Unfortunately, a number of plant species in the Waihaha are under threat from continued possum browse. Fuchsia in particular has already been severely affected. Other palatable species such as totara, *Pseudopanax* spp. and kamahi are also suffering from die back. The extent of the problem is becoming so severe that its effects can be seen from the air, with large numbers of dead or dying totara crowns easily visible.

2.3 THE STUDY AREA

All capturing and monitoring of non-target species was conducted within the boundaries of the Waihaha Ecological Area south of the Mangatu Stream (Fig. 2). Although the area treated with 1080 was substantially larger, monitoring scattered individuals (particularly highly mobile species such as kaka) throughout the length of the range was considered too difficult and time consuming. Within the Ecological Area the Waihaha River was emphasised allowing both kaka and blue duck to be targeted during the same field trip without having to split staff effort or other resources.

3. Methods

3.1 SPECIES MONITORED

Although the selection of species that require monitoring during 1080 operations is relatively straightforward, the ease and/or feasibility with which monitoring can be achieved may be considerably more difficult. Experience has shown that some monitoring techniques (particularly 5-minute bird counts) are often inadequate when a species either occurs in particularly low densities (e.g., N.Z. falcon, Calder and Deuss 1985) or its behaviour is such that variance in standardised counts is so high that the results become inconclusive (e.g., kakariki and kaka, Warren 1984, Calder and Deuss 1985, Greene 1988). Unfortunately, a lack of viable alternatives (especially for kakariki), the requirement for accurate results and the operational time frame imposed on the study resulted in efforts being largely directed toward North Island kaka, blue duck and invertebrate monitoring. Assessments of the effect of 1080 on other species (particularly N.Z. falcon, kakariki and bats) proceeded on a largely subjective basis.

3.2 PRE-POISON METHODS

3.2.1 The capture of kaka and blue duck

The decision to use radio telemetry as a means of monitoring kaka and blue duck populations was based on the known deficiencies of other commonly used monitoring methods (e.g., 5-minute bird counts for species at low density and/or showing considerable variation in their degree of conspicuousness, Greene 1988, Lloyd and Hackwell 1993) and the need to accurately determine

the cause of any deaths of these species during the possum control operation. In order to be confident of identifying 1080 induced mortality, sufficient numbers of individuals must be radio-tagged. For this particular study, a figure of 20 individual kaka and 10 pairs of blue ducks was suggested as a useful minimum. The power of the experimental method to detect mortality within a population using a sample of marked individuals (particularly kaka for which a relatively small proportion of the overall population was monitored compared to blue ducks) can be predicted using the following mathematical expressions;

$$P_{(dx\geq 1)} = 1-(1-Pd)^{n} \quad \textbf{OR} \quad n\log_e(1-Pd) = \log_e\left(1-P_{(dx\geq 1)}\right)$$

where n = sample size

$P_{(dx\geq 1)}$ = probability of getting one or more death in sample

Pd = probability of death (i.e., the kill rate)

Therefore, for the monitored sample of 20 kaka within the population the probability of detecting mortality within the sample for any given kill rate can be predicted as follows;

Pd	$P_{(dx\geq 1)}$
3.4%	0.50
6.6%	0.75
10.9%	0.90
13.9%	0.95
20.0%	0.99
50.0%	1.00

For example, there is a 95% probability of detecting a 13.9% kill rate or a 50% probability of detecting a 3.4% kill rate. Significant mortality as a result of possum control is, therefore, likely to be detected.

Any radio-tagging operation of this scale requires a considerable investment in time and effort. A total of ten field trips (89 field days) over almost 6 months was spent within the core study area prior to the application of non-toxic pre-feed in late June. There were only two huts in the area, so the majority of trips were based at temporary camps in tents or in a hunter's bivvy.

