



Call count monitoring of Northland brown kiwi 2017

Emma Craig



Cover: Cameron McInnes at Kiwi release at Tawapou nursery, Tutukaka. *Photo: Malcolm Pullman, photosnz.co.nz*

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1. Introduction

1.1 Objective

The objective of this report is to provide a summary of the 2017 results for Northland brown kiwi (*Apteryx mantelli*) call count monitoring, and to provide recommendations for future monitoring.

1.2 Background

Northland populations of kiwi had declined mainly due to predation by stoats (*Mustela erminea*), ferrets (*M. furo*), dogs (*Canis familiaris*) and cats (*Felis catus*), along with increasing land development pressures throughout the region (Pierce et al. 2006). In the early 1990s, a network of kiwi call count listening stations was established nationally to determine trends (stable, increasing or decreasing) in kiwi populations over time (McLennan 1992). In 1993, 24 stations were established in four geographic areas in Northland (Northern, Eastern, Southern, Western) where kiwi were known to be present, with kiwi call count monitoring carried out annually since 1995. Call count surveys are one of the main tools used for assessing trends in kiwi populations and are used in Northland to:

- Monitor the trends in call counts (and hence population size) over time at the 24 original (1993) listening stations in the four geographic areas (Northern, Eastern, Western, Southern).
- Monitor the trends in kiwi 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 in 1993 in the four geographic areas in Northland (Pierce & Westbrooke 2003) are mapped in Fig. 1 and listed in Table 1. In the Northern cluster six stations were established either in or on the edge of extensive forest in the Herekino-Raetea-Puketi Forests area. In the Eastern cluster six stations were established in forest remnants and extensive exotic forestry in the Bay of Islands area spanning Purerua Peninsula-Waitangi-Russell Peninsula. In the Western cluster five stations were established in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). The Southern cluster comprises seven stations were established within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two that also include exotic forests (Glenbervie 7A & 9A). Over the years since 1993, many additional listening stations have been added, predominantly in areas where community groups are working to protect kiwi. The extensive involvement of local communities in the protection of kiwi and the associated expansion of the number of kiwi listening stations provides strong information on the current

distribution and density of Northland brown kiwi throughout its range (Fig. 1). Populations now extend across both public and private land in Northland, from Whakaangi in the Far North to Ponui Island in the south (Fig. 1).

