately he doesn't mention where he made his observations. Bent (1919) says he believes, based on other observers' data, that the grebes are actively incubating during the greater part of the incubation period, even though he never managed to see a grebe on its nest himself. As Harrison (1978) states, it has been suggested that heat from decaying nest material may help in the incubation of eggs. Davis et al. (1984) studied pied-bill nests and eggs in Dickinson County, Iowa, and Imperial County and San Diego County, California. They found that pied-bills typically left their nests unattended for prolonged periods of time. In Iowa incubation spells of ten to 50 minutes were interrupted by breaks of 20 to 60 minutes. Nighttime incubation spells lasted two to three hours. In California in the hot Imperial Valley the researchers saw the adults near the nest only at night—never during the day.

Most sources give an incubation time of 23 to 24 days (Bent 1919: 23-24 days; Ehrlich et al. 1988: 23 days; Harrison 1978: 23 days; Palmer 1962: 23 days with some variation). My own data on 22 eggs (in five nests from 1989 to 1991) for which the exact dates of laying and hatching are known show a spread in incubation period of 22 to 27 days, from production of the first egg to hatching of the first egg, with an average of 23.5 days.

#### MOVING OF EGGS BETWEEN NESTS

There is compelling, if circumstantial, evidence that pied-bills move eggs from one nest to another. I deduced such behavior from observations in both the 1988 and the 1989 nesting seasons.

In 1988, on daily visits to the lake, I scanned the water-lily patches and adjacent cattails with a 25x spotting scope. From adult birds' activities I concluded that there were two nests amongst the cattails.

On 6 September, two pairs started constructing nests out amongst the water-lilies, almost straight out from where I postulated the nests in the cattails to be. The birds completed the nests on 9 September and the following day four heavily stained eggs were present in one nest. The other nest had four heavily stained eggs in it one day later. In both nests the first young appeared on 16 September. I watched one of the eggs hatch around 13:30, only ten days after showing up in the nest.

I did not notice any change in the lake or vegetation that might explain the timing of the move. There is no evidence for a change in the population of rats or other predators in the reeds at that time.

In the 1989 transfer the original nest contained three fresh eggs (three, four and five days old). The nest was out in the open between water-lilies, about 15 m offshore. Within one day (!) the birds constructed a new nest closer to shore, underneath branches of a willow. The next day three eggs were in this new nest and none remained in the original nest. In this case a more sheltered nesting site offers a plausible reason for the move.

How the birds move the eggs is still unclear. The whole idea of moving eggs between nests is somewhat unusual, although not unknown in other species of birds (see Skutch 1976: 148-150; Ehrlich et al. 1988: 361, 403). However, it has never to my knowledge been previously noted in pied-bills.

#### HATCHING AND REMOVAL OF EGG SHELL

Of the 58 eggs produced during the Green Lake study, 23 (39.7%) hatched, while the remainder were lost or destroyed.

Clutches of pied-bill eggs on Green Lake hatch over a period of one to four days. I have witnessed young emerging from eggs that, when viewed through a scope half an hour earlier, showed no sign of being pipped on the side facing me. Glover (1953) reported intervals from 0.5 to 2.5 hours between first sign of pipping and actual emergence, depending on climatic conditions. Deusing (1939) reported holding and examining pied-bill eggs from a nest under study for signs of pipping and not finding any. 3.5 hours later one of those eggs hatched.

In the 12 nests for which exact data are available, I have found two or three eggs hatching on the first day of hatching, with the remaining eggs hatching at one-day intervals. Forbes and Ankney (1987), studying hatching asynchrony and food allocation in pied-bills near Minnedosa, Manitoba,



found clutches of from five to eight eggs hatching over three to seven days, with from two to three eggs hatching the first day.

While still wet, the young struggled to climb onto the back of the adult on the nest, by way of the adult's tail. This might take quite a while and sometimes the adult bird stood up and the young fell in or outside the nest, after which it had to start all over. Unlike Glover (1953), I did not find that a hatchling emerged from its shell about as fast as its down dried. Newly emerged, still-wet young would climb onto the incubating adult's back and usually were brooded for about an hour before reappearing completely dry and fluffy.

Shortly after the egg hatched, the adult bird on the nest got up and started removing the egg shell. In all five instances when I observed this event, the adult bird picked up a small piece of shell, broke it up and tucked it between nest material, sometimes eating a small piece of it. After that the adult took the remaining egg shell (always intact with just a "cap" at one end missing) in the bill and carried it away from the nest and discarded it under water.

