Call count monitoring of Northland brown kiwi 2014

Megan Topia and Hilary Gardiner

newzealand.govt.nz

Department of Conservation
Te Papa Atawhai

Cover: Child in kiwi costume at Maranui kiwi release. *Photo: Gina Williams*.

Whangarei Office, Department of Conservation, PO Box 842, Whangarei 0140, New Zealand. Phone: +64 9 470 3300

CONTENTS

Call count monitoring of Northland brown kiwi 2014

Megan Topia and Hilary Gardiner

Whangarei Office, Department of Conservation, PO Box 842, Whangarei 0140

1. Introduction

1.1 Objective

The objective of this report is to summarise the results of the 2014 call count monitoring of Northland brown kiwi (*Apteryx mantelli*), and to make recommendations for future monitoring.

1.2 Background

In the early 1990s a network of call count stations was established nationally in order to determine trends in kiwi populations over time (McLennan 1992). In Northland, 24 stations were established in four geographic areas (Northern, Eastern, Southern, Western) with kiwi call count monitoring occurring annually since 1995. Additional stations have since been added to this network (see Appendix 1). The information gathered from these stations allows us to assess how populations are changing over time, i.e. whether they are stable, increasing or decreasing. The extensive involvement of local communities in the protection of Northland brown kiwi and the associated expansion in the number of kiwi listening stations provides strong information on the current distribution and density of kiwi throughout their range in Northland (Fig. 1).

Call count surveys are used for the following purposes in Northland:

- Monitoring the trends in call counts (and hence population size) over time at the 24 original (1995) sites (Northern, Eastern, Western, Southern).
- Monitoring the trends in populations at the growing number of kiwi management sites throughout Northland.

1.3 Northland listening sites

The 24 original kiwi listening stations that were established at the four areas in Northland where kiwi were known to be present (Pierce & Westbrooke, 2003) are listed in Table 1 (Gartons was added in 1995, the other 23 stations have been used since 1993). The Northern area contains six stations either in or on the edge of extensive forest in the Herekino-Raetea-Puketi Forests area. The Eastern area has six stations in forest remnants and extensive exotic forestry in the Bay of Islands area spanning Purerua Peninsula–Waitangi–Russell Peninsula. The five Western stations are in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). The Southern area has seven stations within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two also with exotic forests (Glenbervie 7A & 9A). Additional listening stations have predominantly been added in areas where community groups are working to protect kiwi.

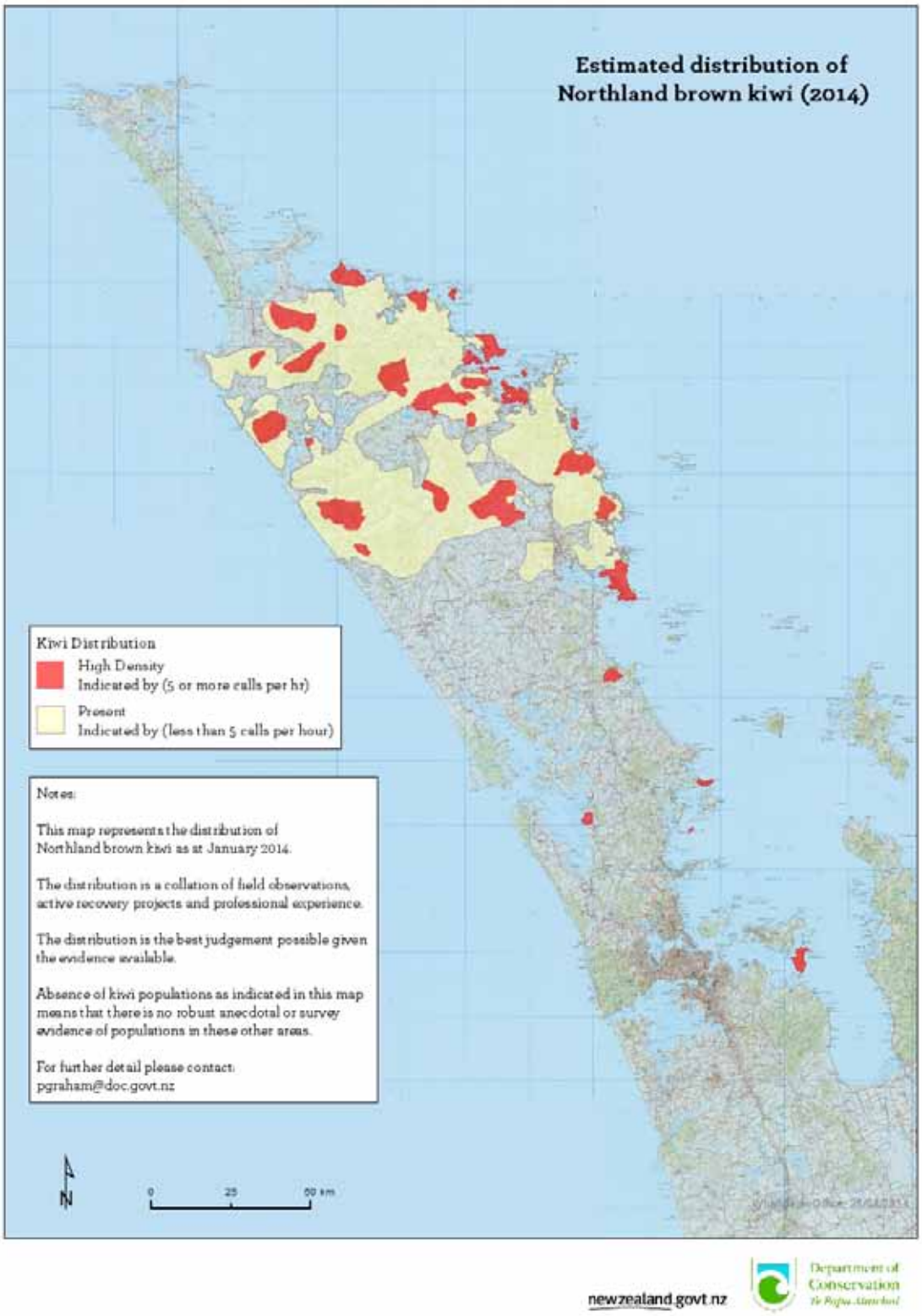

Figure 1. Northland kiwi distribution and relative abundance as known in 2014.

Table 1. The original Northland kiwi listening stations, grouped by geographic area and with corresponding station numbers.

NORTHERN	EASTERN	WESTERN	SOUTHERN
1 Diggers Valley	10 Marsden Cross	16 Kaitui	21 Glenbervie 7A
2 Takahue	11 Puketotara	17 Trounson	22 Glenbervie 9A
4 Gartons	12 Rangitane	18 Cathedral	23 Marlow Road
5 Kaiaka	13 Waitangi No 12	19 Waipoua L/Out	24 Purua N
7 Puketi Forest	14 Mt Bledisloe	20 Paerata	25 Rarewarewa S
8 Puketi Scenic Reserve	15 Tikitikiore		26 Mimiwhangata
			27 Sandy Bay

2. Methods

The 2014 Northland brown kiwi call count survey followed the national kiwi call scheme methodology outlined in the Kiwi Best Practice Manual (Robertson & Colbourne, 2003). Listening was carried out during the dark phase of the moon for the first 2 hours of darkness, for four nights. Ideal kiwi listening conditions are dry and still, so these conditions were favoured wherever possible.

Listening for kiwi was carried out from 18 May to 6 June 2014, with a back-up window from 16 June to 5 July 2014.

2.1 2014 kiwi listening data

Call-count data from 2014 were received from the following kiwi management areas:

- Whaakangi
- Mahinepua – Radar Hill
- Waimate North/Hupara
- Puketi Forest
- Russell Peninsula
- Waipoua Forest complex
- Motatau–Marlow
- Purua–Rarewarewa
- Tutukaka
- Sandy Bay
- Whangarei Heads – Bream Head (three clusters of sites)
- Tawharanui
- Marunui
- Mataia

3. General patterns

3.1 Northland monitoring trends since 1995

Mean call counts since 1995 at the 24 original listening stations (see Table 1) in the Northern, Eastern, Southern and Western survey areas are graphed for comparison in Fig. 2 and separately in Figs 3–6. A Pearson's coefficient analysis was carried out for each site to test the linear relationship of the data. This indicates whether there is a 'real' call-rate trend (and assumed population trend) upwards or downwards over time compared with stable (flat-line) call rates and assumed stable underlying populations. The summary data is presented in Appendix 1.

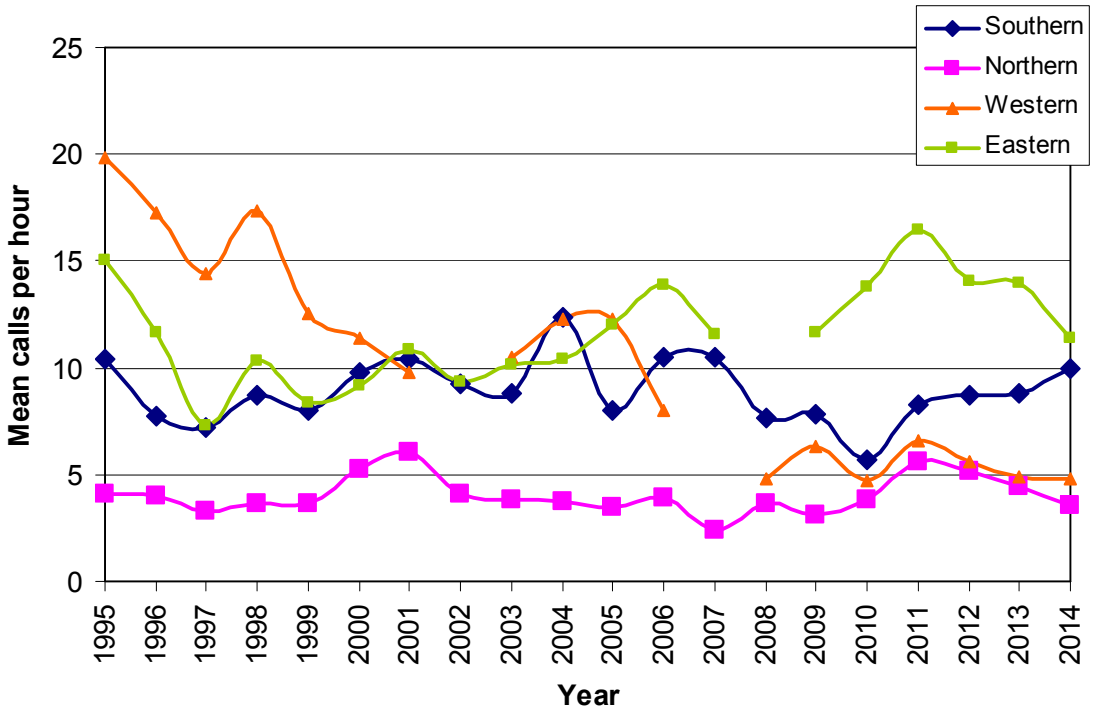

Figure 2. Mean annual kiwi call rates per hour for each of the original four Northland monitoring areas 1995 – 2014. The mean for the Northern and Southern clusters was estimated with one station missing each (Diggers Valley and Glenbervie 7A respectively).

Northern Area

The Northern Area has continued on its downward trend since 2011, recording a mean call rate of 3.55 calls/hr in 2014. The call rates at all the stations listened at were either the same as the previous year or had declined. The analysis of the data shows that there is no significant positive or negative linear trend in the call counts (r = .0436, n = 20, p = 0.43) indicating that the call counts (and the underlying population) have remained stable but relatively low since 1995. Five out of the six stations for the Northern cluster were listened at for four nights. Diggers Valley (station 1) has not been listened at since 2011 and this represents not only a loss of information about what is happening at this station but also its contribution to the Northern cluster analysis. It is strongly recommended that the DOC Kaitaia office organises for this site to be listened at in 2015 to provide a more complete picture for the Northern Area. The other five stations in the cluster each had four complete nights of listening carried out at them. Mean annual kiwi call rates per hour for the Northern Area from 1995 to 2014 are shown in Fig. 3.

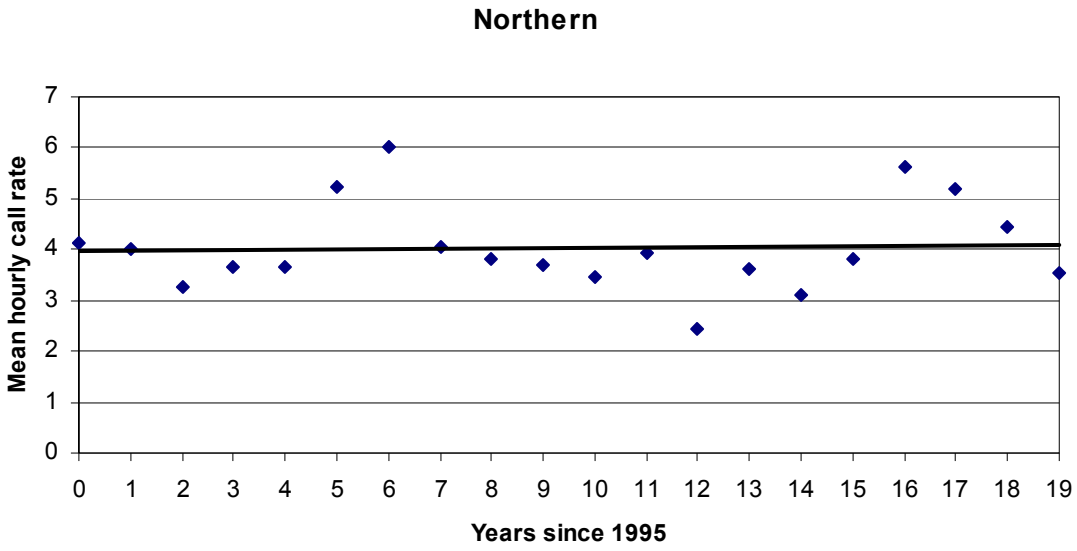

Figure 3. Mean annual kiwi call rates per hour for the Northern Area, one of the original four Northland monitoring areas 1995–2014.

