

## CANADA GOOSE ESTABLISHED AS A BREEDING SPECIES IN SAN FRANCISCO BAY

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We report here on 20 years of records which establish the Canada Goose (*Branta canadensis*) as a breeding bird in the San Francisco Bay area. In California, this species is generally not considered to breed regularly south of the northeastern corner of the state (Kortright 1943:86, Johnsgard 1975). Occasional breeding records have been recorded for the Lake Tahoe area (Grinnell and Miller 1944), and more recently from Bridgeport Reservoir in Mono County (Gaines 1977:6). Additional instances of breeding are known from a reservoir east-southeast of Marysville, Yuba County (F. Kozlik, Calif. Dept. Fish and Game, pers. comm.). In the spring of 1932 a single pair nested on Crystal Springs Reservoir in San Mateo County (Moffitt 1939). Starting in 1959, however, a breeding colony became established on Brooks Island, Contra Costa County, and has probably bred there every year since that time (2 to 16 adults seen each year).

In the course of other biological investigations (e.g., Lidicker 1966, 1973), we have regularly observed the bird life of Brooks Island since early 1958. From 1965 to the present we have been assisted by caretakers employed by the Sheep Island Gun Club. In 1969 the East Bay Regional Park District purchased the island, but the Gun Club continued to occupy the island through a leasing arrangement. In the early years we frequently visited the island, whereas more recently, less frequent trips have been supplemented by information from caretakers. We therefore have fairly continuous records over this 21 year interval except for one year, June 1963 to August 1964.

Brooks Island is about 22 ha in size and lies southwest of Point Richmond. It is covered largely by grassland and brush, and possesses no mammalian predators. Several freshwater ponds and two springs are present. A small, grass-topped islet, relatively inaccessible to humans, lies 210 m offshore to the west. For a more detailed description of the island and an aerial photograph, see Lidicker and Anderson (1962). The island is now an Educational Preserve within the East Bay Regional Park District system, and is scheduled for limited access management, with a resident caretaker.

The first observation of nesting Canada Geese on Brooks Island was in spring 1959 (Table 1). Of course, we cannot be absolutely confident that they did not nest there previously. We are convinced, however, that they were not there in 1958, and other biologists visited the island regularly for several years previous to that (Anderson 1960). Moreover, the initial observation was of a single pair with a brood of five goslings. Their origin is unknown, but it may be significant that the two adults present in 1963 were noticeably disparate in size.

The birds tend to arrive in early spring and leave sometime in the summer (Table 1). In the winter of 1977-1978 the geese arrived unusually early (17 December 1977). Thus, they exhibit migratory behavior, and we presume they can therefore be considered wild birds. They certainly behave like wild birds, and in the early years at least they were always extremely wary. In only one case, an adult seen on 3 April 1965, did an individual appear to tolerate the close approach of humans. Recently, some of the caretakers on the island have offered food to the geese, making them less wary.

We have unequivocal evidence for nesting in only 11 of 18 springs when observations were possible (Table 1). It seems likely, however, that because of the extreme secretiveness of the birds and the fact that we were not making any special efforts to observe them, nesting attempts may have occurred in all the other years as well (except perhaps 1960) and we simply failed to record them. Generally, only a single clutch was attempted. In 1975, however, there were definitely two clutches, and we

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suspect two clutches were raised in 1971 and 1972 as well. In 1973 one definite and a second possible nest site were observed. Assuming that the suspected double clutches are real, minimum clutch (brood) size in this population varied from 4 to 8 with a mean of 5.9 (n = 13). Kortright (1943:88) reports that clutch size in this species ranges from 4 to 10 with 5 or 6 being usual. Johnsgard (1975:139) reports averages ranging from 4.6 to 5.7, and Bellrose (1976) considers clutches over 8 to represent dump laying.

Table 1. Summary of Canada Goose (*Branta canadensis*) records for Brooks Island, Contra Costa Co., California.