#### REARING OF YOUNG

This section is based on observations of nine pairs of pied-bills that raised young during 1988, 1989, and 1991. In 1990 I was gone most of the time when young were present on Green Lake, so I have omitted the sketchy data on these broods. None of the described broods contained more than five young. Individual variation was fairly extensive, but I believe the following is a fair representation of what can be expected on Green Lake.

Hatching of pied-bill eggs on Green Lake didn't occur until fairly late in summer during these three years. The earliest hatching date for young was 5 July (1991) and the latest 6 October (1991). Nesting attempts started as early as the second week of April (1989). In 1990 I saw the first young on 21 May, but further data on this brood are inadequate.

Pied-bill young are semi-precocial (Pettingill 1985), i. e., able to move away from the nest for varying short distances immediately after hatching, yet still fed by their parents. In my observations, young were brooded under the wings of the adults during most of the first week of their lives. Often one parent fed the young while they were on the back of the other parent. The parent birds might make dives while carrying young on the back. I have found no correlation between weather conditions and young being brooded. Brooding took place under all conditions. Although the young spent most of the first week either in the nest or on the back of an adult bird, they could swim practically from the moment they hatched.

Diving was quite difficult and they did not seem to be able to remain submerged for any length of time. Diving times increased with body size and weight.

Riding on the back of the adults pretty much ceased by the time the young were three weeks old. Four would fit on the back of one parent the first week. The second week two fit comfortably. If a third joined, the head of one or more would be exposed next to the neck of the adult or on the back between the adult's wings. When a fourth young attempted to get on the adult's back, the adult often reared up and all young fell out. When four managed to climb "on board" the parent's back, at least one was mostly exposed seated on the tibiotarsus of the adult, behind the folded wing and to the rear of the adult's body (see Fig. 3).

For the first four days begging vocalizations of the young were barely audible *seep* or *pueet* noises. By the second week these noises grew louder and the young started approaching the adult birds when they returned with food, leaving the nest or the back of the adult that was carrying them.

On Green Lake, most prey brought to the young consisted of small fish and insect larvae (if readily avail-

able as in July and August amongst the lily leaves). The parent who brought in a fish (and a few times crayfish) of more than about 3.5 cm often tore the prey up. Only rarely did I see a male pass a fish to the female to distribute amongst the young, and once a female let a male feed a fish she had caught to the young. The prey was held in the bill and shaken violently. This way small pieces were torn off and offered to the young. Often food was offered to a young even when it didn't beg. In such instances the adult could offer the same piece of fish up to four times. If the young didn't take it by then the adult would eat the food.

The adults would feed feathers they dislodged while preening their flanks to the young (Fig. 4). In some instances a feather was the first thing the young received to eat. Several explanations have been given for members of the grebe family's habit of eating feathers, among them physical protection of the stomach from damage by fish bones and, through a

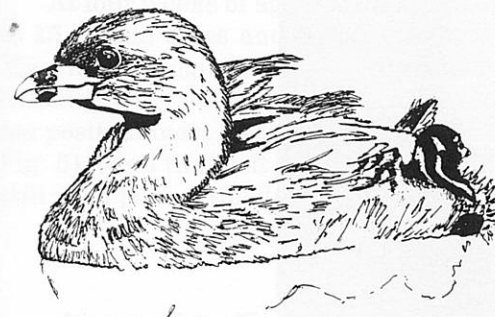


Fig. 3. Adult with three two-week-old young tucked under wings and a fourth exposed on the tibiotarsus

pyloric plug made up of feathers, increase of retention time of fish in the stomach, allowing for complete dissolving of the bones (Storer 1961, 1969). Piersma (1988) conducted a study on the Great Crested Grebes of Lake IJsselmeer in The Netherlands. He suggests that ingested feathers, in the absence of other indigestible matter, contribute substance to the stomach content, enabling the formation of pellets that can be ejected. Storer (1961) has observed casting of pellets in pied-bills that feed on prey other than fish. Because the Green Lake pied-bills' diet consists mostly of fish, pellet casting is probably infrequent. I have seen it twice during more than 900 hours of observations.