Eastern Area

The Eastern Area experienced a decline in call counts in 2014. This was mainly attributed to the decline in the mean call count at the Marsden Cross station which recorded 19 calls per hour in 2014, down from 30 in 2013. The average call rate for Marsden Cross over the last 5 years has been close to 28 calls/hr so it will be important to assess the results of this station in 2015 to see if the depressed call rate remains. The significantly reduced count at Marsden Cross skews the data for the Eastern Area. Only two sites in the Eastern cluster—station 11 (Puketotara) and station 12 (Rangitane)—recorded increases, with the rest (excluding Marsden Cross) showing decreases of 2.12–4.38 calls/hr. Since 2011 there has been a downward trend in kiwi listening results in the Eastern cluster, but the overall trend since 1995 is a statistically significant positive linear trend (r = 0.507, n = 19, p = 0.013) of increasing mean call rates. All six stations in the Eastern cluster were listened at for four nights except for station 11, which was listened at for three nights. Mean annual kiwi call rates per hour for the Eastern Area from 1995 to 2014 are shown in Fig. 4.

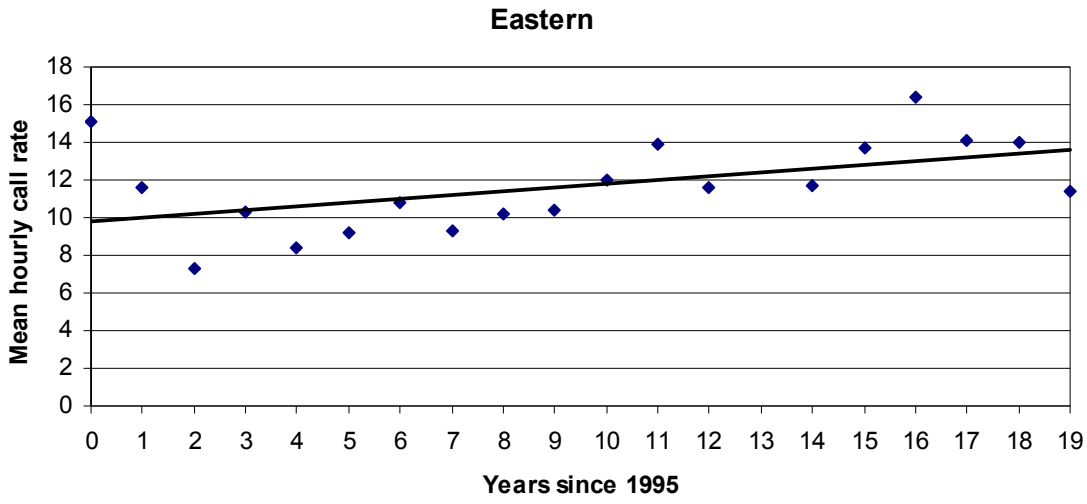

Figure 4. Mean annual kiwi call rates per hour for the Eastern Area, one of the original four Northland monitoring areas 1995–2014.

Southern Area

The Southern Area continued the upward trend in call counts that it has been experiencing since 2008, albeit with a chunky dip in 2010, bringing it closer to its 1995 baseline (Figs 2 and 5). A likely contributor to this recovery are the pulses of 1080 toxin that were applied to control pests 3–5 years ago in the reserves where stations 23, 25 and 26 are located. The observed increase in call counts fits in with the timing of increased recruitment of kiwi into the adult population due to higher chick survivorship after the 1080 operations. A 1080 operation was carried out in Purua Scenic Reserve in 2013, so it will be interesting to see if there is an increase in kiwi calls at station 24 (Purua North) in a few years' time. Despite this upward trend over the last 6 years, analysis of the long-term data shows no significant positive or negative linear trend (r = 0.0849, n = 20, p = 0.36), indicating stable call rates over time, which we assume reflects a stable underlying population. Six out of the seven stations had four nights of listening completed at them. Station 21 (Glenbervie 7A) only had one night of listening completed, with question marks next to the data, so it was not included in the analysis. It may be beneficial to offer more training to new listeners at this site prior to kiwi listening in 2015 to support accurate data collection. Mean annual kiwi call rates per hour for the Southern Area from 1995 to 2014 are shown in Fig. 5.

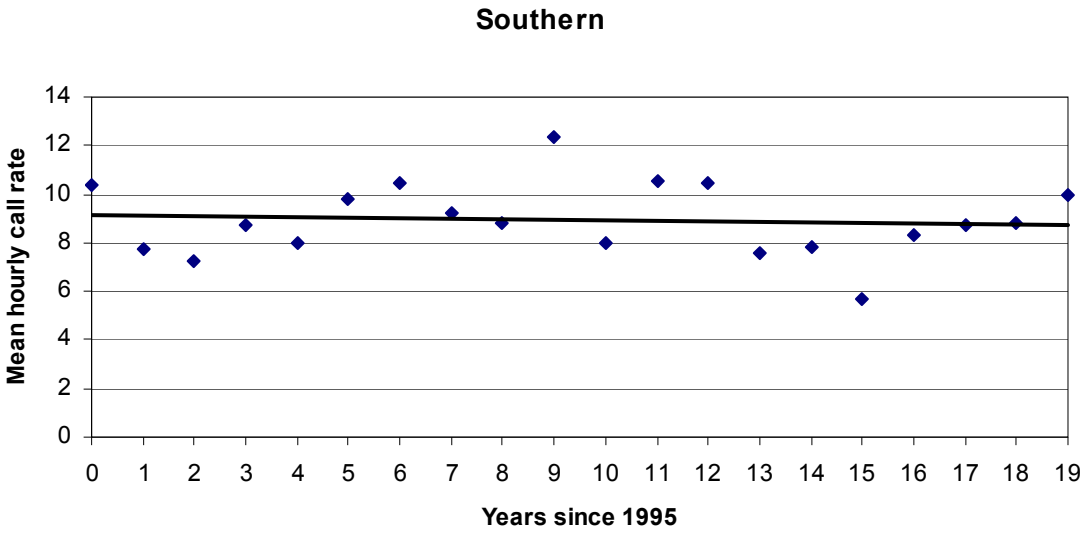

Figure 5. Mean annual kiwi call rates per hour for the Southern Area, one of the original four Northland monitoring areas 1995–2014.

Western Area

The mean call rate of 4.83 calls/hr at stations in the Western Area in 2014 was very similar to the 2013 result. The results are influenced by the fact that only two out of the five stations (stations 18 & 20) from which the mean is calculated from had four full nights of listening carried out at them. These two stations—Cathedral Grove and Paerata—showed slight increases, with Paerata recording a female call on one of the nights, which might bring some comfort to the one or two lonely males at this site. The results from station 17 (Trounson) raise concern, as the mean call rate of 5.25 calls/hr is the lowest result since listening began at this site and a considerable decrease from the 2013 mean of 10 calls/hr. However, this figure was based on just two nights of listening, so it is strongly recommended that in 2015 four full nights of listening are carried out at this station to ascertain whether this drop in call rates remains. The overall population trend for the Western cluster (Fig. 5) shows a strongly significant negative linear trend (r = 0.9205, n = 18, p <0.01). If the results from these stations continue on this trend then the mean call count for the Western Area will be less than 1 call/hr in 5 years' time. Two sites in the Western cluster—Kaitui and Paerata—already

have very low mean call rates of zero and <1 respectively. Despite these results, effort is still being put into listening at these stations and the efforts of Olly Knox and Glen Coulston should be acknowledged, as they listened at those stations knowing that they were going to hear very few or no birds. Mean annual kiwi call rates per hour for the Western Area from 1995 to 2014 are shown in Fig. 6.

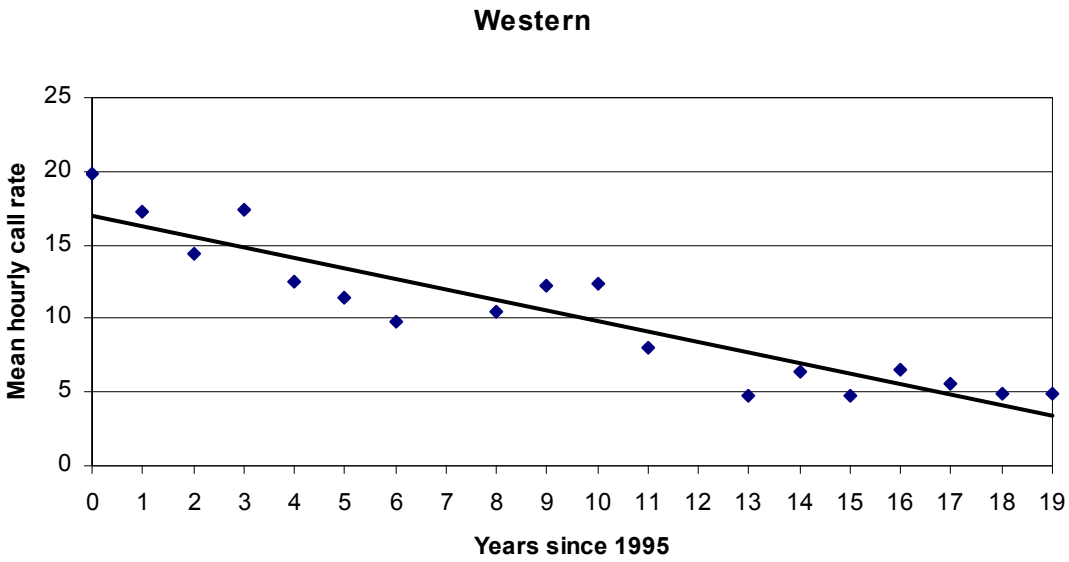

Figure 6. Mean annual kiwi call rates per hour for the Western Area, one of the original four Northland monitoring areas 1995–2014.

3.2 Monitoring of trends in the four kiwi areas

There is great value in having data since 1995 from the original 24 listening stations, as it provides a general indication about population trends in the four geographic areas. This information is complimented by the finer-scale analysis of kiwi listening results at managed populations within each of the geographic areas that show whether those sites are conforming with or bucking the overall trend. To ensure that the monitoring of trends in the four regions continues to have value, it is just as important that we continue to monitor stations where call counts are dwindling or absent, as those where they are growing. If low-call-rate stations are not monitored and data comes only from sites with good call rates, it will not be a true indicator of what is happening over time. The Department of Conservation (DOC) offices that have listening stations in their areas should make it a priority to organise each of the original stations to be listened at so accurate monitoring of trends can continue.

4. Trends at managed populations

Each year, results from the same listening stations are used so that comparisons in call rates over time and the estimates of trends in managed populations are as accurate as possible. It is important that kiwi coordinators prioritise these stations for listening at each year to ensure the most accurate possible depictions of population trends are obtained. The stations that are used in this analysis are listed and data summarised in Appendix 3 for each management site. These should be referred to when organising kiwi listening in 2015. Comments on the trends observed and recommendations for future listening at each management site are provided below.

4.1 Summary of sites

4.1.1. Whakaangi management site

The mean kiwi call count rate for Whakaangi has continued on a downward trend for the fifth consecutive year since the most recent peak (12.23 calls/hr) recorded in 2010 (Fig. 7). The mean of 6.52 calls/hr for 2014 was derived from seven out of the possible nine stations, with the two missing stations (29 and 130) no longer being listened at. In the 2013 kiwi call count report it was shown that the omission of these stations is not a contributing factor in the decline in recorded call counts. The current trend at Whakaangi is very concerning and we can assume that the adult population at this site is declining, most likely because of a combination of reasons including adult deaths (due to recent dog-kill episodes) and low recruitment rates (as suggested by chick monitoring). Although these results are disheartening, the Whakaangi community is assessing and implementing actions to reverse the decline by utilising the advice and support that is available through DOC and the Northland Kiwi Forum and making improvements to their protection programme, where necessary. It is hoped that improved call counts at Whakaangi in coming years will reward them for their commitment to their kiwi.

A total of eight stations were listened at in 2014, seven of which had four nights of listening, while station 133 had two nights. Although not as many stations were listened at in 2014 as in 2013 (15), those that were listened at contribute to the annual analysis, so Whakaangi listeners are thanked for prioritising these sites.

Recommendations:

- Continue to be extra vigilant about encouraging good dog control.
- Continue to prioritise listening at stations 29 and 130–137.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

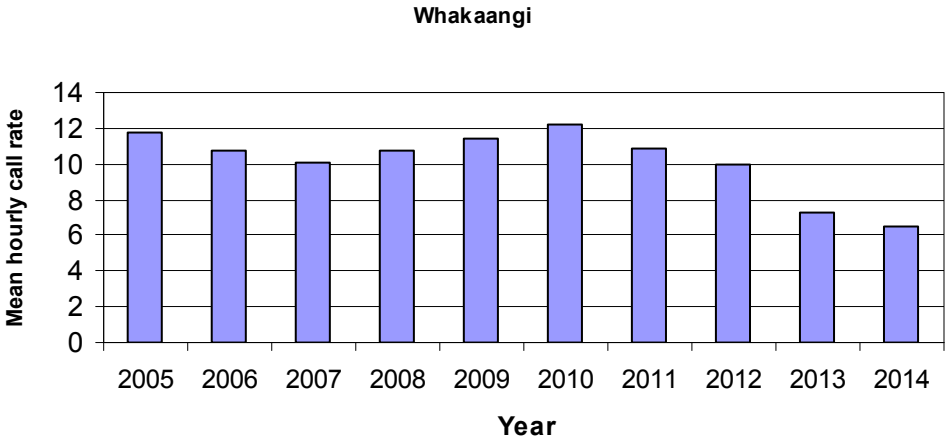

Figure 7. Trends in mean call counts at Whakaangi management site.

4.1.2 Mahinepua – Radar Hill

The 2014 results showed a slight decline in the mean kiwi call counts for Mahinepua – Radar Hill (5.73 calls/hr in 2014 compared to 6.65 calls/hr in 2013), although it is still the third-highest mean call rate recorded, being beaten only by the two previous years' records (Fig. 8). The relatively high result in 2012 appears to be an anomaly, and the 2014 result fits within a generally increasing population trend at this site since 2009, which is very encouraging for this group. Kiwi listening at this management site would benefit from having one consistent listener at each station over the four nights. However, listeners are applauded for taking advice from past listening reports to condense the number of stations listened-at to ensure four complete nights of listening are carried out at the core stations.

Six stations were listened at this year, with four nights of listening completed at each station. Five of these stations were used to calculate the 2014 mean call rate.