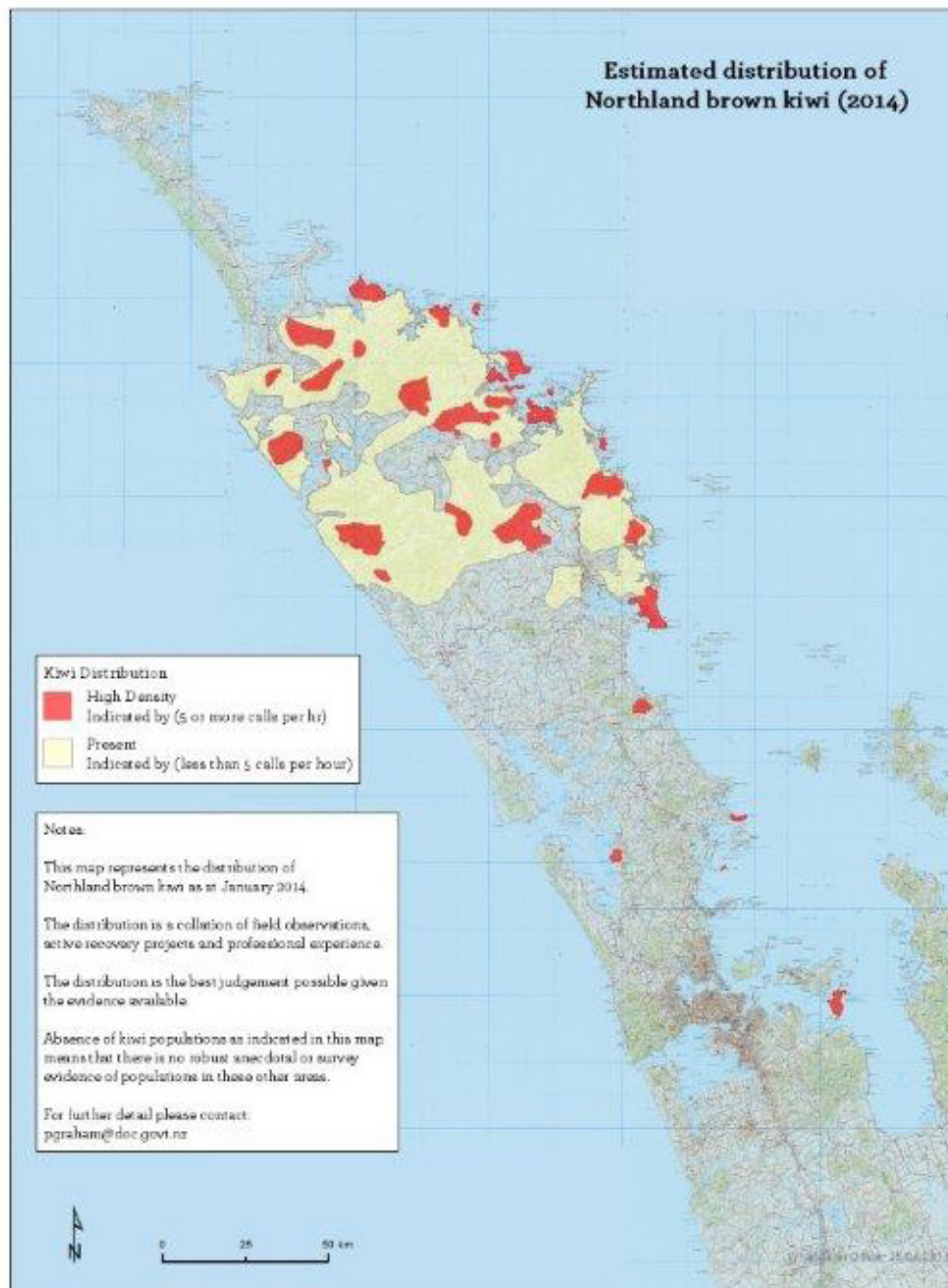


Figure 1. Northland kiwi distribution and relative abundance as known in 2017.

Table 1. The original Northland kiwi listening stations, grouped by geographic area 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 2017 Northland brown kiwi call count survey followed the recommendations made by Robertson & Colbourne in the Kiwi Best Practice Manual (2003, 2017; the relevant instructions from the latter are included in Appendix 1) and aligned with the findings of Colbourne & Digby (2016). Listening was carried out during the first 2 hours of darkness, and during the dark phase of the moon, for 4 nights per station (n = 8 hours). Wherever possible quiet conditions were favoured, with little or no wind, rain or background noise.

Kiwi listening was carried out from 14 May to 2 June 2017, with a back-up window from 13 June to 1 July 2017.

2.1 2017 kiwi listening data

kiwi listening data for 2017 were received from the following management areas:

- Mangatete
- Honeymoon Valley
- Whaakangi
- Mahinepua
- Bay of Islands
- Russell
- Puketi Forest
- Waimate North
- Hupara
- Sandy Bay
- Tutukaka
- Manaia-The Nook
- Kauri Mountain
- Bream Head/Taurikura
- Motatau-Marlow
- Purua-Rarewarewa
- Waipoua-Trounson
- Tawharanui
- Marunui
- Mataia
- Tanekaha

3. General patterns

3.1 Northland monitoring trends since 1995

Trends in call count data collected since 1995 at the 24 original listening stations (Table 1) in the Northern, Eastern, Southern and Western survey areas are graphed for comparison in Fig. 2 and the summary data for all Northland listening stations are presented in Appendix 2. Data for the stations listened from in 2017 are summarised in Appendix 3.