Fig. 4. Young with uneaten feather; parent proffering food

Undisturbed nests were used and maintained for at least three weeks after hatching. By the middle of the second week the family took trips out into small patches of open water amongst the lilies. The young were left unattended on or near the nest for up to half an hour, while both adults were out gathering food. When the young were out swimming, one or both adults stayed near by. It wasn't until the twenty-first day after hatching that I ever saw young swimming outside the territory unaccompanied by at least one adult.

Begging for food became quite intense by the third week. The young made loud peeping noises and started pecking at the bill of the adults, whether the latter carried food or not. Forbes and Ankney (1987) found that food allocation to young was non-random. Both signals of hunger status by young, and parental regulation of chick position (chasing either smallest or largest young away), influenced food distribution. According to Forbes and Ankney, color changes in the loreal area of chicks (from pink-

ish to darker red, presumably through infusion of blood) was of influence in food allocation in broods with equal-sized young. I have noticed a slight change in color of the loreal area, but not as pronounced as Forbes and Ankney found. My data do not allow a conclusion on this subject.

By the third week, the young had grown to more than half the size of the adult birds. The prey the adults brought in got larger and the time they spent tearing the prey apart grew smaller. The young would attempt to swallow prey up to one fourth their own size, but this usually failed. Prey this size seemed more difficult for the adults to tear up. They usually ended up eating it while one or more young were begging for food. Begging young started to lower their necks and point their opened bills up at the adult bird. Begging noises became quite loud and continued as long as an adult was nearby.

At four weeks of age, the young were swimming around, making ten- to 15-second dives and picking up insects and larvae from the surface. They made begging noises as long as an adult was swimming around and hunting. Only when the adults rested in the Pork-pie Attitude, the resting position most frequently assumed by pied-bills and other grebes (see Fig. 5), were they left alone by the young. In some broods the nest was still used part of the day to rest on. Two four-week-old young in one nest

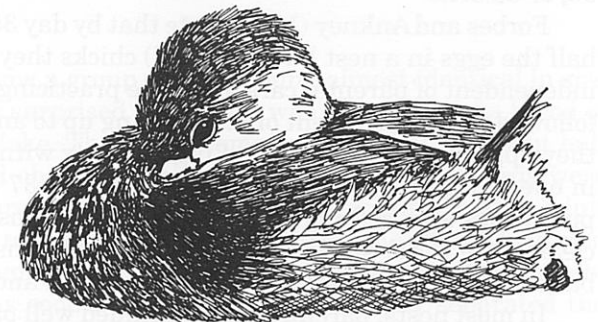


Fig. 5. Adult resting in "Pork-pie Attitude"

actively gathered plant material from the surface and added it to the nest on three consecutive days.



As the young grew larger the begging posture became more exaggerated. They sometimes lowered their necks under water and pointed the opened bill up towards the adult bird. By the fifth week, in broods where there was a size difference between young, larger young would start showing aggression toward smaller siblings. At the same time adults started showing aggression toward the larger young, chasing and pecking them.

Between days 24 and 42, the nest was deserted. It was no longer maintained and quickly deteriorated due to wind and wave action. One nest was deserted when the young were 17 days old, but I believe this atypically early departure was due to human disturbance (tree cutting approximately 35 m from the nest).

The pair that used their nest the longest (nest #4 during the 1989 nesting season, see Map 3), did not only desert the nest, but left the nesting area completely. Both adults and all four young moved to the south end of the lake. This was not standard behavior. Like Chabreck (1963) I have found that the area of rearing is approximately the same as the nesting area. The reason for the move of the #4 pair may be found in the crowded and stressful nesting situation in the largest patch of water-lilies at that time. From the time nest #s 3, 4 and 5 became active till the day family #4 moved away, I witnessed many territorial disputes usually involving an adult bird from nest #4. The move by family #4 coincided with the hatching of young in nearby nest #8.

I found that of 23 eggs hatched, 14 young (60.9%) survived to day 35. Forbes and Ankney (1987) found a somewhat lower survival rate (48 of 90, or 53.3%).

Forbes and Ankney (1987) state that by day 35 after mid-hatch (when half the eggs in a nest have hatched) chicks they studied were generally independent of parental care and were practicing upwind flights. While I followed the development of many young up to and beyond the age where they apparently are capable of flight, I only witnessed two of four young in one brood practice flight. The young were 37 days old and were flapping wings and rushing along the surface against the wind. They barely cleared the water surface and only for a short distance. They then swam back to the point where the rush had started and repeated the exercise.