Recommendations:

- Try to maintain consistency in kiwi listeners, ideally the same person for all four nights, and across multiple years.
- Please refer to Appendix 3 to view the station numbers that are used to calculate the mean for this site. If you are going to listen to any extra stations in 2015 please ensure that stations 87, 89 and 98 are at the top of the list.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

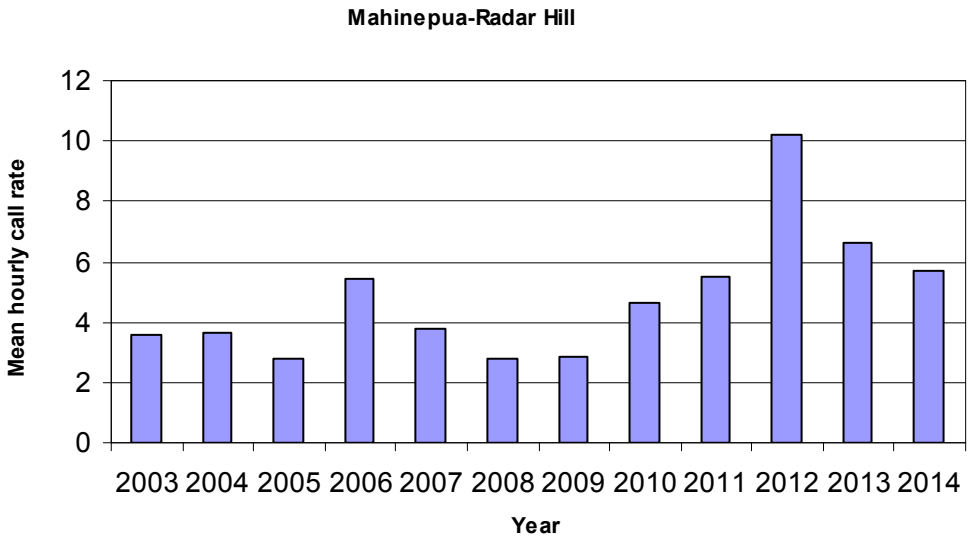

Figure 8. Trends in mean call counts at Mahinepua – Radar Hill management site.

4.1.3 Waimate North

Waimate North had an increase in mean call counts (from 6.60 calls/hr in 2013 to 8.55 calls/hr in 2014). Only two out of the nine stations (114 and 116) listened at had a reduced call rate compared with 2013 and there were some stand-out increases, with station 121 jumping from 1 call/hr in 2013 to 5.50 calls/hr in 2014 and station 122 increasing from 4.13 to 8.00 calls/hr. The Waimate North management site has maintained, since 2005, a range in mean call counts between c. 6 and c. 9 calls/hr, indicating a healthy and stable population (Fig. 9). Waimate North also has the distinction of having the station that recorded the highest average call count across all Northland stations (an average of 27.13 calls/hr at station 113 (W1)). Impressive!

At Waimate North, a total of nine stations were listened at, including all five stations from which the mean call rate is derived. Each station had four full nights of listening. Well done Waimate North listeners!

Recommendations:

- Continue to monitor stations 114, 118, 120, 122 and 124, with extra stations listened from if enough listeners areavailable.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

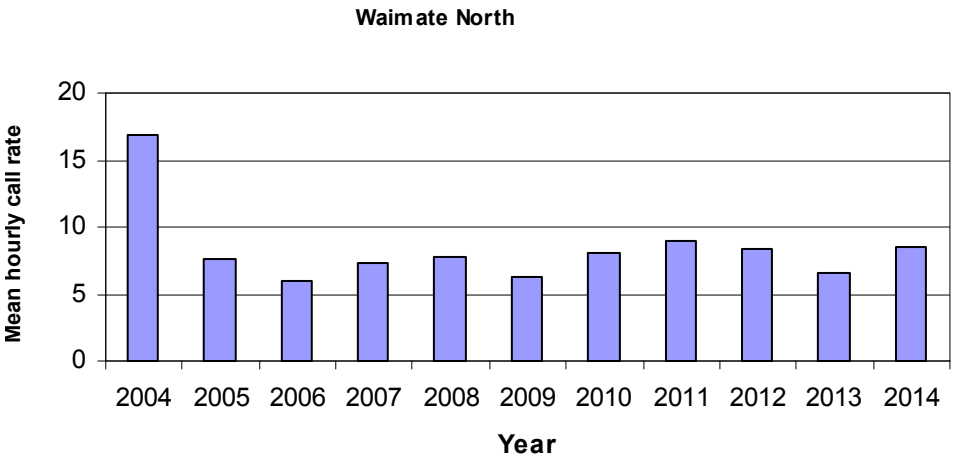

Figure 9. Trends in mean call counts at Waimate North management site.

4.1.4 Puketi Forest

There was a jump in the mean call count rate for Puketi Forest from 3.6 calls/hr in 2013 to 5.67 calls/hr in 2014 (Fig. 10). However, this mean was derived from just three of the possible six stations (104, 108, 111) that are normally used to calculate the mean. The increase in call rates recorded is heavily influenced by this, as the three stations not listened at (102, 105 & 106) usually return relatively low call rates. If the average call rates of the missing stations since 2006 are included in the analysis, the mean call rate drops to 3.7 calls/hr, which is very similar to the 2013 result. This suggests that the real situation is relatively stable around the 3–4 calls/hr range rather than the marked increase recorded.

A total of six stations were listened at (three of which were used to derive the mean for this management site) and all had four complete nights of listening carried out at them.

Recommendations:

- Ensure listening is prioritised at the six selected stations (102, 104–106, 108, 111) that are used to derive the mean call rate for Puketi Forest.
- Try to maintain consistency in kiwi listeners, ideally the same person for all four nights, and across multiple years.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

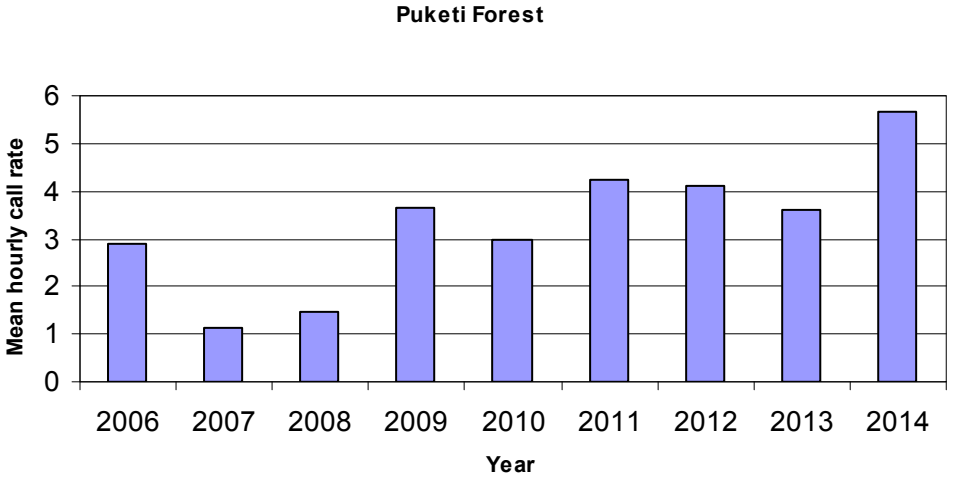

Figure 10. Trends in mean call counts at Puketi Forest management site.

4.1.5 Russell Peninsula

Russell peninsula recorded its highest ever mean call count of 12.83 calls/hr (Fig. 11). However, two of the five stations (62 and173) used to derive the mean weren't listened at and, as at Puketi Forest above, this does have an inflationary effect on the results. The missing result from station 173 (Shortlands) has the greatest effect on the overall mean, as this station has had a low average of 1.67 calls/hr since 2005. If this average result and the one from station 62 (10.58 calls/hr since 2000) are included, then the average drops to 10.15 calls/hr. However, this adjusted figure still indicates that the Russell peninsula population is doing really well and maintaining its relatively high call rate. Great stuff!

A total of eight stations were listened from at Russell Peninsula, all for four full nights. As mentioned above, three of these stations were used to derive the mean for this area.

Recommendations:

- Continue to monitor stations 15, 59, 62, 170 and 173, with extra stations listened at if enough listeners are available.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

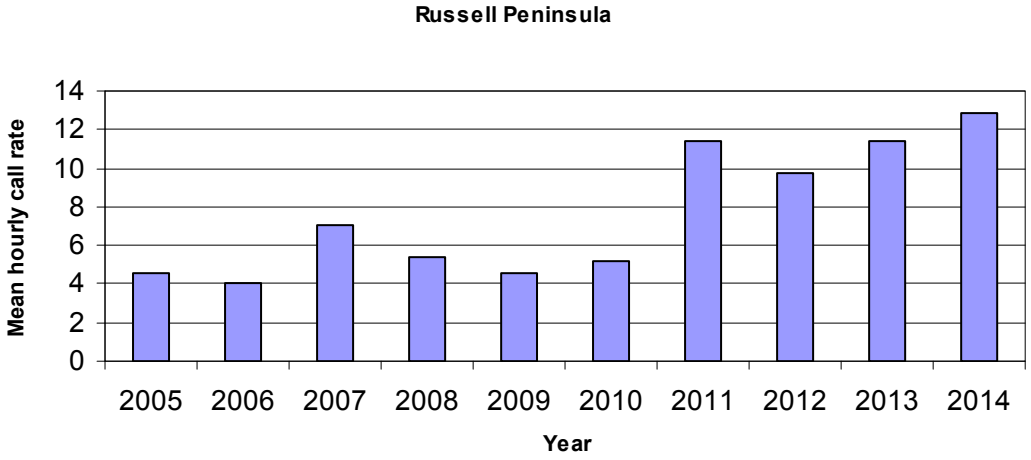

Figure 11. Trends in mean call counts at Russell Peninsula management site.

4.1.6 Waipoua

The mean call count of 6.25 calls/hr recorded for the Waipoua Area in 2014 is very similar to the 6.08 calls/hr recorded in 2013 (Fig. 12). However, of the five stations that are used to derive the mean for this location, only two (18 and 33) had four nights of listening carried out at them. This makes it difficult to draw conclusions about the increase or decrease observed at the other stations that only had one or two nights of listening and puts a question mark next to the overall 2014 result. It is strongly recommended that a concerted effort is made in 2015 to ensure four complete nights of listening are carried out for each of the stations that are used to calculate the mean for Waipoua. As mentioned in the Western Area analysis, one particular site that should be closely looked at is station 17 (Trounson Nth), as it returned only 5.25 calls/hr from two nights of listening. This is well down from the 10 calls/hr recorded in 2013 and is this station's lowest result on record. It will be important to complete four nights of listening at this site in 2015. Three stations that had 4 nights of listening (18, 16b and 33; NB: data from 16b not part of the mean calculation) all showed increases in call counts. This is positive for Waipoua and something for the newly established Kaitiaki Kiwi landcare group to build on as they work towards their vision to restore the Kauri Coast to its rightful place as a stronghold for kiwi in Northland!

Recommendations:

- Maintain annual kiwi listening in the Western area at all the original 1995 stations (16–19, 33). Kaitui (station 16) should continue to be monitored despite low call counts.
- Complete four nights of listening at each station
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

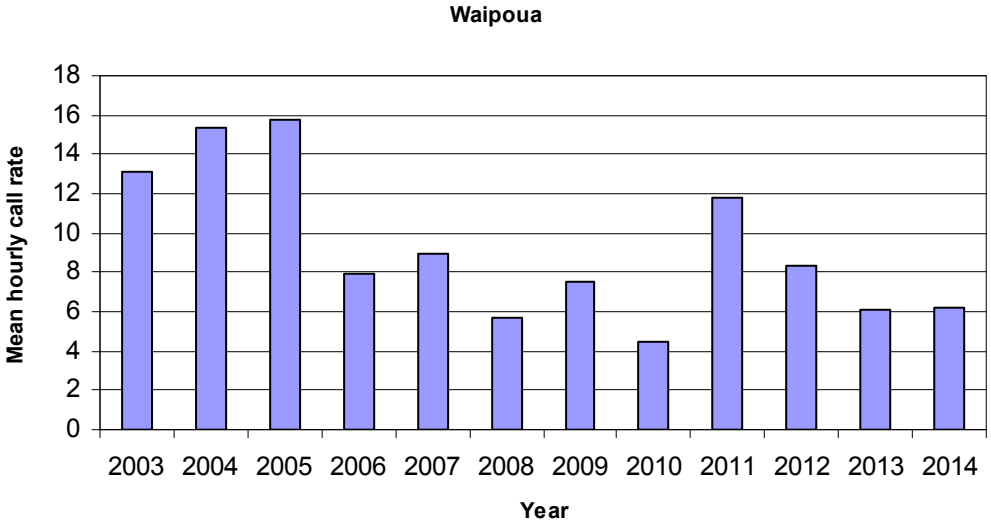

Figure 12. Trends in mean call counts at Waipoua management site.

4.1.7 Motatau–Marlow

There was a slight decline in kiwi call counts for 2014, with a mean of 8.67 calls/hr recorded (down from the mean of 9.13 calls/hr in 2013). This result is derived from only three stations (23, 68 & 129); however, these three stations are consistently listened at, with others added sporadically from year to year. In the last 3 years, the call counts have been c. 8–9 calls/hr and have shown an increasing trend since 2010. These stations are within the Whangarei Kiwi Sanctuary and it is encouraging that kiwi call rates in the last 3 years are the highest since 2006 (Fig. 13). It would be good to get more-consistent results from the other stations that make up this cluster (sites 34–36) to help obtain a more complete picture of kiwi population in this area.

The mean number of kiwi calls per hour for this location was derived from three stations, all of which had four nights of listening completed at them.

Recommendations:

- Maintain annual kiwi listening at stations 23, 34–36, 68 and 129.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

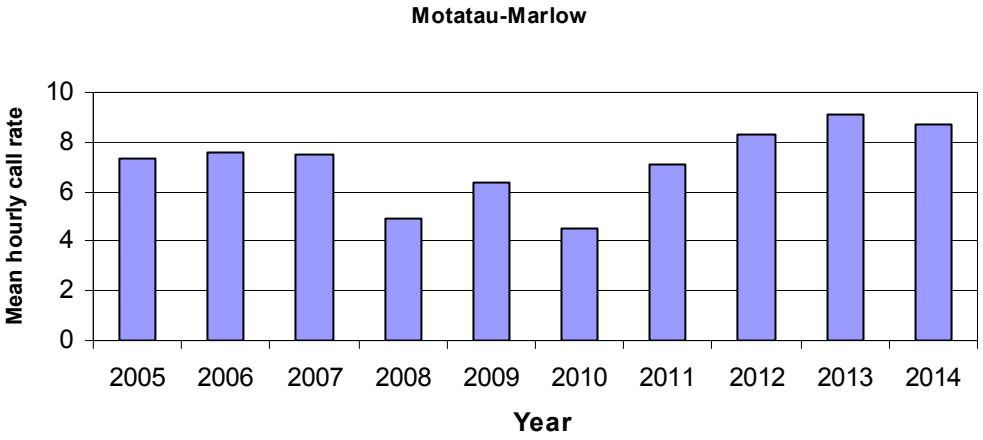

Figure 13. Trends in mean call counts at Motatau-Marlow management site.

