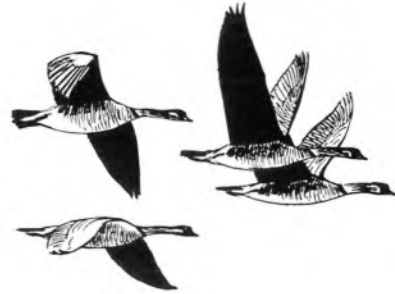


## A progress report on Nene *Branta sandvicensis* in Hawaii Volcanoes National Park from 1974-89

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*Hawaii Volcanoes National Park has supported a Nene Reintroduction Programme since 1974. The Resources Management Division is responsible for the management and monitoring of birds within and adjacent to the Park boundaries. The management aim has been to work toward the production of a wild, self-sustaining population. The method employed in order to achieve this has been to release captive-bred Nene into the wild. To date, a total of 177 birds has been released and monitored in and near the Park. This report summarises progress over the last 15 years.*

Nene *Branta sandvicensis*, the Hawaiian Goose, have been released into Hawaii Volcanoes National Park since 1974. Initially this was achieved by the maintenance of six or eight breeding pairs which were located in open-topped release pens constructed at eight carefully selected low and mid-elevation (15-1220 m) sites throughout the Park. Individual pairs were then placed in each of these pens and allowed to spend most of the year there (see Kear & Berger 1980). Breeding, nesting, and subsequent release of fledglings took place within the same pen. In 1984, a cooperative agreement was made between Hawaii Volcanoes National Park and the State Division of Forestry and Wildlife (DOFAW). To supplement the low gosling production of Hawaii Volcanoes' captive flock, a quota of captive-bred goslings was supplied by the DOFAW Endangered Species facility at Pohakuloa. These goslings were placed in a pen with adult birds and subsequently released into the target localities. The consensus at the time was that the boundaries of the Hawaii Volcanoes National Park encompassed habitat that was suited to Nene, and that releases should be increased in this area. Release site selections were based on historical sightings of flocks in the 1950s.

To date, a total of 177 birds has been released at Hawaii Volcanoes (46% between 1984-86). Sixty-two males and 71 females (75% of the total) were released from sites located in the Ainahou area (660-900 m elevation). The present population utilizes four major flocking areas, which include Ainahou/Kipuka Nene, Kilauea Crater area (golf course), Halfway House/Ka'u Desert, and Mauna Loa.

Table 1 summarises releases of geese and subsequent known mortality in Hawaii Volcanoes. The number of birds censused in the wild in 1981 was 75, and in 1988 was 179. Counts were made during the flocking season when almost every individual shows up within a social group (Table 2). The possibility exists that flocking areas of minor importance may be missed, as flock locations have been known to vary from year to year. Between 1981 and 1988, 160 birds were added to the population, by release or by wild recruitment.

There have been 136 known nesting attempts over the past 15 years. An attempt was recorded when the following was observed: 1) an actual nest; 2) a gravid female; 3) a female with brood patch; 4) a pair with goslings or fledglings. Table 3 summarises all recorded nesting attempts by geographical area.

Seventy-eight percent of recorded nesting attempts failed. Hatching failures included abandoned nests, infertile eggs, egg predation, dead embryos (especially prevalent in the Mauna Loa flock), and eggs smashed in the nest by the female. Rearing failures included any mortality that occurred after hatching. The known number of fledglings recruited into the wild population over the past 15 years is 48 birds. The actual number, however, may be considerably higher due to the fact that only fledglings associated with family groups during the flocking season were included in the count. A significant number of unbanded birds of unknown age and origin was not incorporated into the recruitment total as individuals were very difficult to differentiate; some recruitment also resulted from wild

Table 1. Summary of releases and known mortality of Nene in Hawaii Volcanoes National Park.