In most nests, parental care continued well past day 35. In 1988 most of the young were independent by day 58, but one was still receiving food when it was 62 days old. In 1989, the first young to become fully independent moved away from the nest area at 47 days. Two other young from the same nest were still being fed at 57 days of age. It was evident, though, that these young were actively foraging on or near the bottom of the lake. On day 57 both had considerable amounts of fishing line entangled around their bills and feet. This was the last day I saw these two young.

Young from nest #3 (two survived from the initial four) became independent at day 53. In nest #8, three of the original four hatchlings survived. After the dead tree along the shoreline was cut, one adult with one young (the one considerably smaller than its three siblings) was seen near the water-lilies. The other adult with three young spent most of the time near the Aqua Theater. The one young being tended by one adult disappeared when it was 23 days old. On day 31 one of the three remaining young became independent. A second became independent on day 34. The last remaining young was still being fed on day 46. Its siblings were still in the same general area of the lake as the adults and the one young that was being fed. On day 47 (4 November) I could no longer find these grebes on Green Lake. I believe they may have migrated out.

It is somewhat puzzling to find that the adult grebes on Green Lake continue feeding their young well past the age when the young are capable of feeding themselves or, based on observations by Forbes and Ankney (1987), may be capable of flight. On Green Lake, the young do forage for themselves while parental care continues. Possibly continued parental care has something to do with the fact that most adults and their offspring do not leave the lake until winter. Even when the young are fully independent, some of the families remain together on the lake. It may be of adaptive value for the adults to continue caring for their young, when this doesn't interfere with their own food supply, to insure survival of the young. As mentioned in the description of Green Lake, the lake has a large capacity for fish, and food shortage seems to be no problem.

#### MIXING OF BROODS

On one occasion I saw a group of eight young almost identical in size (three weeks old). This surprised me since I was not aware of a brood of eight pied-bills on the lake. The young remained together for about half an hour after I started observing the group, while no adult birds were nearby. An adult appeared and started feeding one young. Another adult showed up and seemed to herd four young away from the others. It turned out that the young from neighboring pairs had congregated in the absence of adult birds. As soon as the adults arrived they separated the young. Six minutes later two adults had a territorial dispute on the border between the territories.

In 1991 one three-week-old young (from a brood of four) spent an hour resting close to two two-week-old young from a different brood and their mother. The adults did not attempt to separate the young. The "stray" young eventually swam to its own family 90 m away when one of its parents arrived with food.

## UNSUCCESSFUL NESTING BY PIED-BILLS

During the 1989 nesting season, one pair of grebes tried very hard to produce offspring. First nest construction started on April 10. 185 days later, after construction of a total of six nests and production of at least 12 eggs, on 12 October the birds finally gave up, having failed to produce live offspring.

In all six instances the nest location was close to shore in a small patch of water-lilies, approximately ten by 15 m. Distance from shore varied between 5.0 and 6.5 m. Two nests were located under branches of a weeping willow and four out in the open.

The birds sat very tight, not disturbed by people walking, bicycling, running or roller-skating by at less than eight meters. Even people standing still, talking in loud voices and pointing, usually did not drive the incubating bird off the nest. Often I had to wait for 45 minutes at a considerable distance (keeping an eye on the nest through a spotting scope) before the bird on the nest would get up and allow me a glimpse of the situation in the nest.

In June the birds produced a clutch of five eggs. It disappeared without a trace during the second week of incubation, while I was out of town. On 24 July a Norway rat swam out to the nest and destroyed the second clutch of two eggs (in the fifth nest they had constructed). The following day the birds were constructing their sixth nest, only three meters away from the previous nest. The female produced five eggs over the next seven days. This makes me believe that there was only one replacement clutch of seven eggs, distributed over the two nests. Incubation by both birds started after laying of the second (fourth) egg. As far as I witnessed, the eggs were never left unincubated for more than two minutes over a continuous period of 31 days. Then, on 5 September, one egg disappeared. The cause is unknown, but I believe the egg may simply have slipped from the small, flimsy nest. Several times while the birds were turning the eggs in this particular nest, it looked as if at least one egg was about to roll into the lake. They lost two more eggs over the next eight days. By 13 September, only two eggs remained.