4.1.8 Purua–Rarewarewa

Kiwi call rates for Purua–Rarewarewa increased in 2014, with a mean call rate of 14.18 calls/hr recorded—a new high for the stations in this area (Fig. 14). This result is to be expected, however, as the area is a core part of the Whangarei Kiwi Sanctuary where kiwi have been well protected through dog advocacy and trapping for many years (now complimented by regular pulses of 1080 baits in the various reserves to reduce the number of trap-shy stoats and increase chick survivorship). One station (81) had many more calls per hour than previously recorded (a mean of 18.63 calls/hr, cf. 7.25–14.75 in previous years), which obviously influenced the upward trend, as only one other station in this cluster recorded an increase (station 25). The rest of the stations recorded decreases from the previous year of 2.12–6.33 calls/hr, but all results fell into the normal range for these stations.

The data for the Purua–Rarewarewa Area were derived from all of the five stations in this area, each of which had four nights of listening.

Recommendations:

- Continue to monitor all five stations (24, 25, 81, 82, 139).
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

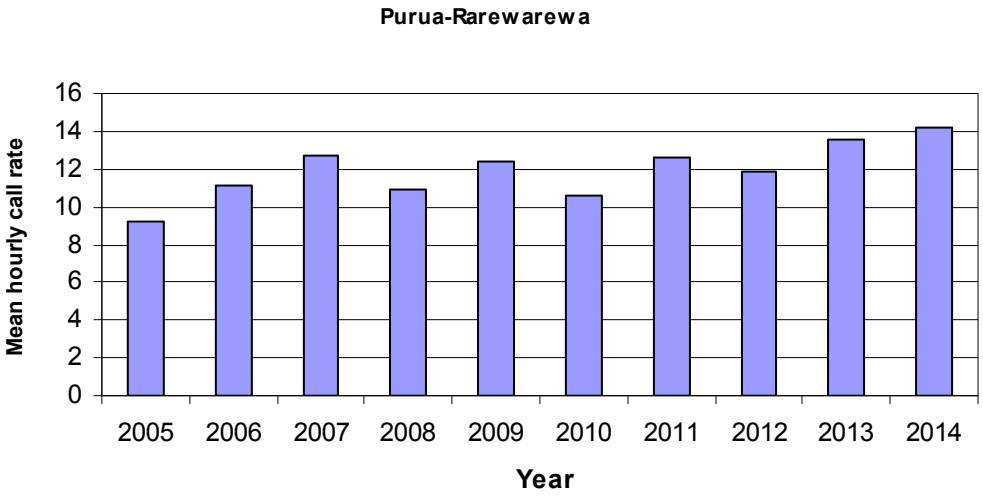

Figure 14. Trends in mean call count rates at Purua-Rarewarewa management site.

4.1.9 Tutukaka

The mean call rate of 6.17 calls/hr for Tutukaka in 2014 is derived from three (125, 142, 143) of the possible five stations and is the second-lowest call rate recorded since listening began in 2005. This relatively low call rate may be a little bit disappointing considering that the population in this area is being supplemented with kiwi from Matakohe-Limestone Island. However, for the 3 years prior to 2014, only two or three stations were listened at, limiting what can be interpreted from the data. Kiwi monitoring data at Tutukaka would benefit from comprehensive listening coverage for 2015 and beyond to provide more accurate estimates of the population and to better track the impact translocated kiwi have on call rates.

A total of five stations were listened at in 2014, all with four nights of listening completed at them. Three of these stations were used to calculate the mean (Fig. 15) .

Recommendations:

- Ensure the main listening stations (125, 126, 142, 143, 144) are listened from each year, for the full four nights.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

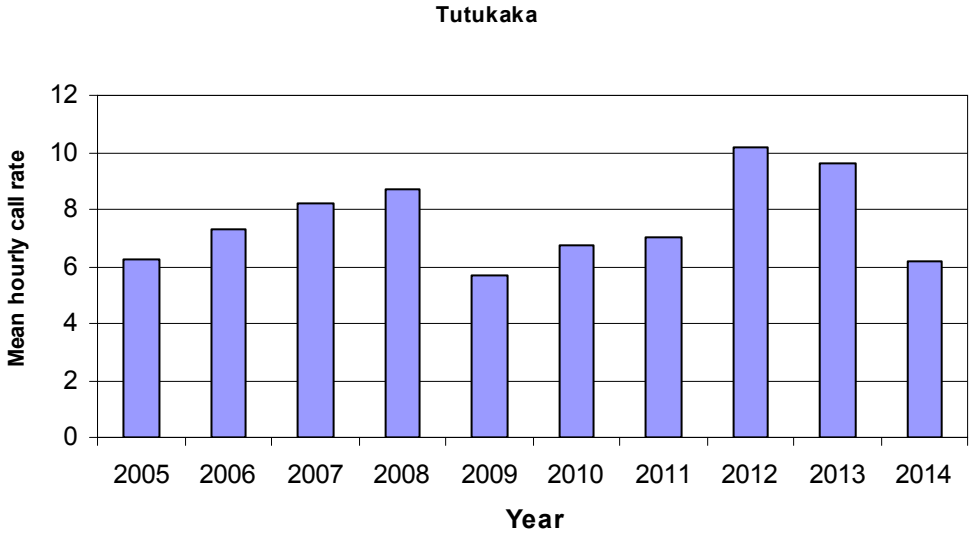

Figure 15. Trends in mean call count rates at Tutukaka management site.

4.1.10 Sandy Bay

Sandy Bay recorded a mean call rate of 3.71 calls/hr in 2014. This site only has four years of data available for comparisons, but it would appear that the rate continues to be c. 3–4 calls/hr (Fig. 16). It is great to have data coming in from this site to allow its kiwi population trend to be analysed. Well done to Nan Pullman who carried out a total of 24 hours of kiwi listening!

Recommendations:

- Ensure listening stations 27, 194 and 195 are listened at each year, for the full four nights.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately and returned before 31 August in the kiwi listening year.

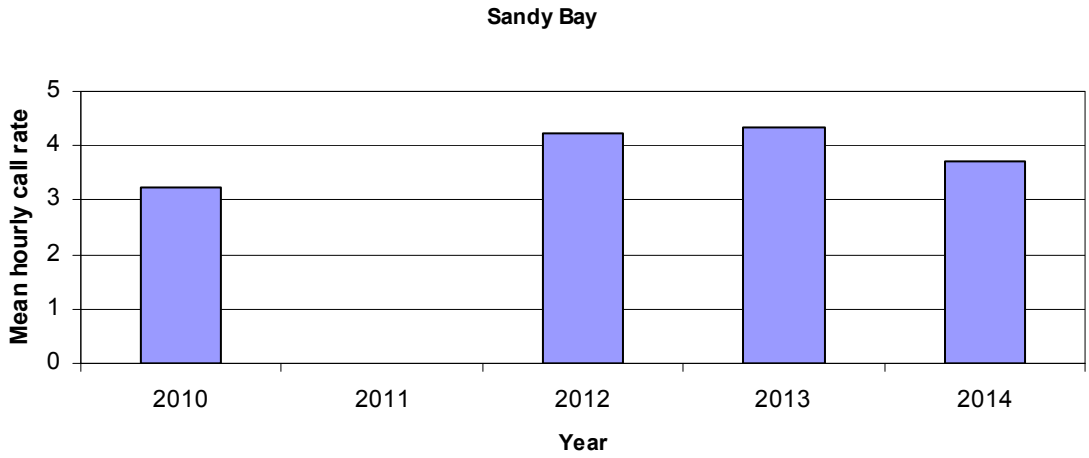

Figure 16. Trends in mean call count rates at Sandy Bay management site.

4.1.11 Manaia–The Nook

This management area recorded a slight increase in mean call counts from 6.43 calls/hr in 2013 to 6.81 calls/hr in 2014 (Fig. 17). One site used to derive the mean was missing (station 71) and if the average of this site since 2002 (1.66 calls/hr) was included, the call rate would drop to 5.78 calls/hr. Although there has been a slight decline in numbers from a peak call count of 7.75 calls/hr in 2012, the overall trend at this site is indicative of a healthy and increasing population. The successful community-initiated application of 1080 baits recently carried out in this area will likely lead to increases in kiwi call counts in the future.

Five stations were listened at, all with four nights of listening completed at them. Four of these stations were used to derive the mean.

Recommendations:

- Maintain annual kiwi listening at stations 47–49, 56 and 71.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

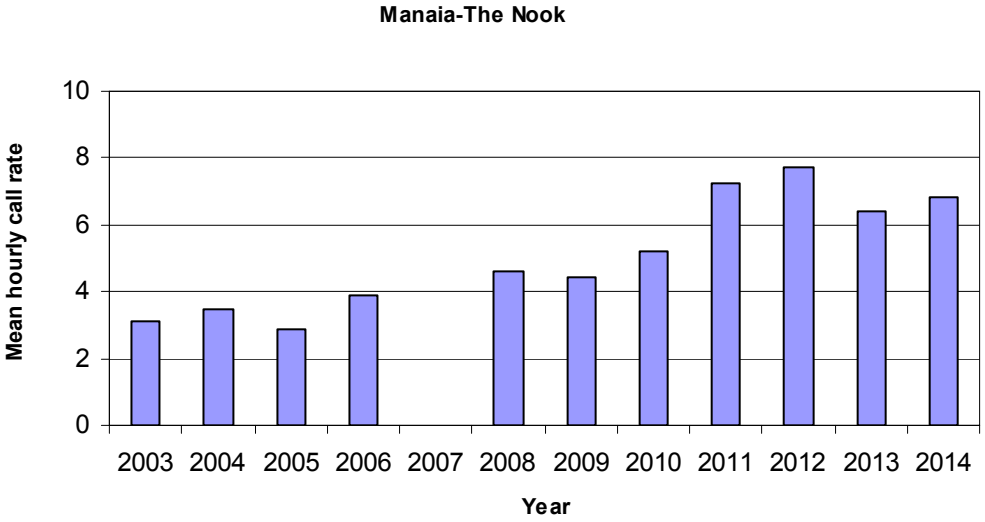

Figure 17. Trends in mean call counts at Manaia–The Nook management site.

4.1.12 Kauri Mountain

The mean kiwi call count for Kauri Mountain increased to 4.95 calls/hr in 2014, up from a mean of 3.8 calls/hr in 2013. This is the highest mean call count recorded for this management area, which has been showing an increasing trend since 2006 (Fig. 18). This result is really encouraging and Kauri Mountain is becoming a great example of the steady kiwi population recovery gains that can be made over time through community protection.

All five stations that are used to derive the mean for this management site were listened at for four nights. Thank you listeners!

Recommendations:

- Continue to maintain annual kiwi listening at stations 54, 72–74 and 141.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

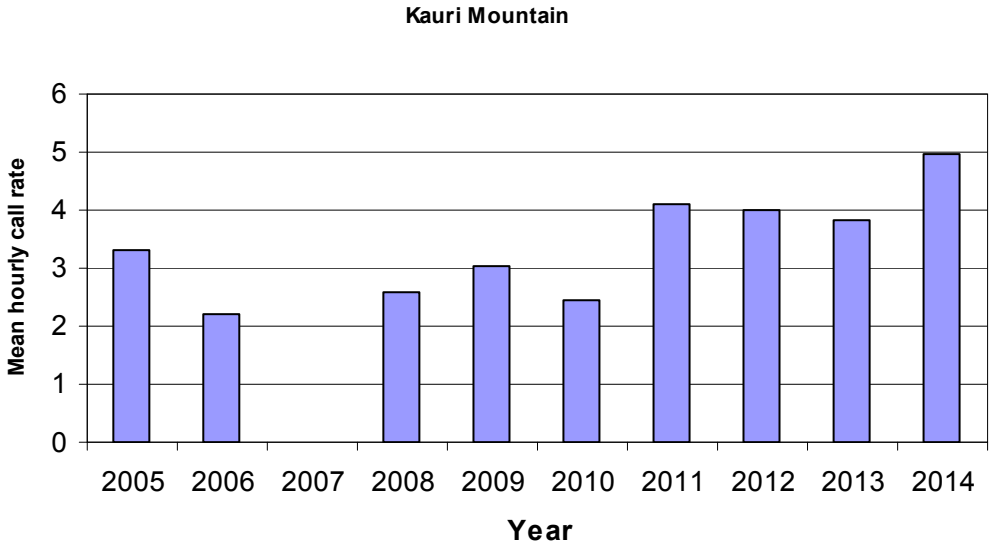

Figure 18. Trends in mean call counts at Kauri Mountain management site.

4.1.13 Bream Head/Taurikura

The Bream Head/Taurikura area experienced a decline in mean call counts in 2014, down from the 8.68 calls/hr recorded in 2013 to 6.19 calls/hr. This has gone against the previously consistent pattern of increasing call counts for this area (Fig. 19). One station was missing from this analysis (station 44) and the absence of this data is a contributing factor to the the decline, as this site had recorded 10.75 calls/hr in 2013. However, there was also a large drop in call counts at station 42 (7.63 calls/hr in 2013 to 2.13 calls/hrin 2014). The same listener has been at this station for the last 2 years so it will be important to see what next year' results bring for this station. It is strongly recommended that all five stations are listened at next year so that a more accurate analysis can be obtained for this site.

The mean was calculated from four stations, each of which had been listened at for four nights.