	n Released	Origin	Ainahou		Kilauea		Kaone		Kukalaula		Kalapana		Hilina Pali		Known Mortality
			M	F	M	F	M	F	M	F	M	F	M	F	
1975	4	4 - H	1	3											0
1976	10	10 - H	1	2	1		3	1	2						2 - Unknown
1977	15	15 - H	4	9			1	1							1 - Road kill
1978	6	6 - H					2	2		2					1 - Tar pool
1979	5	5 - H						1	2	1				0	
1980	8	8 - H							2	1			5		1 - Road kill
1981	8	7 - H 1 - P	1	1	1		1	1	2		1				1 - Road kill
1982	6	6 - H	1	5											0
1983	0														1 - Road kill
SUBTOTAL	62		9	20	2		7	6	8	4	1		5		8
1984	38	19 - H 19 - P	18	20											1 - Unknown 1 - Predation
1985	22	10 - H 12 - P	8	10	2	2									1 - Road kill
1986	2	22 - P	11	4							4	3			1 - Road kill
1987	12	4 - H 8 - P	5	7											2 - Road kill
1988	13	8 - H 5 - P	7	6											1 - Road kill 1 - Unknown
1989	8	2 - H 6 - P	4	4											0
SUBTOTAL	115		53	51	2	2					4	3			8
TOTAL	177	104 - H 73 - P	62	71	2	4	7	6	8	4	5	3	5	0	16

H = Bred at Hawaii Volcanoes facility, P = Pohakuloa.

Table 2. Present Nene flock composition (1988).

Flock	n	NPS bands		State bands			Unbanded		
		% of flock	% of all NPS released birds	n	% of flock	% of all State released birds	n	% of flock	% of all unbanded birds
Ainahou/ Kipuka Nene	76	87.4	66.7	1	1.1	5.3	10	11.5	21.7
Kilauea	25	58.1	21.9	2	4.7	10.5	16	37.2	34.8
Halfway House	13	39.4	11.4	4	12.1	21.1	16	48.5	34.8
Mauna Loa	0	0	0	12	75.0	63.2	4	25.0	8.7
				114 (63.7% of tot. pop.)		19 (10.6% of tot. pop.)		46 (25.7% of tot. pop.)	

NOTE: Total numbers of NPS and State released birds as well as unbanded birds represent the actual number seen during the 1988 flocking season.

Population distribution by flock.

Flock	n	Percent of total pop.
Ainahou/Kipuka Nene	87	48.6
Kilauea	43	24.0
Halfway House	33	18.4
Mauna Loa	16	8.9
179 Total		

free-flying pairs returning to nest within the release pens. These pens are partially protected from the predatory mongoose *Herpestes auro-punctatus* by a

surrounding wire mesh and live traps. Table 4 shows the number of birds sighted and recruited by geographical area since 1975.

The main cause of known mortality in the Nene flocks has been road kill (50% of 32 known deaths) occurring on the Kilauea Crater Rim Drive. One individual was predated by a cat *Felis catus* during the flightless moulting season. Preliminary studies by the USFWS (D. Espy pers. comm.) show that the range of feral cats overlaps that utilized by Nene during the moult (Kilauea Crater to Hilina Pali Road).

Upon leaving the nest, some families walk

Table 3. Summary of Nene nesting attempts.

		Ainahou/ Kipuka Nene	Kilauea	Halfway House/ KauDes	Mauna Loa	Kukalaula	Kaone	Totals June 1989
Known attempts	<i>n</i>	53	36	20	7	14	6	136
Failures	%**	43 81.1	29 80.6	14 70.0	7 100.0	12 85.7	3 50.0	108 79.4%
Successes	%	10 18.9	7 19.4	6 30.0	0 0.0	2 14.3	3 50.0 1*	28 20.6%
Known eggs	<i>n</i>	77	76	33	12	37	10	245
Mongoose predation	%	11 14.3	9 11.8	3 9.1	3 25.0	7 18.9	2 20.0	35 14.3%
Dead embryos	%	0 0.0	1 1.3	2 6.1	6 50.0	2 5.4	0 0.0	11 4.5%
Infertile	%	13 16.9	8 10.5	5 15.2	0 0.0	3 8.1	0 0.0	29 11.8%
Rearing failure	%	30 39.0	32 42.1	13 39.4	2 16.7	19 51.4	0 0.0	96 39.2%
Surviving fledglings	%	19 24.7	12 15.8	9 27.3	0 0.0	3 8.1	5 50.0 1*	48 19.6%

\*\* refers to percentage of eggs or attempts (failure and success rows only), \* = in pen

Table 4. Total number of Nene sighted and recruitment by geographical area 1975-88.