North Island Kaka

This programme represents the first attempt to capture significant numbers of kaka within a mainland North Island forest. Given the difficulties experienced in catching kaka in low density populations in South Island forests (P. Wilson pers. comm.) and the relatively short period of time in which to achieve the useful minimum of 20 radio-tagged birds for this study, this was not expected to

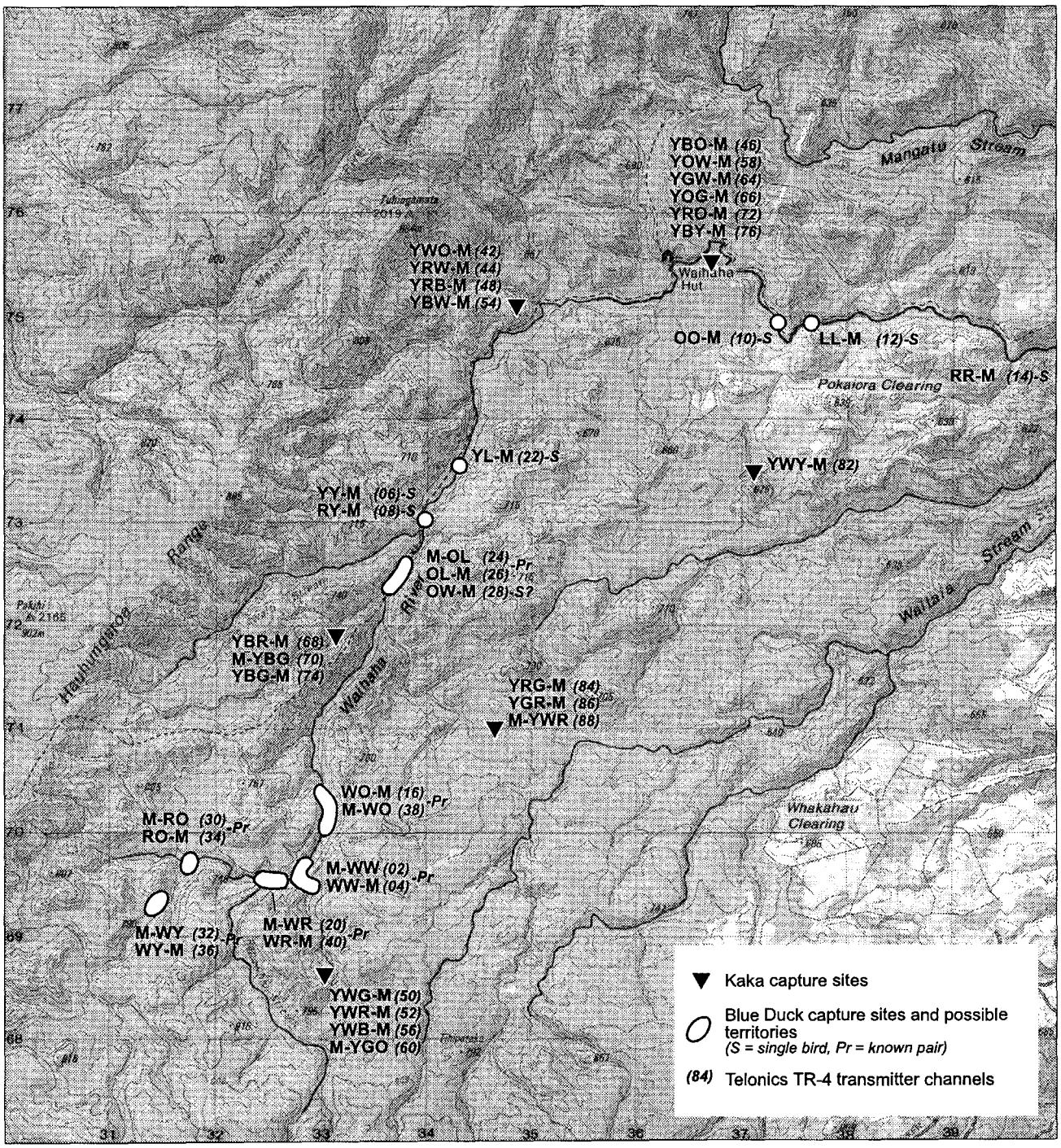

FIGURE 3. CAPTURE LOCATIONS OF NORTH ISLAND KAKA AND BLUE DUCK — PUREORA FOREST PARK JANUARY–JUNE 1994.

be easy. However, by the middle of June, 21 kaka (18 males and 3 females) had been captured and fitted with radio transmitters within the Waihaha Ecological Area (see Fig. 3).

Capturing kaka in the very tall forest found within the study area required considerable effort. Mistnets (42 feet long, 8 feet deep with a mesh size of 21/4 inches) stacked six deep were commonly used. This involved extensive use of rope and tree climbing techniques to trim and prepare sites so that these large rigs could be raised as high as possible into the canopy and used effectively.