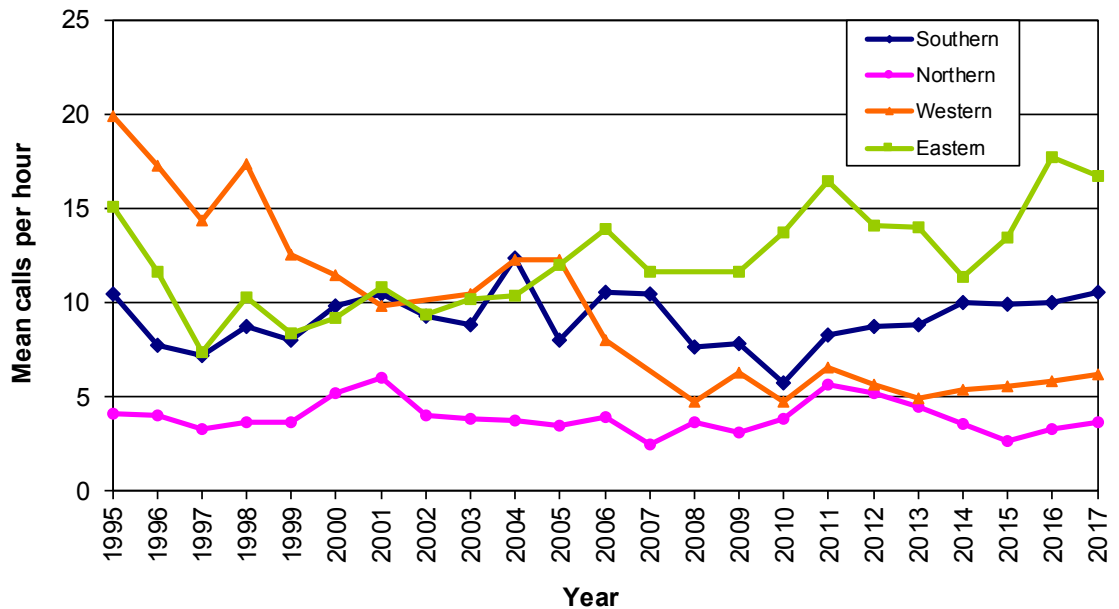


Figure 2. Mean hourly kiwi call rates for each of the original four Northland monitoring areas 1995–2017. The mean for the Northern cluster was estimated using the 2016 data for two stations (Takahue and Gartons), and the 2015 data for one station (Kaiaka). The mean for the Western cluster was estimated using the 2014 data for one station (Paerata). The mean for the Southern cluster was estimated using ALDs for two stations (Glenbervie 7A and Glenbervie 9A), and with only 110 minutes of listening on the first night from one station (Purua North).

Northern Area

The mean hourly kiwi call rate for the Northern cluster followed the upward turn observed in 2016 with a further increase for 2017 (Fig. 2). Two years in a row of increased calls has only been observed twice before – in 2000–01 and 2010–11. It is hoped that this trend will continue as kiwi protection measures increase in the area. The 2017 mean was 3.6 calls/hr, a modest increase of 0.3 calls/hr from 2016. Overall, the call rate results from the Northern Area stations have been the most stable of the four areas over time, varying by only 3.6 calls/hr, with the highest observed rate 6 calls/hr (in 2001) and the lowest 2.4 calls/hr (in 2007). Unfortunately, not all of the Northern Area stations were listened from in 2017, so data from previous years needed to be used to calculate the mean (2016 data for Takahue Station 2 and Gartons Station 4; 2015 data for Kaiaka Station 5. All other stations had the full 4 nights of listening completed). It would be helpful to have these stations listened from consistently, so we can be sure that the reported mean is a true reflection of what is happening on the ground. Artificial listening devices (ALDs) may need to be considered as an option if it is too difficult to regularly get human listeners to the stations. After the pleasing result from Digger’s Valley (Station 1) in 2016, it was disappointing to see the calling rate drop to only 0.9 calls/hr for 2017, the lowest rate ever recorded for this station. At the other end of the scale, the mean for Puketi Forest (Station 7) was the highest recorded to date with 9.75 calls/hr (closely followed by 9.38 calls/hr in 2011). There was little change between 2016 and 2017 for Puketi Scenic Reserve (Station 8 – 9.25 and 9 calls/hr, respectively).

Eastern Area

The mean number of kiwi calls heard for the Eastern cluster dropped 1 call/hr from 17.7 in 2016 to 16.7 in 2017 (Fig. 2). However, 16.7 is the second highest mean recorded for this cluster and is very high relative to many stations. The observed decrease probably reflects natural fluctuation in calling rates or may be due to the limitations of the kiwi call listening method rather than reflecting a decrease in kiwi abundance, especially given the general pattern of increasing call rates for this cluster of listening sites over the last 20 years. The station that recorded the largest change was Tikitikiore (Station 15), which rose sharply from 2015 to 2016 (from 15 calls/hr to 25.5 calls/hr), before dropping in 2017 to 20.4 calls/hr. Waitangi No. 12 (Station 13) increased 4 calls/hr, from 7.5 calls/hr in 2016 to 11.5 in 2017. All other stations had variations of 2.6 calls/hr, which again were likely due to natural variation and/or methodological limitations. Marsden Cross (Station 10) showed very little change from the very high mean of 38.6 calls/hr recorded in 2016, with a slight increase to 38.8 in 2017. This call rate is exceptionally high and is even more exceptional in that it continues the high level of call rates recorded over recent years. Over the last decade there has been no overlap between the mean call rates from the Eastern Area and the three other areas (Fig. 2), with the Eastern Area returning results that are consistently the highest for Northland. The ongoing positive results for the Eastern Area are no doubt due to the concerted and growing effort to protect kiwi populations in the area. All six stations had the full 4 nights of listening completed.