Year	Earliest date recorded*	Latest date seen	Maximum numbers seen	Max. no. goslings (date)	Date nest observed
1959	9 May	—	2	5 (9 May)	—
1960	—	—	—	—	—
1961	22 April	21 May	2	6 (23 April)	—
1962	22 April	15 July	5	††	—
1963	24 March**	5 May	2	—	—
1964	—	—	—	—	—
1965	21 Feb.	3 April	16	—	—
1966	—	—	—	—	—
1967	12 April	—	2	—	12 April
1968	24 March	—	2	6‡ (?)	—
1969	11 April	—	5	—	—
1970	28 March	1 Sept.	15	—	—
1971	27 March	30 July	6	15‡ (early summer)	—
1972	6 March	22 Aug.	3	10 (18 April)	—
1973	4 April	26 Aug.	10	—	4 April (6 eggs)
1974	29 April	—	5	—	—
1975	8 April	27 July	6	9 (13 May, 27 June)	—
1976	23 Feb.	Late Aug. ‡	3	5‡ (April)	—
1977	8 Feb.	6 June	4	7 (19, 27 April)	—
1978	17 Dec. 1977‡	—	7‡	—	—
1979	23 Feb.	26 April	5-7	7 (26 April)	—

\* Adult birds or fresh goose droppings present.

\*\* Heard only.

‡ According to caretaker on Island.

†† Two goslings raised at Berkeley dump; see text.

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We have only limited data on gosling survival. In some years, e.g. 1973 and 1974, apparently no young survived. In other cases, only a few goslings survived to fledging (3 out of 5 in 1976, and 2 out of 7 in 1977). However, in two of the years with double clutches, survival to fledging was excellent (9 out of 10 in 1972, and 9 out of 9 in 1975). These double broods were combined into one creche, and generally were tended by only two adults. Successful production is also indicated by the increase in the adult population to 16 birds by 1965, and possibly by breeding occurrences in nearby areas starting in 1961 (see below). Other studies have also indicated that gosling survival can be quite variable (Bellrose 1976:162). Summarizing reproductive performance in this population, we can say that there is no evidence that it is subnormal for the species.

In the two instances in which a bird was definitely observed to be incubating (Table 1), both nests were located in the open grass on top of the small islet to the west of the main island. In other years, also, pairs of adults were seen frequenting the islet. We feel that this is a prime nesting site, probably because of its relative protection from human disturbance. However, in such an exposed site hatchlings would be quite vulnerable to gull predation. From behavioral observations, we suspect that three other sites have also been used by nesting geese. One is near the south end of the island where several fresh water ponds are located at the base of a steep slope. This is a favorite resting area for the geese, and fairly inaccessible nesting sites are on the slope above the ponds. The second area is on a long spit of sandy fill which is associated with a rock breakwater extending northwesterly from the island. The final site (1979 only) is on a small rocky promontory at the north end.

The successful establishment of Canada Geese in the San Francisco Bay area represents an extension of their breeding range of either about 300 km southward and westward from the Klamath Basin and Honey Lake region, or 270 km westward from Mono County. Breeders from both these areas are placed in the subspecies *moffitti* (Johnsgard 1975, Gaines 1977). In addition to the small but persistent Brooks Island population, another breeding colony, established as recently as 1967, has been reported for Bay Farm Island in Alameda County (Remsen and Gaines 1973). A pair of adult geese with four young were also seen near the Oakland Bay Bridge toll plaza in April 1961 (Cutler and Pugh 1961), and, lastly, a pair nested successfully on the Berkeley dump (5 km SE Brooks Island, in Alameda Co.) in 1962 (Garland 1965).

Whether these Bay Area breeding birds are derived from *moffitti*, from some other form that winters in central California, or from escaped captive birds, remains uncertain. Cogswell (1977) feels that the Bay Area breeding records involve birds referable to *moffitti*. Remsen and Gaines (1973) suggest that the Bay Farm Island group was derived from a semicaptive population resident on Lake Merritt (Oakland, Alameda Co.). The Lake Merritt population was apparently derived from *moffitti* stock, and has nested successfully since at least 1956 (Cogswell 1956). Of course, both the Bay Farm Island birds and the Berkeley dump pair could have been derived from surplus Brooks Island birds. Perhaps, when information becomes available on the movement patterns of these birds outside of the breeding season, additional clues to their origin(s) may be forthcoming.

Regardless of the sources of these Bay Area breeding geese, they seem to be established and merit further study. It would be of interest, for example, to learn more of the food habits of these new populations. In view of the largely fresh water and vegetarian predilections of this species, it is not at all clear what features of the Brooks Island and Bay Farm Island habitats are critical to it. Surprisingly, broods on Brooks Island are most often seen on salt water. Detailed investigation of these populations would thus be of general interest as well as possibly critical to their survival into the future.

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