Recommendations:

- Maintain annual kiwi listening at stations 39, 40, 41, 42 and 44.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

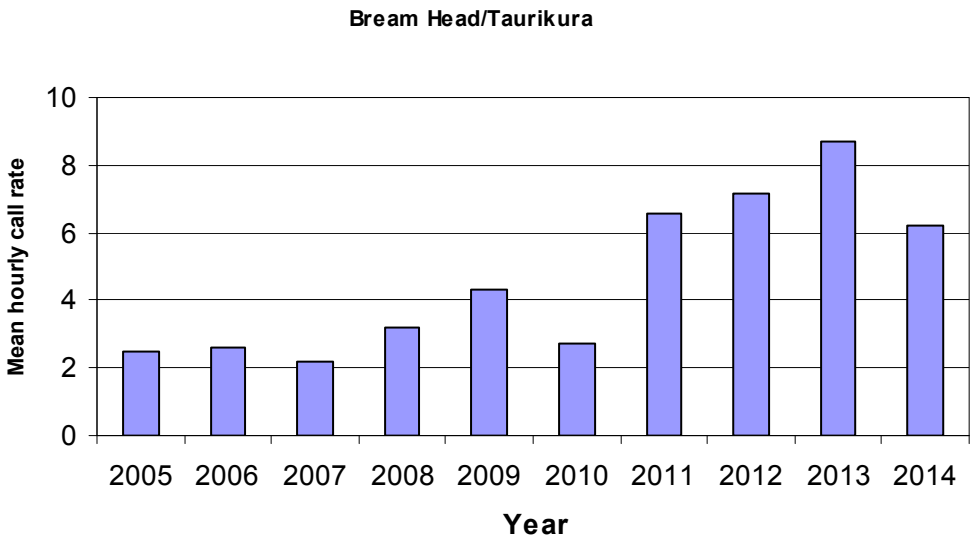

Figure 19. Trends in mean call counts at Bream Head/Taurikura management site.

4.1.14 Tawharanui

There mean call count for this site in 2014 was 4.58 calls/hr, an increase on the 2.65 calls/hr recorded in 2013 (Fig. 20). Kiwi were first translocated to Tawharanui in 2006/07, so it has taken some time for kiwi call rates to start increasing, but it is hoped that the trend will continue in the coming years. Five of the six stations recorded increases in their call counts, with station 164 (possum gully) going from 1.38 calls/hr in 2013 to 7.88 calls/hr in 2014.

The 2014 data were derived from six stations; each listened at for four nights.

Recommendations:

- Maintain annual kiwi listening at stations 161–166.
- Try to maintain consistency in kiwi listeners, ideally the same person for all four nights, and across multiple years.
- Refer to each station by the consistent station number as well as by name.
- Ensure that all kiwi call count data sheets are filled out fully and accurately.

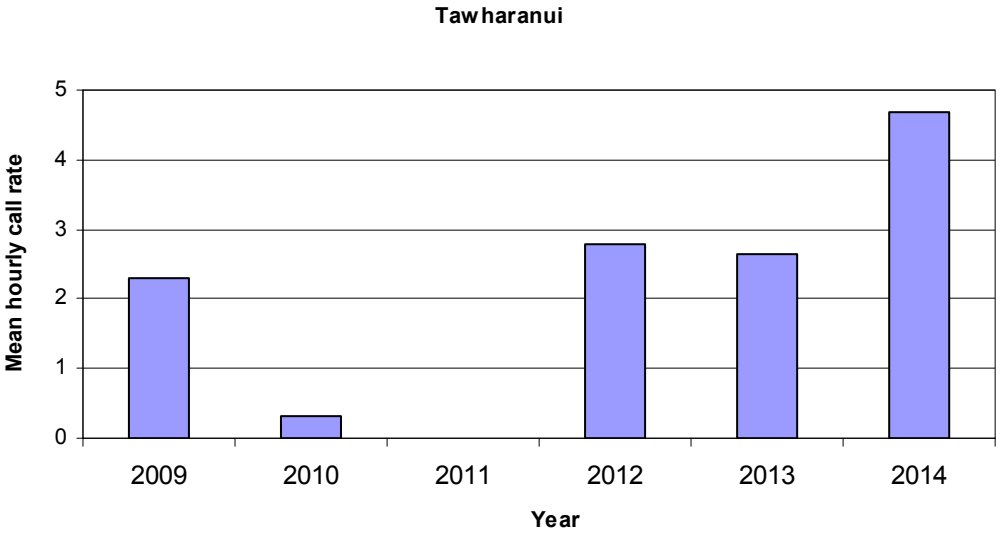

Figure 20. Trends in mean call counts at Tawharanui Open Sanctuary management site.

4.1.15 Kawau Island

No data were received from Kawau Island for the 2014 kiwi listening report. The Pohutakawa Trust is bringing kiwi management on Kawau under its umbrella and we look forward to working with them and including kiwi listening results from Kawau Island in future reports.

4.1.16 Marunui

A total of 38 kiwi have been translocated to Marunui since April 2013. This is a new site within the former range of Northland brown kiwi. Kiwi listening was carried out for the first time this year at one listening station, which returned a call rate of 1.13 calls/hr. This relatively low call rate can be expected from only one station as the birds are spread out and it will take time for numbers to build. Kiwi are already successfully breeding at Marunui and it will be really interesting to track the listening results over the next 10 years to see how well the population grows from its founding kiwi.

Recommendations:

- Increase the number of listening stations to achieve a broader coverage of the area (3–5 stations) and to better track the progress of this newly established population.

4.1.17 Mataia

A second fantastic success story for Northland brown kiwi was their release at Mataia on the Kaipara Harbour, with a total of 34 kiwi being translocated to this area since May 2013. This is the first year of listening at Mataia and the area's managers have opted to use kiwi listening devices that were set up at two different locations. One device was out for six nights, the other for seven and both listened for four hours each night, returning a combined mean of 1.25 calls/hr. Once again, while these are relatively low call rates, they will be expected to increase over time as the population becomes established and expands.

Recommendations:

- The listening devices must be used consistently at the two stations that have been chosen. Alternating between listening devices and people at these stations must be avoided so that direct comparisons can be made from year to year.

5. Discussion and general recommendations

The overall result of Northland kiwi listening in 2014 was generally positive, with many management sites returning call counts that had increased or stayed similar to those of the previous year. Although kiwi listening did not return any dramatic increases this year, the results from the last 5 years show a positive trend in call counts for most of the managed populations in Northland, which is encouraging. There are a couple of notable exceptions to this (Whakaangi and Waipoua) which are, as previously mentioned, cause for concern.

One improvement that is required for 2015 and beyond is to ensure that the stations that are used to derive the mean are always listened at. The absence of data from the missing stations has meant some results for 2014 are questionable and highlights how important it is for listening to be carried out at all the selected stations to allow for more-consistent and accurate reporting. Could local kiwi listening coordinators PLEASE refer to Appendix 3 and check what stations are used in the analysis and prioritise listening to occur at those stations, even if they have low kiwi numbers or kiwi are now absent.

Please note that kiwi listening data should include the following:

- The station is easily identifiable to those who enter and analyse the data for this report, and to future listeners who will repeat listening at the same station. This means that each and every kiwi listening card must include the **individual station number**, and this number must not be changed. Each card must also include an up-to-date GPS reference for the site. Both the station's number and GPS reference need to be written on every card, every night.
- There is consistency in kiwi listeners. Ideally, this will mean the same person will listen from the same station for each of the four nights, and in subsequent years. If this is not practical, aim for at least having the same person covering the same stations for all four nights.
- Each station needs to be covered for four nights if at all possible. If this cannot be finished in the first kiwi listening window, the second window can be used. **It is more important that fewer stations are listened from for four nights than more stations are listened at for only one or two nights**. This will produce more robust data and will give a more accurate measure of kiwi in the area.
- **Kiwi call cards need to be filled out in full, including all the fields, each night**. If fields are missing or data are not legible, it will not be used (please use a **pen** and write firmly. It is difficult to read sheets that have been written in pencil and then scanned or photocopied).
- Kiwi data need to be returned to DOC's Whangarei Office, in electronic or paper form, **no later than the 31st of August in the year in which it was collected.** This should include recordings if regular stations are not listened from. Historically, data has been submitted up to a year after listening occurs. This holds up the process of compiling this report, and it not fair to those who handed data in on time. A reduced capacity in the Whangarei Kiwi Sanctuary team means there is no time for someone to chase up missing or incomplete data. If it is not submitted by the 31st of August it will not be included in the report.

5.1 Other recommendations

- Provide new listeners with adequate training. This must include how to identify the difference between male/female kiwi calls, other species' calls that may be mistaken as kiwi, compass use, judging distances and also how to fill out the forms fully, correctly, and legibly.
- Try to map the location of calling birds during the four nights of listening. This will help to identify the minimum number of individuals and pairs heard from each station.
- If you add a new station in your area, please identify it very clearly as a new station so that it can be allocated a consistent station number. Please make sure you also provide GPS co-ordinates for the station, a name that will make sense to everyone, and any other identifying or necessary information about the station.
- Please check the station numbers listed in appendix 1. If any of these numbers are not accurate, please let Megan Topia (meganleetopia@gmail.com) know as soon as possible.

Thanks to those who followed these recommendations for 2014, your efforts are very much appreciated. Thanks also to everyone who clearly used the station number when identifying their spot, this has made reporting and analysis much easier.

Kiwi listening 2015

Kiwi listening for 2015 should preferably be carried out from 7 May to 26 May, with a back-up window from 6 June to 24 June.

Information about kiwi listening can be found on the Kiwis for kiwi website http://www.kiwisforkiwi.org/resources/call-count-monitoring/.

7. Acknowledgements

Thank you to all the people who carried out kiwi listening in 2014. Participants are listed by station in Appendix 2. Your time and effort in obtaining information about kiwi in your area on those cold winter nights is very much appreciated. Thanks also to local co-ordinators.

Thank you to Hilary Gardiner for your work with data entry and all that involves!

8. References

McLennan, J.A. 1992: Nationwide monitoring of kiwi populations. *DSIR Land Resources Contract Report No 92/91*. Prepared for Science and Research Division, Department of Conservation, Wellington.

Pierce, R.J.; Westbrooke, I.M. 2003: Call count responses of North Island brown kiwi to different levels of predator control in Northland, New Zealand. *Biological Conservation 109(2)*: 175–180.

Robertson, H.A.; Colbourne, R. 2003: Kiwi (*Apteryx* spp.) best practice manual. Department of Conservation, Wellington.

Topia, M.; Craig, E. 2011: Whangarei Kiwi Sanctuary Annual Report 2010–2011. Department of Conservation, Whangarei.

Appendix 1. Mean call count data for all Northland stations 1995–2013.

Appendix 2. Summary of Northland kiwi listening data for stations listened from in 2013.

Appendix 3. Trends in mean kiwi call count rates from annual monitoring at selected stations of managed Northland kiwi populations.