Southern Area

For the seventh year in a row the Southern cluster followed a trend of increasing or stable mean kiwi call rates (Fig. 2). The mean rose 0.6 calls/hr from 10 in 2016 to 10.6 in 2017. However, the 2017 data included that from Glenbervie 7A (Station 21), recorded via an ALD. Although there are some inherent differences between human listeners and ALDs, I have opted to include these data here in the absence of a human listener. Listening results from Glenbervie 7A have not been included in the analysis for this cluster since 2013. If these data were also excluded in 2017, the mean for this cluster would have been 12 calls/hr. This demonstrates how the presence or absence of data from just one station can skew the results, and that the rigor of the patterns seen for kiwi call counts in Northland is improved by applying a consistent listening method, including repeating the same stations each year. Of the remaining stations, all had increased or stable mean call rates. The greatest change was seen at Mimiwhangata (Station 26), which increased from 10.8 calls/hr in 2016 to 14.6 calls/hr in 2017. Glenbervie 9A (Station 22) also had a reasonable increase, from 2 calls/hr in 2015 (when listening was last completed for this station), to 5.25 calls/hr in 2017 (via ALD), likely due to the predator control undertaken by Rayonier. This is the highest mean call rate recorded for this station since 2007. All the other stations had changes of <2.5 calls/hr. All stations had the full 4 nights of listening completed, except for Purua North (Station 24), which had only 110 minutes of listening for the first night. Two stations (Purua North and Mimiwhangata) had data collected during the second listening window, but it is not expected that this will have altered the results, as the second period is still within the May-July window recommended by Colbourne & Digby (2016).

Western Area

Since kiwi call count monitoring began for Northland in 1995, the Western cluster has had a generally decreasing mean kiwi call rate. It is gratifying to see this pattern start to change, with slow but steady increases in mean call rates recorded from 2013 to 2017 (Fig. 2). At 6.2 calls/hr, the 2017 mean is the highest observed call rate since 2011. It was helpful to be able to include the data for Katui (Station 16) in the analysis, as this station hadn't been listened from since 2013, when 0 calls were heard in 8 hours of listening. The 2017 mean was 1.5 calls/hr for this station, so it is excellent that kiwi have held on in this area. Paerata (Station 20) wasn't listened from in 2017; the last time was in 2014. It would be good to include this station again as it has had huge variation in kiwi calls/hr (from 9.9 in 1995 to 0 in 2003-2005 inclusive) and it would be useful to know what

is happening to kiwi in this area. The other three stations had minor changes between 2016 and 2017. Trounson (Station 17) increased from 9.4 calls/hr to 11.1 calls/hr, Cathedral Grove (Station 18) and Waipoua Lookout (Station 19) both decreased (by 1 and 0.4 calls/hr respectively). With the exception of Paerata, all stations had the full 4 nights of kiwi listening completed. Although there is still a need to do more to protect kiwi in this area, it is pleasing to see that the current measures are starting to make a positive difference.

4. Trends at managed populations

Each year, the same selection of listening stations are used to compare call counts rates to provide a population trend for each of the four Northland kiwi monitoring areas. Only these 'core' stations contribute data for the mean hourly call rate calculations depicted in the bar graphs for each management site provided below. It is important that kiwi coordinators prioritise kiwi listening from the core stations each year to ensure that the most accurate depictions of population trends that are occurring in management areas are obtained. The stations that are used in this analysis are listed and data summarised in Appendix 4 for each management site. These should be referred to when organising kiwi listening each year.

4.1 Summary of sites

4.1.1 Mangatete

After 2 years of increasing mean kiwi call rates, the 2017 result for Mangatete decreased to 15.9 calls/hr, which was on par with the 2015 mean (Fig. 3). Although this is a decrease of 2 calls/hr from a mean of 17.9 in 2016, this is still a very high number of calls and probably not a cause for concern. As mentioned in previous kiwi call count monitoring reports, the mean for this management area is derived from only two stations. Adding more stations would add more rigor and give a better picture of what is happening to the kiwi population over time in this area. Both stations had lower call rates in 2017 than in 2016; with Station 3 reducing by just over 3 calls/hr, and Station 256 decreasing by around half a call/hr, and both were listened from for the full 4 nights. The 2017 means for both stations were almost identical to the 2015 results. It will be interesting to see if the current relative stability in this area persists.

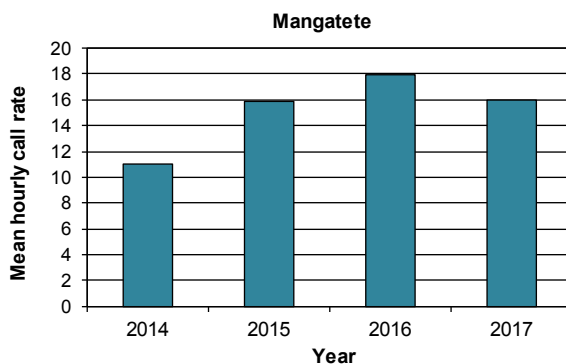


Figure 3. Trends in mean kiwi call rates at Mangatete management area.

4.1.2 Honeymoon Valley

As with 2016, in 2017 there were insufficient kiwi listening data from Honeymoon Valley to graph the overall kiwi call count trend. Data were received from one station (NZFRT reserve, campsite), where a mean of 5.1 calls/hr was heard over the full 4 nights of kiwi listening. This was a slight decrease from the 5.6 calls/hr heard at this station in 2016, but it is good to see the mean staying at about 5 calls/hr in an area where most stations have returned a mean of <1 call/hr.