Incubation by both birds continued till day 57. The last two days I saw both birds away from the nest for 45 minutes at a time. I observed no incubation behavior after 26 September. The birds kept adding fresh material—coontail (*Ceratophyllum demersum*) leaves and rotting plant matter from the lake bottom—for four more days, but wind and wave action were eroding the nest rapidly. After the first fall storm the two remaining eggs were floating in the lake amongst debris from the nest.

Both adult birds remained in the nest area (usually within 90 m of the nest site) and still actively chased ducks away. Pursuit of other water birds (mostly ducks) ceased in late October. Two months later a pair of pied-bills was still in the general area and performing Greeting Ceremony, which would indicate the pair-bond was still maintained.

## PREDATION ON PIED-BILLS

One day I witnessed a two-year-old Glaucous-winged Gull swooping down and picking up one of four 30-day-old pied-bills by a wing. The gull lifted the flailing young about 30 cm out of the water. One nearby parent grebe lunged up at the gull carrying the young, but didn't make contact. The gull did drop the young bird. Less than a minute later the young had resumed its original activities (swimming and begging for food).

In March of 1990 I witnessed an adult Bald Eagle repeatedly dive at an adult pied-bill. The grebe had been feeding halfway between the western lake shore and the island where the eagle was perched. The pied-bill did not have anything edible the eagle might have been after. The grebe dove every time the eagle swept down upon it. The first three dives lasted about ten seconds and the grebe surfaced in approximately the same spot where it went under. After this it surfaced twice, once after 16 seconds and the last time after 18 seconds. It covered the distance to the reeds (approximately 150 m) in these two dives. The eagle returned to the island after the grebe started heading for the reeds. McEwan and Hirth (1980), Bond (1939) and Fielder (1982) have documented pied-bills as prey for Bald Eagles.

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## SHARP-SHINNED HAWK HUNTS FROM THERMAL

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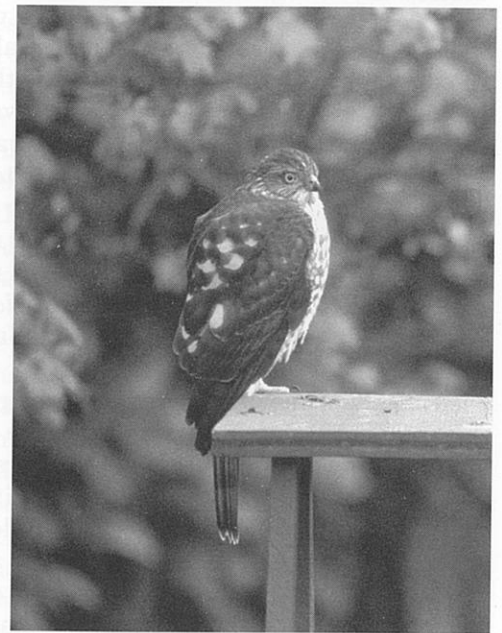
Sharp-shinned Hawks (*Accipiter striatus*), like other accipiters, are thought of as hawks that capture their prey by surprise and quick dashes in or near cover (Brown 1977). Although sharp-shins hunt prey during migration (Brown and Amadon 1968), I have seen no discussion of them hunting from high in the air in soaring flight (Bent 1937). I watched a sharp-shin do so between 12:30 and 13:00 on 9 October 1992 in Seattle, King County, Washington. The sky was mostly clear, the temperature about 16° C., with a very light southwest breeze. I first noted the hawk as it circled higher and higher above me. It was impossible to judge the height, but from comparing it with nearby trees, I estimated it as >150 m. My assumption that the hawk was riding a thermal up to head off to the south in migration was dispelled as it suddenly folded its wings and dove straight down, almost directly toward me, in a hunting stoop. I could hear the sound of its passing as it dove through a flock of about a dozen Pine Siskins flying at treetop (20 m) level.

The hawk failed to capture a siskin but flew right over me—at which time I saw that it was an immature female—and landed in a grove of trees. Within two minutes it left the trees and began to ascend in circling flight again. A Red-tailed Hawk appeared at this time and much more rapidly than the sharp-shin rode a thermal up to 300 m or more, then leveled off in southward flight. The sharp-shin slowly followed but, on reaching about its previous maximum height, again dove straight down, this time disappearing behind nearby trees. Within a few seconds the same or another flock of siskins flew over me, coming from that direction. I watched for 10 minutes more and did not see the hawk again.