Appendix 1

Mean call count data for all Northland stations 1995–2013

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
Northern																					
1	Diggers Valley	1.10	2.40	4.10	2.50	2.10	3.30	4.10	3.75	3.00	3.90	3.90	2.70	1.30	2.00	1.67	–	2.50	–	–	–
2	Takahue	4.30	3.50	5.50	5.40	6.30	8.40	7.90	4.50	3.30	4.75	5.30	5.00	3.60	4.90	3.13	4.75	11.38	6.88	–	2.38
4	Gartons	5.60	5.00	1.20	–	0.80	2.00	8.60	–	1.50	4.10	4.90	7.10	1.50	1.25	0.00	0.13	0.25	0.75	0.25	0.25
5	Kaiaka	1.70	1.30	2.40	3.40	1.60	3.50	3.00	2.10	1.90	3.75	2.80	1.50	0.00	0.75	–	1.63	1.13	0.25	1.60	1.63
7	Puketi	6.60	5.40	2.10	3.00	6.00	7.60	6.40	3.50	50	3.40	1.50	2.30	0.80	3.90	4.00	6.88	9.38	6.25	6.25	5.88
8	Puketi SR	5.40	6.50	4.40	4.00	5.10	6.50	6.10	6.40	8.25	9.40	2.30	5.10	7.40	8.90	9.00	7.88	9.00	11.75	9.75	7.63
3	Lightning Hill	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.5	13.50	10.00
218	Wells Rd, Kaiaka, Kaitaia	–	–	–	–	–	–	–	–	–	–	–	–	–	0.75	–	–	–	–	–	–
256	Baigents home drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.00
Whakaangi																					
130	Whakaangi 1	–	–	–	–	–	–	–	–	–	–	9.00	10.40	4.60	7.60	6.33	–	–	–	–	–
131	Whakaangi 2	–	–	–	–	–	–	–	–	–	–	14.90	25.00	15.30	20.75	17.13	16.13	9.38	8.00	4.75	3.13
132	Whakaangi 3	–	–	–	–	–	–	–	–	–	–	13.50	14.60	9.00	10.75	12.17	12.17	5.50	3.13	6.75	3.88
29	Whakaangi 4	–	–	4.50	–	2.90	1.90	6.25	3.75	4.90	6.60	2.30	6.80	6.30	4.90	5.75	9.83	5.00	–	–	–
133	Whakaangi 5	–	–	–	–	–	–	–	–	–	–	9.80	13.80	10.10	–	8.25	–	7.88	4.13	–	3.50
134	Whakaangi 6	–	–	–	–	–	–	–	–	–	–	6.00	7.30	3.90	–	9.50	7.00	–	–	4.50	–
135	Whakaangi 7	–	–	–	–	–	–	–	–	–	–	21.90	28.00	24.50	27.00	25.88	21.88	23.38	19.13	11.88	13.63
136	Whakaangi 8	–	–	–	–	–	–	–	–	–	–	14.10	29.00	11.80	18.80	15.25	10.50	20.00	15.25	12.75	13.00
137	Whakaangi 9	–	–	–	–	–	–	–	–	–	–	4.80	8.40	5.60	6.50	4.88	8.13	5.00	–	–	2.63
138	Whakaangi 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.75	4.00	5.83	4.33	3.75	2.88
140	Whakaangi 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16.63	7.63	3.88	7.13
Mahinepua–Radar Hill																					
90	Mahinepua 0	–	–	–	–	–	–	–	–	–	–	–	–	2.0	2.90	3.38	3.63	4.00	7.13	4.38	3.25
83	Mahinepua 1	–	–	–	–	–	–	–	–	3.50	–	2.60	4.10	3.50	2.60	2.38	2.25	3.13	7.50	6.75	4.25
84	Mahinepua 2	–	–	–	–	–	–	–	–	4.20	0.80	2.30	4.80	4.30	2.75	3.25	3.25	4.25	6.75	4.75	3.63
85	Mahinepua 3	–	–	–	–	–	–	–	–	5.60	4.75	4.00	5.50	5.40	3.25	5.88	5.25	5.25	10.25	5.00	5.88
88	Mahinepua 4	–	–	–	–	–	–	–	–	6.10	4.10	3.00	7.80	4.70	4.10	9.50	4.75	5.38	10.63	7.13	8.00
87	Mahinepua 5	–	–	–	–	–	–	–	–	–	–	–	–	2.40	0.90	2.00	–	–	–	–	–
86	Mahinepua 6	–	–	–	–	–	–	–	–	1.00	2.50	2.30	–	0.40	0.75	1.25	–	–	–	–	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
89	Mahinepua 7	–	–	–	–	–	–	–	–	0.90	5.90	1.80	4.80	1.90	0.40	–	–	–	–	–	–
181	Mahinepua 8	–	–	–	–	–	–	–	–	–	–	–	–	0.80	0.40	–	–	–	–	–	–
182	Mahinepua 9	–	–	–	–	–	–	–	–	–	–	–	–	0.10	0.10	–	–	–	–	–	–
183	Mahinepua 10	–	–	–	–	–	–	–	–	–	–	–	–	1.60	1.25	–	–	–	–	–	–
184	Mahinepua 11	–	–	–	–	–	–	–	–	–	–	–	–	2.90	1.25	1.25	–	–	–	–	–
98	Mahinepua 12	–	–	–	–	–	–	–	–	–	3.50	2.30	3.80	2.50	3.40	2.88	–	–	–	–	–
99	Mahinepua 13	–	–	–	–	–	–	–	–	–	3.90	3.80	7.40	7.30	5.00	9.38	7.75	9.50	16.00	9.63	6.88
92	Mahinepua 14	–	–	–	–	–	–	–	–	–	–	–	–	0.60	1.25	1.13	1.38	0.75	–	–	–
91	Mahinepua 15	–	–	–	–	–	–	–	–	–	–	–	–	1.00	1.10	1.63	1.75	3.13	–	–	–
93	Mahinepua 16	–	–	–	–	–	–	–	–	–	–	–	–	1.30	6.00	2.00	2.63	5.25	–	–	–
94	Mahinepua 17	–	–	–	–	–	–	–	–	–	–	–	–	2.50	4.90	5.00	3.38	6.88	–	–	–
95	Mahinepua 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.75	–	–	–	–	–
Bay of Islands																					
146	Kauri Cliffs 1 (Pink Beach)	–	–	–	–	–	–	–	–	9.00	–	–	4.00	4.25	1.75	5.00	6.50	–	–	–	–
147	Kauri Cliffs 2 (Puriri)	–	–	–	–	–	–	–	–	–	–	–	1.50	3.00	2.75	1.00	–	–	–	–	–
10	Marsden Cross	20.90	18.30	9.60	16.70	14.50	19.90	21.90	17.90	18.50	22.00	19.30	30.60	23.00	–	20.25	24.50	34.88	30.86	30.25	19.25
148	Wiwiki Beach	–	–	–	–	–	–	–	–	–	–	–	32.10	–	–	–	–	–	–	–	–
149	Mataka Stn Gate, Purerua	–	–	–	–	–	–	–	–	–	–	–	4.00	4.10	8.25	6.75	18.50	3.25	10.00	6.88	–
150	McKenzie Rd, Purerua	–	–	–	–	–	–	–	–	–	–	–	9.50	12.10	10.25	5.00	7.50	–	2.50	–	–
151	Mtn Landing (Lot 30) Purerua	–	–	–	–	–	–	–	–	–	–	–	12.30	10.20	18.75	12.60	25.00	22.75	20.25	–	–
11	Puketotara	10.00	13.80	8.10	11.60	9.70	8.00	–	2.50	7.50	3.60	–	7.10	13.70	10.60	6.17	9.50	9.25	9.13	9.75	14.00
152	Waitoto Block	–	–	–	–	–	–	–	–	–	–	–	4.00	–	–	–	–	–	–	–	–
12	Rangitane	14.00	5.60	8.40	10.50	7.50	8.40	11.50	10.50	8.60	8.00	8.00	11.50	9.10	15.9	15.25	11.38	10.75	12.75	11.25	12.83
153	Aroha Island	–	–	–	–	–	–	–	–	6.88	–	–	12.60	–	–	–	–	–	–	–	–
154	Napia Bay	–	–	–	–	–	–	–	–	–	8.70	5.50	4.60	4.00	4.50	3.25	5.60	7.50	3.60	4.00	–
155	Stirlings Quarry	–	–	–	–	–	–	–	–	7.30	9.80	13.00	12.40	10.20	8.30	4.00	8.50	–	–	–	–
97	Kurapari Rd	–	–	–	–	7.10	–	–	–	12.70	8.80	9.25	10.40	5.50	6.00	6.75	4.75	2.33	5.59	7.00	–
13	Waitangi No 12	7.60	7.60	6.30	8.90	5.30	7.10	11.50	15.10	18.40	13.75	11.50	15.50	6.30	–	–	–	–	6.75	7.38	3.00
14	Mt Bledisloe	27.10	10.90	5.50	7.90	8.80	5.10	6.40	6.75	4.90	8.90	9.10	5.50	9.60	11.25	8.25	11.38	13.71	7.38	10.75	6.75
138	Hupara	–	–	–	–	–	–	–	–	–	25.60	19.30	27.80	–	–	–	–	–	–	–	–
185	Akeake Reserve, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	2.75	0.50	–	6.00	–	–	–
186	Cunningham Gardens, Aroha Island	–	–	–	–	–	–	–	10.75	8.63	–	–	–	–	–	–	–	8.17	–	–	–
187	Gaitens, Rangitane Rd, Kerikeri	–	–	–	–	10.00	–	12.80	6.33	6.88	10.00	12.00	12.63	14.70	10.50	8.00	7.25	7.50	4.75	–	–
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–	–	–	–	–	10.25	10.30	7.67	8.26	6.20	6.00	8.00	4.50	6.88	8.75	6.40	0.00	–
189	Doves Bay, Kerikeri (Lockyer)	–	–	–	–	4.17	–	–	2.00	–	3.78	2.46	–	–	4.50	7.50	15.25	18.25	–	–	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
190	Rangitu, Opito Bay Road, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	9.10	16.00	15.50	15.50	–	–	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	4.50	4.00	–	–	–	–
192	Kraus, Hansen Rd, Purerua	–	–	–	–	–	–	–	–	–	3.33	–	–	–	–	11.00	–	–	–	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–	–	–	–	–	–	41.50	–	30.00	39.00	32.67	24.50	41.75	30.00	41.25	–	30.83	30.88	–
194	Mataka Station, Ninepin Track, Purerua	–	–	–	–	–	–	–	–	–	30.00	–	–	–	50.75	43.50	–	18.00	–	24.00	–
195	Mountain Landing (Lot 30) Wharengaere, Purerua	–	–	–	–	–	–	–	–	–	–	–	12.25	10.20	18.75	12.60	25.00	22.75	20.25	13.25	–
196	Mountain Landing, Mataka Ridgeline, Purerua	–	–	–	–	–	–	–	–	–	–	–	7.50	10.10	18.00	25.50	14.25	22.00	–	–	–
197	Mountain Landing, Paddle (Entrance), Purerua	–	v	–	–	–	–	–	–	–	–	–	8.50	10.20	12.50	14.25	17.00	–	–	–	–
198	Mountain Landing, Poraenui Point	–	–	–	–	–	–	–	–	–	–	–	–	7.30	14.50	16.00	13.75	–	–	–	–
199	Paoneone	–	–	–	–	–	–	–	16.67	–	–	–	–	–	–	–	–	37.60	–	11.25	–
200	Pattersons Big Hill	–	–	–	–	–	–	–	9.00	–	–	30.50	–	4.01	20.50	70.25	33.00	35.50	–	–	–
201	Pattersons, Rocky Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	16.50	19.50	17.67	11.67	–	–	–
202	Tapuaetahi	–	–	–	–	–	–	–	–	–	–	–	5.00	–	3.00	3.25	16.50	–	–	7.38	–
203	Wharengaere Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.50	15.50	–	–	–
204	Wiroa Station	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	6.67	–	–	–
205	Wiroa Station Hill 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	–	–	–	–
206	Maintenance Facility, Kauri Cliffs45	–	–	–	–	–	–	–	–	–	–	–	–	–	6.50	5.00	13.13	–	–	–	–
207	Waiaua Bay, Matauri X	–	–	–	–	–	–	–	–	2.25	–	–	0.50	0.50	–	–	–	–	–	–	–
208	Waterfall, Kauri Cliffs, Takou Bay	–	–	–	–	–	–	–	–	6.00	–	–	5.50	2.25	4.50	3.50	–	–	–	–	–
209	Hikurua Rd (end)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	–	–	–
212	Drivers Whitehills farm	–	–	–	–	–	–	–	–	–	–	–	–	–	7.50	2.00	8.00	8.00	7.88	–	–
213	Landcorp Takou Kiwi covenant	–	–	–	–	–	–	–	–	–	–	–	–	–	8.50	0.75	3.00	–	–	–	–
214	Maori Block	–	–	–	–	–	–	–	–	–	–	–	–	1.50	–	–	3.50	–	–	–	–
215	Otaha Station (south end)	–	–	–	–	–	–	–	–	–	–	–	–	3.00	–	–	3.00	–	–	–	–
216	Just past Clinton's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	–	–	–
217	End of Te Ra Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.25	–	–	–	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
219	Achtzhener, Bulls Gorge, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	7.00	–	6.00	11.75	5.75	2.75	–	1.88	–
220	Airstrip Rd (Baigent-Mercer)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	3.25	–	–
221	Airstrip Rd (Sharp)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.00	–	–	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	0.75	6.00	–	–	–	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.50	–	–	5.75	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.00	–	–	11.00	–	–
225	Kauri Hills, Totara North	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	6.25	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	9.00	–	6.50	–	5.38	4.63	–
227	Puketotara Rd = 709	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.00	–	–	–	–
228	Puketotara Rd = Kearney	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	–	–	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.60	0.50	–	–	–	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	–	–	–	–	–	–	–	–	–	–	–	4.00	–	–	–	–	–	–	–	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	–	–	–	–	–	–	–	–	–	–	–	4.50	4.60	8.00	5.00	–	–	–	–	–
233	Wharau Rd, Kerikeri (Manning)	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	–	5.50	3.50	4.50	–	–
234	Wharau Rd, Kerikeri (Starr)	–	–	–	–	–	–	–	–	–	–	–	–	–	7.00	–	–	–	–	–	–
Puketi Forest																					
102	Bramley's Rd	–	–	–	–	–	–	–	–	–	–	–	2.50	0.50	2.00	2.00	2.75	2.75	2.50	2.00	–
103	Pirau Ridge	–	–	–	–	–	–	–	–	–	–	–	0.00	–	0.00	1.00	0.50	1.25	1.25	1.38	0.50
104	Pond	–	–	–	–	–	–	–	–	–	–	–	4.50	1.00	3.75	5.00	3.50	8.00	6.88	4.63	5.88
105	Pudding Bowl Hill	–	–	–	–	–	–	–	–	–	–	–	0.30	0.75	1.125	2.04	2.00	1.00	–	3.00	–
106	Takapau Track	–	–	–	–	–	–	–	–	–	–	–	0.00	1.00	0.00	2.50	3.25	2.38	2.57	1.38	–
107	Takapau/Pirau Rd Junction	–	–	–	–	–	–	–	–	–	–	–	0.50	–	1.00	2.75	1.38	3.50	1.50	1.13	0.88
108	Totara Ridge	–	–	–	–	–	–	–	–	–	–	–	5.75	–	0.75	7.13	3.50	6.13	4.63	5.88	5.00
109	Waihoanga Gorge	–	–	–	–	–	–	–	–	–	–	–	2	–	3.75	5.38	3.25	6.25	4.5	4.25	–
110	Waihoanga Gorge 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.50	2.50	1.50	–	4.50	–
111	Walnut	–	–	–	–	–	–	–	–	–	–	–	4.25	2.50	1.25	3.29	3.00	5.25	4.00	4.75	6.13