Re-commencing kiwi listening from the other stations would be useful to enable the trends in this area to be monitored.

4.1.3 Whakaangi

The mean for the Whakaangi management area is usually calculated using the call counts from seven stations; however, only three of the core stations were listened from in 2017, each for the full 4 nights. With the exception of 2015, the mean call count has been trending down since 2011, after being relatively stable from 2005 to 2010 (Fig. 4). The 2017 mean was 4 calls/hr, and this is the second time the mean for this area has dropped below 5 calls/hr (the first time was 2016, with a mean of 4.7 calls/hr). Three stations were listened from and the results from all three differed considerably from the previous year. The mean count from Station 135 crashed from 5.3 calls/hr in 2016 to only 0.5 in 2017, and from >20 calls/hr in the 2005-11 period. Conversely, Station 137 increased from a mean of 0.8 calls/hr in 2016 to 4.8 in 2017, with the 2017 result being near the middle of the range recorded for this station (0.8-8.4 calls/hr) since 2005. The third station (Station 136) increased from a mean of 4.5 calls/hr in 2016 to 6.8 calls/hr in 2017. Although this increase should be considered desirable, it is worth noting that the 2017 mean was the second lowest ever recorded for this station. The stations that were excluded in 2017 had slightly higher mean call rates in 2016 than those used to create the mean for 2017, so the mean may be lower than if these other four stations were included. The mean kiwi call rate for individual stations in this management area has fluctuated immensely over the previous few years, so it is difficult to predict how much the exclusion of these stations will have skewed the results; but regardless, it is clear that the kiwi call rates in this area are trending down. I hope that enough is being done to protect the remaining kiwi in Whakaangi and that this alarming downward trend will cease.

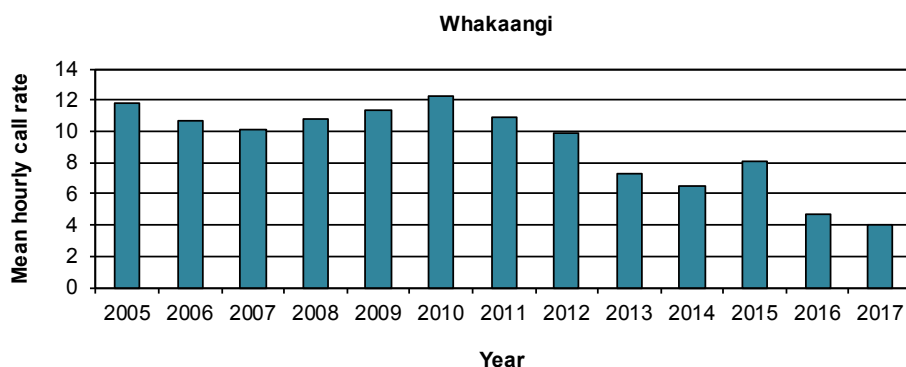


Figure 4. Trends in mean kiwi call rates at Whakaangi management area.

4.1.4 Mahinepua-Radar Hill

The mean kiwi call counts for Mahinepua-Radar Hill decreased slightly from 7.8 calls/hr in 2016 to 7.5 in 2017 (Fig. 5). This is a minor decrease and, in general, call counts in this area have shown some fluctuation, but a general pattern of steadily increasing rates since 2003 (with the peak in 2012 an apparent anomaly). The full 4 nights of listening data were obtained from four stations in 2017, and a fifth station had the last hour of data absent. The mean call rate at one of these (Station 83) increased from 4.3 calls/hr in 2016 to 7.9 in 2017, a substantial increase and the

highest recorded mean for this station. The four remaining stations (84, 85, 88 and 99) all had decreases of between 0.9 and 1.6 calls/hr, likely related to natural fluctuations in calling rates and/or different observers.

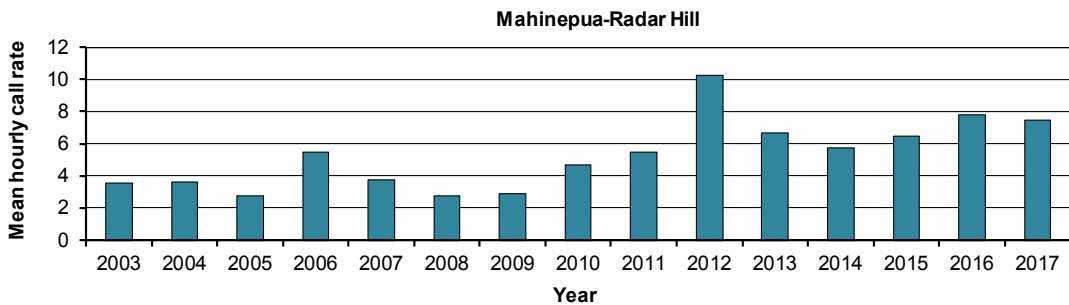


Figure 5. Trends in mean kiwi call rates at Mahinepua-Radar Hill management area.