Area	Flock sizes (% of total)	Total recruitment (% of total)
Ainahou/ Kipuka Nene	106 (40%)	19 (39.6%)
Kilauea	63 (24%)	12 (25%)
Halfway House	48 (18%)	9 (18.8%)
Mauna Loa	24 (9%)	0
Kukalaula	13 (5%)	3 (17.6%)
Kaone	1 (4%)	5 (10.4%)
TOTAL	265	48

up to 5 km to grass pastures that are grazed by cattle (at Kilauea and Halfway House area). The delay caused by having to cross busy roads and the lack of food leaves the goslings vulnerable to predation (Banko 1988). In 1989, a cat or a

mongoose captured and killed two goslings *en route* to the pasture. Mongoose predation had a greater impact on gosling survival in areas such as Ainahou/Kipuka Nene and low-land nesting areas, where the density of mongoose is highest. Thirty-five of 245 eggs located were taken by mongooses but this is certainly an underestimate. Banko (1988) reported that 97% of 485 chicken eggs positioned in Nene breeding areas were removed, probably by a mongoose.

Nene habitat, particularly in the Ainahou/Kipuka Nene area is also used by feral pigs. Pig *Sus scrofa* rooting was observed within 2 m of nest sites within the perimeter of the Ui'la burn and may have involved predation or nest disturbance. Within Kipuka Kahali'i, feral pigs eat mamaki berries *Pipturus albidus*, which are also eaten by Nene.

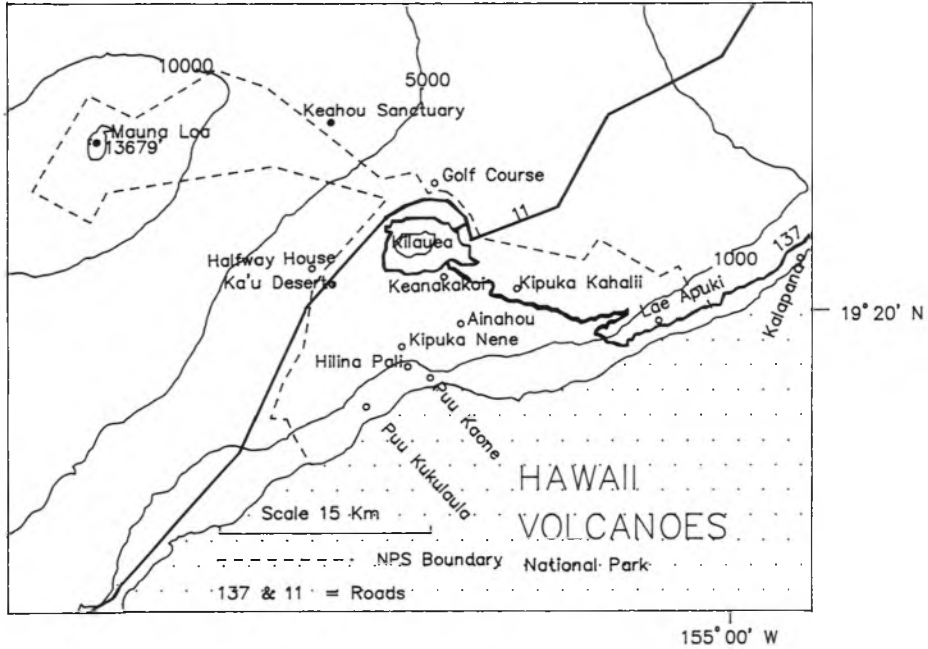
*The text has been considerably improved through consultation with Jeff Black, Dan Espy and Paul Banko.*

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**Hawaii Volcanoes National Park**



Nene in the Ainahou area: Two captive-bred adult birds with young successfully reared in the wild. The adult male bird has a radio transmitter attached to his back.



Nene in the Keanakakoi area: A successful nesting attempt first observed when this family visited a busy car-park