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
112	Stoat line 9 - Puketi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.13	4.00	3.63	1.38
188	Puketi Nature Trail	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.13	–	3.25	–
Russell Peninsula																					
15	Tikitikiore	10.80	13.50	6.10	6.10	4.50	6.50	2.90	3.30	3.10 (12.30)	6.10 (7.10)	3.38	13.00	7.90	–	12.25 (5.25)	12.25	13.50	17.75	14.50	12.38
59	Opito Farms	–	–	–	–	–	5.70	–	9.90	–	–	4.63	13.10	6.10	9.13	6.75	4.25	5.25	8.13	6.88	11.50
60	Flagstaff/Te Maiki	–	–	–	–	–	3.70	1.30	1.30	–	–	–	4.30	–	6.38	–	2.50	4.25	3.88	3.25	3.25
62	Uruti Rd	–	–	–	–	–	10.80	7.60	10.50	–	–	7.63	14.40	7.90	5.00	12.75	12.25	12.75	11.5	13.88	–
61	Milne Ct	–	–	–	–	–	–	–	–	–	–	–	6.30	5.80	–	–	–	–	–	–	–
156	Russell Heights	–	–	–	–	–	–	–	–	–	–	–	9.80	4.80	5.00	2.50	5.00	–	–	–	–
171	Mace/Farmer	–	–	–	–	–	–	–	–	–	–	–	–	–	6.63	4.75	17.63	10.38	6.25	4.00	4.00
172	Pipiroa Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	3.00	2.00	2.75	6.00	5.38	5.63
173	Shortlands	–	–	–	–	–	–	–	–	–	–	2.00	–	2.50	1.38	1.13	1.25	–	2.33	1.13	–
170	Nikau Block	–	–	–	–	–	–	–	–	–	–	12.88	10.00	–	1.00	3.00	8.88	14.25	9.13	20.75	14.63
174	Johnsons	–	–	–	–	–	–	–	–	–	–	–	–	9.75	12.75	–	1.63	11.38	8.5	10.13	10.25
176	Jarvis	–	–	–	–	–	–	–	–	–	–	5.38	4.30	–	–	–	–	–	–	–	–
177	Soloman's Gate	–	–	–	–	–	–	–	–	–	–	11.50	6.38	–	–	–	–	5.38	6.25	4.88	14.00
210	Paroa Bay, Russell	–	–	–	–	–	–	–	–	–	–	–	–	4.30	–	–	–	–	–	–	–
211	Eagles Nest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	–	–	–	–
Waimate North																					
113	W1	–	–	–	–	–	–	–	–	–	23.5	15.8	24.75	–	–	25.5	25.75	23.63	23.13	23.75	27.13
114	W2	–	–	–	–	–	–	–	–	–	12.25	7.00	9.50	7.90	11.50	5.75	14.50	11.63	12.50	7.13	5.13
115	W3	–	–	–	–	–	–	–	–	–	14.90	–	–	–	–	–	–	1.00	0.00	1.00	1.38
116	W4	–	–	–	–	–	–	–	–	–	9.40	10.50	6.00	–	8.00	–	8.50	13.50	10.50	10.88	8.50
117	W5	–	–	–	–	–	–	–	–	–	5.90	1.83	3.00	–	–	–	–	–	–	–	–
118	W6	–	–	–	–	–	–	–	–	–	22.3	11.00	5.70	8.50	7.30	9.13	5.63	10.63	8.00	7.50	10.38
119	W7	–	–	–	–	–	–	–	–	–	–	5.30	6.50	–	3.10	–	–	–	–	–	–
120	W8	–	–	–	–	–	–	–	–	–	13.75	2.83	1.00	8.10	8.00	5.50	8.13	9.13	11.88	9.13	11.25
121	W9	–	–	–	–	–	–	–	–	–	5.20	3.50	2.125	2.30	3.50	–	–	–	–	1.00	5.50
122	W10	–	–	–	–	–	–	–	–	–	–	–	7.33	8.30	5.90	5.25	4.13	7.25	5.13	4.13	8.00
123	W11	–	–	–	–	–	–	–	–	–	7.07	7.75	2.00	–	–	–	–	–	–	–	–
124	W12	–	–	–	–	–	–	–	–	–	18.90	9.75	6.10	3.60	5.90	6.00	7.88	6.25	4.63	5.13	8.00
178	W13	–	–	–	–	–	–	–	–	–	–	–	–	–	4.50	2.80	–	–	–	–	–
127	W14	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	0.88	0.50	0.00	–	–	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
128	W16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.90	2.17	–	–	–	–
191	Hupara Land Care 1 (Bill's Plateau)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.25	15.13	21.38
245	Hupara Land Care 2 (Mike Sullivan's)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20.88	11.00
246	Hupara Land Care 3 (Sue's place)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	19.38	–
257	Hupara Land Care 4 (Home Orange Tree)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.63
Western																					
16	Katui	47.60	39.40	20.40	28.20	17.50	16.10	14.40	–	14.90	13.90	–	4.00	–	0.00	–	0.25	–	–	0.00	0.00
17	Trounson North	8.50	17.30	12.50	19.00	16.00	14.30	16.10	–	15.25	19.90	22.20	15.40	–	13.75	22.33	5.75	15.13	12.00	10.00	5.25
33	Trounson South	–	–	–	–	–	–	12.25	–	23.75	19.10	–	–	8.20	8.90	–	11.13	12.33	10.00	6.00	7.75
18	Cathedral	2.30	3.80	5.10	5.50	5.10	1.80	2.75	5.90	5.25	4.90	4.00	4.60	4.40	3.00	1.63	2.75	4.13	2.63	4.38	5.75
19	Waipoua L/Out	30.90	24.40	30.80	27.70	21.40	21.80	14.60	8.40	16.90	22.75	23.00	–7.90	11.80	6.00	6.00	9.25	15.63	8.88	10.00	12.50
79	Toronui Track	–	–	–	–	–	–	–	–	1.75	2.40	–	–	–	–	–	–	–	–	–	–
96	Kawerau Rd Cr	–	–	–	–	–	–	–	–	3.40	2.00	0.30	0.40	1.00	–	–	–	–	–	–	–
179	Marlborough 13	–	–	–	–	–	–	–	–	–	–	–	–	–	6.50	–	–	–	–	–	–
20	Paerata	9.90	1.30	3.10	6.50	2.80	3.10	1.25	–	0.00	–	–	–	0.90	1.10	1.63	0.25	0.38	1.13	0.25	0.63
31	Te Matua Ngahere	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.25	4.13	–	–	–	–
13b	Site 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.13	–	–	–	–	–
14b	Site 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–	–	–
16b	Marlborough Rd Site 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.38	2.13	1.50	1.38	0.63	2.00
18b	Site 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	–	–	–	–	–
28b	Site 28	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.25	8.88	3.63	4.13	5.13	–
30b	Site 30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	3.00	0.88	–	–	–
31b	Site 31	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	–	–	–	–	–
32b	Site 32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.88	–	–	–	–	–
157	Opouteke CHH	–	–	–	–	–	–	–	–	–	–	–	6.60	6.10	2.80	11.25	–	–	–	–	–
158	Pipiwai CHH	–	–	–	–	–	–	–	–	–	–	–	7.30	0.50	1.50	–	–	–	–	–	–
189	Alf's Cottage	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.20	–	–	–
190	River Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.00	–	–	–
244	Maunganui Bluff	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-	–	–	–	0.00	–
Southern																					
21	Glenbervie 7A	5.00	6.40	7.10	7.50	5.00	0.50	1.00	2.40	1.00	–	1.30	–	2.40	2.50	1.88	1.75	2.63	1.13	4.25	–
22	Glenbervie 9A	11.20	3.80	4.30	7.30	5.90	12.60	6.75	5.25	4.50	6.50	–	1.80	2.80	2.90	1.38	2.88	1.63	6.75	6.88	2.75

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
23	Marlow Road	22.40	13.90	14.00	17.80	19.80	21.30	22.90	–	19.80	17.60	12.10	10.00	13.30	11.10	10.25	7.25	13.13	15.38	14.00	18.38
24	Purua North	12.10	13.00	10.30	10.50	10.60	15.00	12.75	12.5	13.25	10.90	12.60	13.60	18.30	9.90	13.50	10.00	16.13	16.00	17.63	14.88
81	Purua South	–	–	–	–	–	–	–	–	14.75	15.90	14.40	14.10	14.60	10.50	12.50	11.13	17.50	10.75	7.25	18.63
25	Rarewarewa –early listen	–	–	–	8.00	10.40	4.60	7.00	6.50	4.60	5.90	5.60	4.80	6.00	–	–	–	–	–	–	–
25	Rarewarewa South	7.50	8.00	8.50	6.60	8.30	6.60	7.00	5.80	6.50	6.60	5.30	6.30	6.60	6.40	8.88	4.00	7.88	6.50	4.63	7.50
82	Rarewarewa North	–	–	–	–	–	–	–	–	9.75	6.60	4.00	8.50	7.90	10.40	11.38	11.38	11.88	12.13	10.00	7.88
139	Hodges Bush	–	–	–	–	–	–	–	–	–	–	9.80	13.00	16.10	17.75	15.5	16.63	9.5	13.75	28.63	22.00
145	Whangaruru	–	–	–	–	–	–	–	–	–	–	–	6.00	6.00	10.25	13.38	10.75	24.29	13.50	9.38	7.75
26	Mimiwhangata	11.00	5.60	3.50	3.60	0.30	9.40	19.10	20.30	13.80	20.25	14.30	21.00	19.50	12.90	11.00	8.38	–	11.00	9.00	12.13
167	Kaikanui Rd	–	–	–	–	–	–	–	–	–	–	–	–	8.50	11.60	15.00	8.38	7.25	3.75	2.88	–
27	Sandy Bay 1	3.60	3.40	2.80	8.00	6.10	3.30	3.50	–	3.00	–	2.50	–	–	6.75	–	5.25	–	4.17	5.50	4.25
194	Sandy Bay 2	–	–	–	–	–	–	–	–	–	–	–	4.50	–	–	3.83	3.50	2.50	4.50	–	3.00
195	Sandy Bay 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.00	–	4.00	7.50	3.88
34	Motatau 1	–	–	–	–	8.80	–	10.00	15.00	6.75	7.50	5.60	6.50	7.50	8.75	6.00	–	4.88	2.50	–	–
35	Motatau 2	–	–	–	–	–	–	–	2.70	–	–	1.50	3.00	2.50	–	–	–	4.25	–	5.50	–
36	Motatau 3	–	–	–	–	–	–	4.80	1.50	2.75	5.50	3.50	4.60	4.00	0.90	–	–	5.50	–	–	–
38	Motatau 5	–	–	–	–	–	–	1.50	1.25	0.90	1.00	–	–	–	–	–	–	–	–	–	–
68	Motatatu 9/ Marlow 1	–	–	–	–	–	–	–	11.70	11.75	17.60	13.50	10.50	9.30	2.90	7.13	3.00	9.75	9.88	9.25	5.38
129	Motatau 10/ Marlow 2	–	–	–	–	–	–	–	–	–	7.1	7.5	10.9	9	5.75	2.17	3.38	5	5.38	7.75	2.25
168	Worsp Rd	–	–	–	–	–	–	–	–	–	–	–	–	1.80	2.40	2.00	5.75	1.38	–	–	–
185	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	–	–	–
Whangarei Heads																					
39	Bream Hd 1	–	–	–	–	–	–	5.00	3.10	5.75	3.10	4.70	5.10	3.50	5.00	6.00	3.00	7.13	9.50	9.63	9.63
40	Bream Hd 2	–	–	–	–	–	–	1.20	2.00	1.25	2.10	2.40	2.00	2.80	2.00	–	–	1.25	–	–	–
41	Bream Hd 3	–	–	–	–	–	–	–	–	–	–	1.50	2.00	1.30	1.60	–	–	–	8.38	8.63	8.63
42	Bream Hd 4	–	–	–	–	–	–	1.2	2	1.25	2.1	2.4	2	1.5	3.1	2	2	5.38	5.33	7.63	2.13
69	Bream Hd 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.88	6.75	4.38
44	Taurikura 1	–	–	–	–	–	–	–	–	–	–	1.50	2.00	–	4.40	4.88	3.13	12.63	9.63	10.75	–
45	Taurikura 2	–	–	–	–	–	–	–	–	–	–	–	–	–	9.00	8.50	10.88	10.25	5.50	10.38	11.88
46	Taurikura 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.50	1.88	5.88	4.63	4.00	7.50
47	Manaia 1	–	–	–	–	–	–	3.50	2.50	4.25	4.00	3.30	3.90	2.10	5.10	3.88	3.25	10.25	2.88	2.75	3.63
48	Manaia 2	–	–	–	–	–	–	4.00	4.50	4.90	5.75	4.00	5.30	7.40	7.60	8.75	10.75	8.38	16.63	13.25	15.88
49	Manaia 3	–	–	–	–	–	–	3.25	3.90	2.90	–	2.10	3.00	–	4.00	3.13	3.50	6.25	3.13	5.13	3.63
71	Manaia 8	–	–	–	–	–	–	–	1.50	0.25	1.00	1.20	2.00	1.50	1.40	1.88	0.75	2.13	–	4.63	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
186	Manaia 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.75	3.63	6.88	9.13
54	Kauri Mtn 1	–	–	–	–	–	–	4.50	1.50	–	3.10	7.40	1.30	–	1.40	3.00	2.13	2.50	3.63	4.63	4.38
72	Kauri Mtn 2	–	–	–	–	–	–	–	5.10	3.20	4.30	2.70	2.30	0.40	2.25	3.60	2.38	3.38	5.25	5.00	6.25
73	Kauri Mtn 3	–	–	–	–	–	–	–	2.00	1.00	1.00	1.30	2.50	–	5.00	3.38	1.13	6.00	3.25	3.17	5.13
74	Kauri Mtn 4	–	–	–	–	–	–	–	4.80	5.90	2.60	3.00	2.90	–	2.00	2.00	3.38	3.88	3.75	3.25	4.13
141	Kauri Mtn 5	–	–	–	–	–	–	–	–	–	–	2.30	1.90	1.25	2.50	3.13	3.25	4.75	4.13	3.00	4.88
127	The Nook 1	–	–	–	–	–	–	–	–	–	1.80	1.50	0.90	–	0.70	1.38	1.25	2.25	–	0.88	–
56	The Nook 2	–	–	–	–	–	–	6.00	2.10	3.25	3.80	4.00	5.30	–	5.00	4.50	7.75	9.25	8.38	6.38	4.13
128	The Nook 3	–	–	–	–	–	–	–	–	–	–	–	–	–	3.40	4.75	5.00	3.38	3.38	4.63	–
58	Nook Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	3.75	–	3.67	4.63	1.50	–	–
187	McNamaras	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.00	14.13	12.25	9.25
75	McCleod Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.63
Tutukaka																					
125	TLC 1	–	–	–	–	–	–	–	–	9.75	5.90	7.10	8.80	10.90	11.60	8.13	8.63	12.38	12.00	12.14	9.63
126	TLC 2	–	–	–	–	–	–	–	–	–	8.40	7.80	9.80	10.25	6.50	–	7.38	2.75	10.00	–	–
142	TLC 3	–	–	–	–	–	–	–	–	–	–	3.00	4.60	3.60	3.00	–	–	9.25	8.50	7.13	5.38
28	TLC 4	–	7.30	–	–	8.00	4.40	–	–	10.70	7.25	4.40	10.00	–	–	8.17	4.50	–	–	–	6.50
143	TLC 5	–	–	–	–	–	–	–	–	–	–	4.10	6.00	3.30	7.10	4.00	2.33	3.83	–	–	3.50
144	TLC 6	–	–	–	–	–	–	–	–	–	–	9.20	–	13.00	15.20	6.50	8.75	–	–	–	–
160	TLC 7	–	–	–	–	–	–	–	–	–	–	–	4.40	–	–	4.75	4.88	–	5.50	2.13	3.00
100	Kaiatea 1	–	–	–	–	–	–	–	–	–	1.60	–	–	–	–	–	–	–	–	–	–
101	Kaiatea 2	–	–	–	–	–	–	1.20	2.00	1.25	2.10	–	–	–	–	–	–	–	–	–	–
Tawharanui																					
161	TWN 1 Marine triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.16	0.50	–	1.25	2.25	2.88
162	TWN 2 Trig triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.16	0.67	–	3.88	1.88	1.25
163	TWN 3 Top ecology track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	0.33	–	1.63	2.00	4.63
164	TWN 4 Possum gully	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00	0.00	–	2.75	1.38	7.63
165	TWN 5 Twin hills	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.16	0.00	–	2.25	1.88	3.25
166	TWN 6 South coast water tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.83	0.33	–	4.88	6.50	7.88
Kawau Island																					
192	Bostaquet Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.57	–	–
193	South Cove	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.40	–	–

Continued on next page

Appendix 1 continued

STN NO.	STATION NAME	1995 MEAN	1996 MEAN	1997 MEAN	1998 MEAN	1999 MEAN	2000 MEAN	2001 MEAN	2002 MEAN	2003 MEAN	2004 MEAN	2005 MEAN	2006 MEAN	2007 MEAN	2008 MEAN	2009 MEAN	2010 MEAN	2011 MEAN	2012 MEAN	2013 MEAN	2014 MEAN
Maranui																					
253	Marunui 1 (House 17 deck)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.13
Mataia																					
254	Mataia 1 KLD (Top of fishing track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-	–	–	–	–	1.04
255	Mataia 2 KLD (Mid pa track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.46