4.1.5 Russell Peninsula

After the peak in mean kiwi call counts observed at Russell Peninsula in 2016 (19.7 calls/hr), there was quite a drop in the 2017 data, to 11.3 calls/hr (Fig. 6). This is still a relatively high mean call rate but is more aligned with the previous pattern observed in this area. As discussed in the 2016 report (Craig & Topia 2016), the 2016 data may not be an accurate reflection of overall kiwi numbers, at least in part because two core stations (59 and 173) were missing from the 2016 analysis (these stations are included in 2017, thanks so much to the listeners involved in recording data for the full 4 nights for these two and the other three stations analysed for this management area). Station 173 has had consistently low call counts (<2 calls/hr), which is much lower than the overall mean for the stations in this area, so the absence of this station in 2016 artificially increased the annual mean. Station 59 had a mean of 13.5 calls/hr in 2017 which was the highest on record for the area, but only by 0.4 calls/hr, and the absence of these data were less likely to skew the mean. There was a slight decrease observed at Station 170 (12 calls/hr in 2016 to 10.4 in 2017). Station 15 decreased from 25.5 calls/hr in 2016 to 20.4 in 2017. This is the second highest mean call rate recorded for Station 15 after the peak seen in 2016, and still a very high rate despite the decrease. The largest change was observed at Station 62, where recorded calls halved from 21.6 calls/hr in 2016 to 10.4 in 2017, to produce a rate more in line with previous years. The kiwi listener for this station has not changed recently so it seems that the 2016 data for this station were an outlier, cause unknown. When we look at the mean call rate for Russell Peninsula from 2005 to the present, it has been generally stable between 7.3 and 11.4 calls/hr, with three exceptions – 6.1 calls/hr in 2005, in 2015 and 19.7 in 2016.

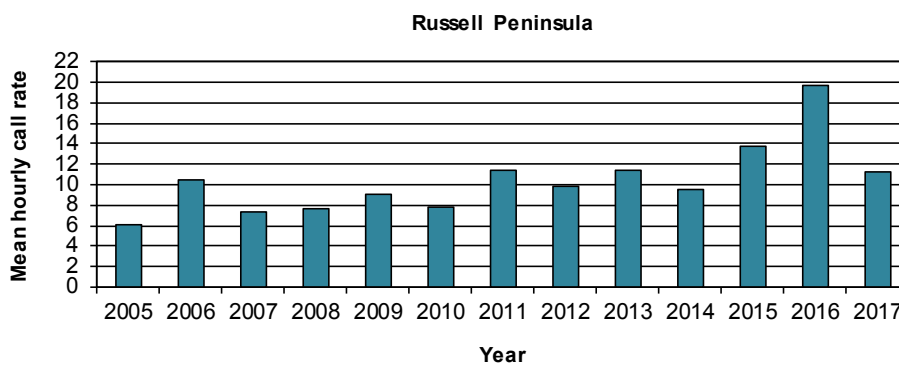


Figure 6. Trends in mean kiwi call rates at Russell Peninsula management area.

4.1.6 Puketi Forest

The mean kiwi call rate for Puketi Forest for 2017 was 3.5 calls/hr, down from the 2016 mean of 4.2 calls/hr. On the graph (Fig. 7) it looks like a sizeable change; however, a change of only 0.7 calls/hr should not be viewed as significant. Five stations were listened from for the full 4 nights to calculate the mean for this area. Of these, one station (102) had little change (0.13 calls/hr), but the remaining four (104, 106, 108, 111) all had relatively large variations from the previous year (ranging from 1.7 to 3 calls/hr). Looking back over the historical data for this area, there is a noticeable trend of large variation both up and down between years for some of the stations, particularly 104 and 108. The natural variation we can expect to see with the kiwi listening method is more obvious with lower mean call rates, which may be why this pattern of variability is more noticeable in the Puketi Forest area than in others. Stations 105 and 110 have not been listened from since 2013 due to remoteness and lack of personnel, but these stations previously contributed to the mean for this area for several years. There are now five stations regularly listened from which is sufficient; but if the Puketi Forest listeners want to re-establish these two remote stations to increase the rigor of the mean they may want to consider using ALDs.