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Immature Sharp-shinned Hawk  
(D. Paulson)



## SANDERLINGS FEEDING UPON RAZOR CLAMS IN WINTER ON THE WASHINGTON SEACOAST

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On 28 Dec 1992, while walking south along the beach at Moclips, Grays Harbor County, Washington, I observed a flock of an estimated 200 Sanderlings (*Calidris alba*) loosely spread out along the tide line. This was in mid-morning, and the outgoing tide was near to reaching its charted low of 3.3 feet. High clouds obscured the sun; there was no wind, and the temperature did not rise above freezing that day. My attention was caught by a gull chasing a Sanderling and forcing it to drop its prey. In my experience, it is unusual for small shorebirds to bring up anything sizable enough to interest a gull, so I continued to watch carefully.

The Sanderlings were foraging on the firm sand just above the water line. They walked slowly and appeared to be looking for visual cues. Upon finding a likely spot they would probe deeply several times. I watched several birds extract an oblong object about two centimeters in length. They "chewed" these objects furiously with their bills then swallowed them with effort. Some individuals ran landward up the berm, away from the other birds, before starting to work on swallowing their prey. Several times I observed gulls chasing Sanderlings into flight and forcing them to drop their prey.

The sun broke through the clouds momentarily and I managed to approach to within ten meters. Through my 7x35 binoculars I clearly saw the amber shells of tiny razor clams (*Siliqua patula*). Over the ensuing 30 minutes I saw an estimated 20 razor clams being taken by the foraging Sanderlings.

I observed one immature Sanderling (Prater et al. 1977) pull a larger clam (about three centimeters) from the sand. The sandpiper was chased by a gull and managed to elude it. It ran up the beach, away from the other birds, and attempted to swallow its prey, but the clam seemed too large. After several attempts it still could not get it down. Another Sanderling then pursued it for a while but failed to make it relinquish the clam. The futile swallowing attempts continued until the bird finally dropped the clam onto the beach and hammered it energetically with its bill, which seemed helpful in softening the shell. I have seen Sanderlings soften up the shells of mole crabs (*Emerita analoga*) in a similar manner on California beaches. All this activity took several minutes. The juvenile Sanderling eventually lost its prize to a pirating gull.

## DISCUSSION

Sanderlings are at the northern edge of their winter range in Washington and British Columbia (Hayman et al. 1986). Many authors discuss the benefits and risks of wintering in areas where the costs of winter may exceed the advantage of remaining close to breeding grounds (Pienkowski et al. 1984). One cost may be lack of food. Myers et al. (1979) note several changes in prey availability due to the season: isopods decrease in number and activity in winter, thus limiting visual cues to their presence. They also migrate deeper down into the sand, possibly beyond the range of short Sanderling bills. Razor clams, on the other hand, are known to live high in the sand substrate, near the water column (Kozloff 1983). Isopods are an important food source for Sanderlings: if they become unavailable in winter, it may be that immature razor clams serve as a replacement for them in the diet of Sanderlings wintering on the Northwest coast.

I observed no evidence of territorial behavior in this group of foraging Sanderlings, though I have seen such behavior among late-fall Sanderlings on Nantucket Island, Massachusetts. Myers et al. (1979) suggest that lack of territoriality in a group of Sanderlings foraging together in winter may indicate a food resource so rich that territory defense is not worth the effort. The lack of observed territoriality in the present instance may lend weight to the notion that the razor clam resource is a rich one.

Razor clam numbers commonly rise and fall in unpredictable patterns, as human predators on this species know quite well. Buchanan (1992) remarks on the high variability of Sanderling numbers in his winter census of the Washington coast. It may be that these two phenomena are at least partially correlated.

A final point is related to the issue of prey-handling time. The immature Sanderling spent several minutes attempting to eat a larger clam; eventually it was lost to a gull. The bird might have been able to find and eat two or three smaller clams in the time it struggled with the too-large one. In addition, this young bird risked losing its prey to other pirates. Finally, it may also have risked being preyed upon by a falcon, as so much time and attention was given to this food item. Birds must learn to forage effectively in their first year of life. One might wonder if this experience illustrated to one juvenile Sanderling wintering on the Northwest coast the importance of not biting off more than you can swallow.

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Juvenile Sanderling (D. Paulson)



## WASHINGTON ORNITHOLOGICAL SOCIETY

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**"...to increase our knowledge of the birds of Washington and to enhance communication among all persons interested in those birds."**

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Cover photo of Pied-billed Grebe on nest, Green Lake, Seattle,  
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