Appendix 2

Summary of Northland kiwi listening data for stations listened from in 2013

STN. NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
131	Wha 2	B. Smith	4	3	6	1	3	0	2	1	20	2.50
132	Wha 3	B. Collett	8	2	3	1	5	1	5	6	31	3.88
133	Wha 5	D. Walsh	2	2	5	5	–	–	–	–	14	3.50
135	Wha 7	W. Sporle	20	8	22	12	11	10	14	12	109	13.63
136	Wha 8	P.L. & P.J. Johnston	11	13	9	12	16	14	14	15	104	13.00
137	Wha 9	A. Goodwin	0	2	4	3	5	2	4	1	21	2.63
138	Wha 10	I. Mateer	3	5	2	1	5	2	4	1	23	2.88
140	Wha 11	M. & J. Landridge	12	6	6	7	12	4	5	5	57	7.13
Western												
18	Cathedral	J. McCaughlin	4	1	8	8	8	9	6	2	46	5.75
16	Katui	O. Knox	0	0	0	0	–	–	–	–	0	0.00
19	Lookout	B. Searle & O. Knox	15	10	–	–	–	–	–	–	25	12.50
16b	Malborough Rd Site 16	M. Calder	4	2	4	2	1	0	2	1	16	2.00
17	Trounson Nth	R. Booth	3	6	5	7	–	–	–	–	21	5.25
33	Trounson Sth	A. Meduna	5	7	1	11	7	10	10	11	62	7.75
Southern												
21	Glenbervie 7A	T. & S. Howard	1	0							1	0.50
22	Glenbervie 9A	A. Jackson	5	1	0	3	0	0	8	5	22	2.75
139	Hodges	P. Graham	26	36	17	11	16	26			132	22.00
23	Marlow Rd	G. Coulston	21	14	14	23	16	26	11	22	147	18.38
26	Mimiwhangata	R. Taylor	6	13	11	11	20	16	9	11	97	12.13
129	Motatau 10	R. Fuchs	3	0	7	0	2	1	4	1	18	2.25
68	Motatau 9/Marlow 1	M. Ritchie	3	5	10	3	7	6	2	7	43	5.38
20	Paerata	G. Coulston	1	1	2	0	0	1	0	0	5	0.63
24	Purua N	M. Jordan	12	7	12	10	21	20	14	23	119	14.88
81	Purua S	F. Gordon	14	15	11	18	27	38	11	15	149	18.63
82	Rarewarewa N	B. Cook	8	14	8	10	8	3	6	6	63	7.88
25	Rarewarewa S	E. McCool	9	12	9	0	7	5	10	8	60	7.50
27	Sandy Bay 1	N. Pullman	2	2	6	1	5	9	3	6	34	4.25
194	Sandy Bay 2	N. Pullman	3	5	6	2	3	1	1	3	24	3.00
195	Sandy Bay 3	N. Pullman	5	8	1	1	3	12	1	0	31	3.88
145	Whangaruru	T. Grant	12	7	10	7	12	9	2	3	62	7.75
Mahinepua												
90	Site 0	C. Pusch/R. Wright et al.	7	2	2	4	5	5	1	0	26	3.25
83	Site 1	J. Hill/V. Wright/D. Brown	8	3	1	3	11	7	1	0	34	4.25
84	Site 2	M. Cox/M. Woodworth et al.	7	3	2	2	9	2	2	2	29	3.63
85	Site 3	P. Williams/D. Hayman	7	8	8	2	5	3	14	0	47	5.88
88	Site 4	A. Herbert et al.	4	11	7	6	7	9	17	3	64	8.00
99	Site 13	F. Barnes Jr/R. Corrie	5	4	10	7	7	6	15	1	55	6.88
Waimate North												
191	Hupara Land Care 1 (Bill's Plateau)	W. & S. Atkinson et al.	11	24	29	21	23	33	25	5	171	21.38
245	Hupara Land Care 2 (Mike Sullivan's)	W. & S. Atkinson/S. Brown	16	17	16	5	4	7	12	11	88	11.00
257	Hupara Land Care 4 (Orange Tree)	W. & S. Atkinson/S. Brown	6	11	10	9	15	5	15	22	93	11.63

Continued on next page

Appendix 2 continued

STN. NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
113	W1	P. Saunders/I. Kerr/D. Way	38	24	35	31	29	18	22	20	217	27.13
114	W2	L. Mountain/B. Wards	4	7	6	8	5	6	2	3	41	5.13
115	W3	A. Taylor/K. Taylor/F. Taylor	1	6	0	3	0	0	1	0	11	1.38
116	W4	H. Horrobin	10	18	2	13	4	6	14	1	68	8.50
118	W6	D. Way/C. Matthews/ P. Jones	9	7	13	12	7	10	11	14	83	10.38
120	W8	A. Chiaroni/J. Blakey/D.Way	19	16	6	14	8	3	8	16	90	11.25
121	W9	B. Brown	6	15	2	6	1	1	6	7	44	5.50
122	W10	D. Liebert/N. Moore	6	7	4	13	14	7	7	6	64	8.00
124	W12	L. Fletcher/J. Tood et al.	7	2	8	11	12	10	5	9	64	8.00
Whangarei Heads												
39	Bream Head 1	W. Newbold	11	9	12	13	5	5	8	14	77	9.63
41	Bream Head 3	O. Petel	7	10	8	11	9	7	5	12	69	8.63
42	Bream Head 4	M. & C. Pearson	1	4	1	3	4	1	2	1	17	2.13
69	Bream Head 6	C. Cook	3	5	4	3	7	5	5	3	35	4.38
54	Kauri Mt 1	J. Nairn	0	4	5	4	4	5	7	6	35	4.38
72	Kauri Mt 2	M. Barteldres	5	4	4	12	11	8	3	3	50	6.25
73	Kauri Mt 3	T. Bull	2	5	2	6	14	7	4	1	41	5.13
74	Kauri Mt 4	G. Faber	8	3	2	3	5	9	3	0	33	4.13
141	Kauri Mt 5	L. Brown	2	1	5	4	9	0	11	7	39	4.88
47	Manaia 1	U. Schmid	2	2	11	1	1	2	7	3	29	3.63
48	Manaia 2	T. Hamilton	21	10	31	7	18	13	19	8	127	15.88
49	Manaia 3	P. Richards	5	1	3	4	4	4	6	2	29	3.63
186	Manaia 9	J. Williams	12	9	8	5	10	8	10	11	73	9.13
56	Nook 2	P. Coates/P King et al.	2	4	4	2	7	3	6	5	33	4.13
45	Taurikura 2	G. Pike	9	14	13	14	9	7	16	13	95	11.88
46	Taurikura 3	K. Lange	11	7	11	5	11	4	8	3	60	7.50
187	Craig Rd	C. & J. McNamara	3	14	6	7	9	5	16	14	74	9.25
75	McLeod Bay	W & V Biddle	15	4	17	6	11	3	15	6	77	9.63
Tutukaka												
125	TLC 1	M. Camm	8	11	5	11	7	16	6	13	77	9.63
142	TLC 3	A. & J. Gilbert	8	2	11	1	6	3	4	8	43	5.38
28	TLC 4	S. Seitzer	7	12	6	9	7	1	4	6	52	6.50
143	TLC 5	K. Watzig	4	2	4	4	4	2	4	4	28	3.50
160	TLC 7	N. Shayer	8	0	2	4	4	2	3	1	24	3.00
Eastern												
10	Marsden Cross	A. Hosted/B. Hunt	30	20	18	18	20	7	18	23	154	19.25
14	Mt Bledisloe	S. M. McManus	5	11	16	0	11	5	3	3	54	6.75
11	Puketotara	A. Mentor/A. Kearney	17	11	10	12	14	14	14	20	112	14.00
13	Waitangi No. 12	M. Douglass	3	2	2	5	1	3	3	5	24	3.00
12	Rangitane	A. Walker	14	11	13	10	9	20	-	-	77	12.83
Puketi Forest												
103	Pirau Ridge	V. & C. Miller et al.	1	1	1	1	0	0	0	0	4	0.50
104	Pond	A. & S. Mentor et al.	5	10	6	8	7	6	3	2	47	5.88
107	Takapau/Pirau Rd Jn	I. & D. Godbert et al.	2	1	1	0	1	1	1	0	7	0.88
108	Totara Ridge	B. & L. Holliday et al.	7	5	8	1	7	2	7	3	40	5.00
111	Walnut	M. Young/T. Ricketts et al.	4	14	3	5	4	5	8	6	49	6.13
112	Stoat line 9 - Puketi	A. Linton et al.	3	2	3	2	0	0	1	0	11	1.38
Northern												
7	Puketi	D. O'Halloran	4	9	3	4	8	3	12	4	47	5.88
8	Puketi SR	K. Aukett/S. Grimme	11	9	6	10	10	3	3	9	61	7.63

Continued on next page

Appendix 2 continued

STN. NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
4	Gartons	G. Upton	0	1	0	0	1	0	0	0	2	0.25
5	Kaiaka	T. Higginson	3	1	3	0	1	0	4	1	13	1.63
2	Takahue	F. Schou	4	4	1	1	3	1	4	1	19	2.38
3	Lightning Hill	L. Baigent	4	14	13	11	15	8	8	7	80	10.00
256	Home drive	A. Baigent	11	21	12	11	4	25	8	4	96	12.00
Russell												
59	Opito	E. Harwoord	12	16	9	13	9	10	12	11	92	11.50
15	Tikitikikiore	L. Gordon	23	11	11	21	16	0	7	10	99	12.38
170	Nikau Block	L. Gordon	17	16	23	6	23	9	15	8	117	14.63
171	Mace/Farmer	T. Klee	5	4	5	1	3	1	7	6	32	4.00
172	Pipiroa	M. Pasco	6	5	6	5	2	2	16	3	45	5.63
60	Te Maiki/Flagstaff	H. Lindauer	4	1	3	2	4	5	3	4	26	3.25
174	Johnsons	M. Frankum	15	6	8	7	13	8	17	8	82	10.25
177	Solomon's Gate	L. Collins	10	8	18	19	22	7	17	11	112	14.00
Tawharanui												
161	TWN 1 Marine triangle	Patte/Fiona et al.	2	4	2	0	8	4	2	1	23	2.88
162	TWN 2 Trig triangle	T. & J. Endeby/I. Smith	2	1	1	0	0	0	3	3	10	1.25
163	TWN 3 Top ecology track	P. & B. Kane et al.	8	6	2	1	5	10	2	3	37	4.63
164	TWN 4 Possum gully	Geoff/Don/G. Borrough et al.	7	2	0	0	20	9	17	6	61	7.63
165	TWN 5 Twin hills	K. McGee/R. Williams	7	5	3	5	1	2	3	0	26	3.25
166	TWN 6 South coast water tank	Kerry/Martin	3	5	4	3	11	21	9	7	63	7.88
Marunui												
253	House 17 Deck	J. Hawley	1	3	0	3	1	0	1	0	9	1.13
Mataia												
254	Mataia 1	Kiwi listening device	KLD put out for 7 nights listening for 4 hours a night (21.30 – 01.30)								29	1.04
255	Mataia 2	Kiwi listening device	KLD put out for 6 nights listening for 4 hours a night (21.20 – 01.30)								35	1.46

Appendix 3

Trends in mean kiwi call count rates from annual monitoring at selected stations of managed Northland kiwi populations

AREA	NO. OF STN	SELECTED STATION NUMBERS USED TO CALCULATE MEAN	STATIONS LISTENED TO IN 2014 AND USED TO CALCULATE MEAN	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Whakaangi	7–9	29, 130–137	131–137	–	–	11.80	10.70	10.10	10.80	11.68	12.23	10.88	9.93	7.33	6.52
Mahinepua-Radar Hill	8	83-85,87–89, 98, 99	83-85,88,99	–	3.60	2.80	4.90	2.70	1.90	2.46	4.65	5.50	10.23	6.65	5.73
Waimate North	5	114, 118, 120, 122, 124	114, 118, 120, 122, 124	–	10.46	4.28	–	6.80	6.48	4.68	8.05	8.98	8.43	6.6	8.55
Puketi Forest	6	102, 104–106, 108, 111	104, 108, 111	–	–	–	2.88	1.15	1.48	3.66	3.00	4.25	4.11	3.6	5.67
Russell Peninsula	5	15, 59, 62, 170, 173	15, 59, 170	–	–	4.53	4.01	7.04	5.35	4.61	5.54	11.44	9.77	11.4	12.83
Waipoua	5	16-19, 33 (33 added in 2010)	16–19, 33	13.08	15.36	15.78	7.98	8.90	5.69	7.49	4.50	11.80	8.38	6.08	6.25
Motatau-Marlow	6	23, 34–36, 68, 129	23, 129, 68	–	–	7.30	7.60	7.50	4.90	6.39	4.54	7.08	8.28	9.13	8.67
Purua-Rarewarewa	5	24, 25, 81, 82, 139	24, 25, 81, 82, 139	–	–	9.20	11.10	12.70	10.90	12.35	10.63	12.58	11.83	13.6	14.18
Tutukaka	5	125, 126, 142, 143, 144,	125, 142, 143	–	–	6.24	7.30	8.21	8.68	5.67	6.77	7.05	10.17	9.63	6.17
Sandy Bay	3	27, 194, 195	27, 194, 195								3.25	–	4.22	4.33	3.71
Manaia-Nook	5	47–49, 56, 71	47–49, 56, 71	3.10	3.50	2.90	3.90	–	4.60	4.43	6.31	7.25	7.75	6.43	6.81
Kauri Mountain	5	54, 72–74, 141	54, 72–74, 141	–	–	3.30	2.20	–	2.60	3.02	2.45	4.10	4.00	3.83	4.95
Bream Head-Taurikura	5	39, 41, 42, 44, 69 (69 added in 2012)	39, 41, 42, 69	–	–	2.50	2.60	2.20	3.20	4.29	2.70	6.59	7.14	8.68	6.19
Tawharanui Open Sanctuary	6	161–166	161–166	–	–	–	–	–	–	2.30	0.31	–	2.77	2.65	4.58
Kawau Island				–	–	–	–	–	–	–	–	–	–	–	–
Maranui Conservation Limited	1	253	253	–	–	–	–	–	–	–	–	–	–	–	1.13
Mataia Restoration Project	2	254, 255	254, 256	–	–	–	–	–	–	–	–	–	–	–	1.25

Note: In previous reports up to 2009: where a single station was not covered, the previous year's results were used. However, some of the stations had not been listened from for several years, so the mean call count rates for the data from 2010 and beyond were calculated only from the relevant stations listened from for that year.