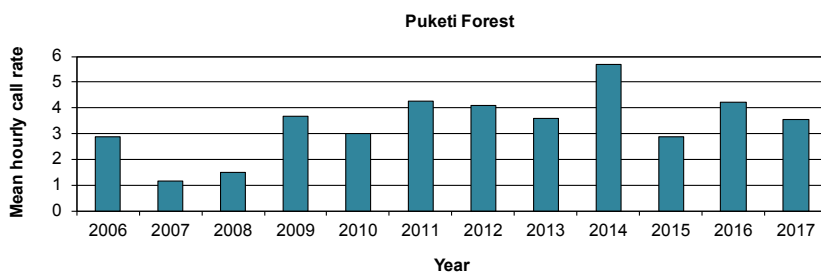


Figure 7. Trends in mean kiwi call rates at Puketi Forest management area.

4.1.7 Waimate North

Once again, the mean call rate for the Waimate North area has stayed within the stable range of 6–9 calls/hr observed since 2005 (Fig. 8). The 2017 mean was 7.8 calls/hr, a slight increase from the 2016 mean of 7.6 calls/hr. The 2017 mean was derived from four stations, one of which (Station 114) was listened from for 3 nights only. The other three stations (118, 120, 124) each had the full 4 nights of listening. One station was usually included in this area was absent (122). The overall mean for Station 122 is 5.9 calls/hr. This is lower than the mean for the area, so it may be that the absence of these data was artificially increasing the 2017 mean. Continuing to include Station 122 for 2018 and beyond will be beneficial in calculating an accurate mean call rate for the Waimate North area. The biggest differences observed between the 2016 and 2017 data were Station 114, where the call rate almost doubled from 4.8 calls/hr in 2016 to 8.8 calls/hr in 2017 (similar to the 8.6 calls/hr heard in 2015) and Station 118 where the mean call rate decreased from 13.3 calls/hr in 2016 to 10.9 calls/hr in 2017. The phenomenally high mean call rates at Station 113 continued, with 31.38 calls/hr recorded in 2017.

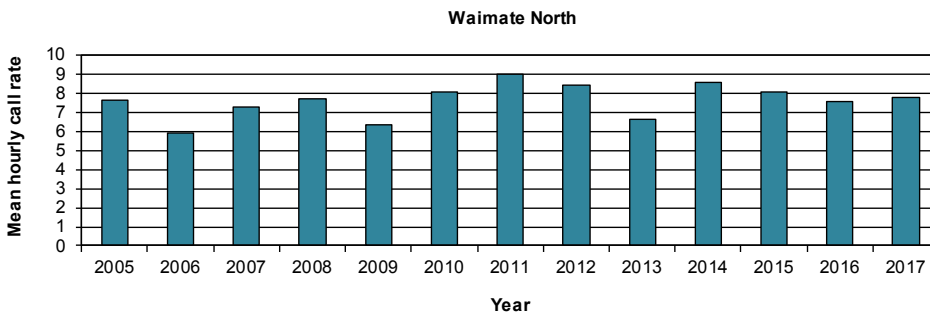


Figure 8. Trends in mean kiwi call rates at Waimate North management area.

4.1.8 Hupara

The mean kiwi call rate recorded in the Hupara area in 2017 was 16.8 calls/hr (Fig. 9). This is a decrease of 5 from the 2016 mean of 21.8. A decrease of 5 calls/hr was observed at both stations that data were received from for this area (Station 257 decreased from 17.1 calls/hr in 2016 to 12.1 in 2017; Station 258 decreased from 25.4 calls/hr in 2016 to 21.4 in 2017. Both stations had the full 4 nights of kiwi listening completed). Although this is quite a big decrease, it is on a par with the cluster mean for 2015, so it may be that the number of calls heard decreased due to natural fluctuation and/or inherent flaws in the method used, rather than being reflective of the number of kiwi on the ground. As previously mentioned, it is difficult to interpret the data from this area in a meaningful way when only two stations are being used, but the current mean call counts for both stations are high enough to presume there is a reasonably robust kiwi population present.

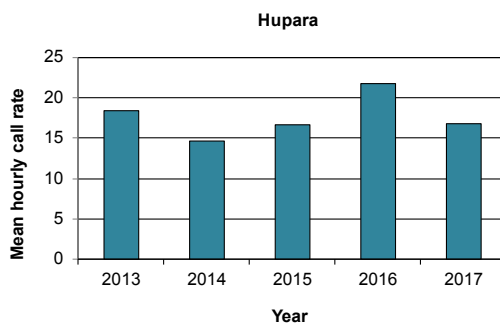


Figure 9. Trends in mean kiwi call rates at Hupara management area.

4.1.9 Sandy Bay

There was little change between the 2016 and 2017 mean kiwi call counts for the Sandy Bay area, at 6.9 and 7 calls/hr respectively (Fig. 10). It was good to see that the increase from 2015 to 2016 wasn't an anomaly, and that the 2017 mean has stayed above the coveted 5 calls/hr. As with previous years, the data for Station 260 was collected via an ALD. Although this is not as desirable as having a listener on the ground, it is preferable to not having the data collected, so many thanks to the Sandy Bay coordinator for ensuring these data are included. The full 4 nights of listening were completed for three stations in the Sandy Bay area. There was little change in the mean call rate at station 27 in 2017; the rate at station 260 increased by approx. 3 calls/hr to 9.3 calls/hr in 2017 (the highest on record for both this station, and all the Sandy Bay stations); and the rate at station 261 decreased by approx. 3 calls/hr to 5.5 calls/hr in 2017.

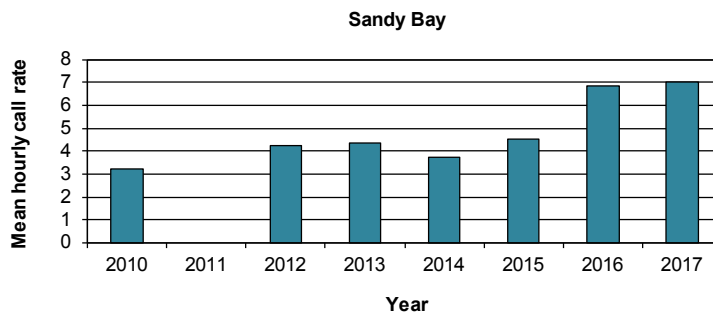


Figure 10. Trends in mean kiwi call rates at Sandy Bay management area.

4.1.10 Tutukaka

The graph for the Tutukaka area appears to show that there has been an appreciable increase in call counts from a mean of 9.9 kiwi calls/hr in 2016 to 15.3 in 2017 (Fig. 11). However, a degree of caution should be applied before celebrating this gain, as the mean was calculated from only two stations. These were Station 125, where the mean call rate increased from 11.5 calls/hr in 2016 to 13.8 in 2017; and Station 126 which increased from 9.5 calls/hr in 2016 to 16.9 in 2017. The 2017 means were both the highest recorded for these stations, and the mean of 16.9 calls/hr is the highest recorded for the Tutukaka area. Station 142 is generally included in the analysis for this area but was absent for 2017. The overall mean for Station 142 is 5.7 calls/hr; its exclusion from the 2017 analysis has likely artificially increased the mean for this area. However, as the two stations listened from both showed increases, it is likely that increase is real, but possibly less than that indicated in Fig. 11. Including counts from Station 142 (and, ideally, stations 28, 143 and 144) in future years will give a more robust measure for this area.

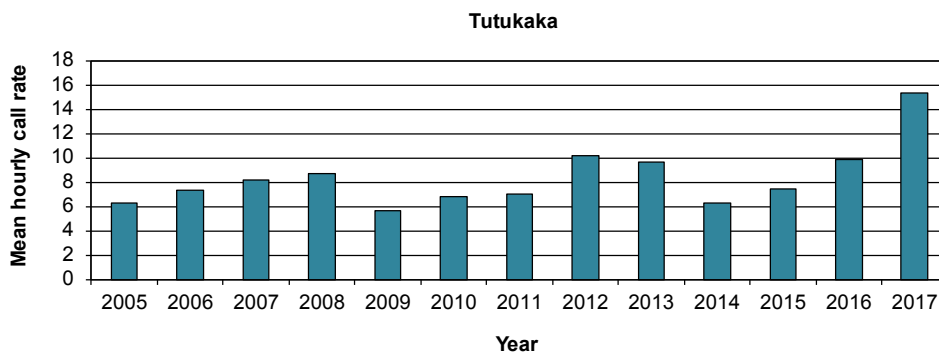


Figure 11. Trends in mean kiwi call rates at Tutukaka management area.

4.1.11 Manaia-The Nook

In 2017 the Manaia-The Nook area continued an upward trend in mean kiwi call rates, recording 8.8 calls/hr, up from the 8.2 recorded in 2016 (Fig. 12). This increase was largely attributed to Station 56, where the mean call rate more than doubled from 3.9 calls/hr in 2016 to 8.5 in 2017. Similarly large mean call rates have been recorded at this station previously (in 2010-13). An increase was also observed at Station 49, where the mean number of calls heard increased from 7.1 calls/hr in 2016 to 9.3 in 2017, which is the highest mean kiwi call rate on record for this station. At Station 47, the number of kiwi calls/hr hour increased more than 6-fold from 2015 to 2016, and it was good to see that the call rate remained high in 2017 (at 8.8 calls/hr). This indicates that the 2016 rate (9.4 calls/hr) was likely accurate, rather than an outlier. The other two stations (71 and 48) decreased by 0.9 and 2.1 calls/hr respectively and were within the typical range known for these stations. All five stations were listened from for the full 4 nights.

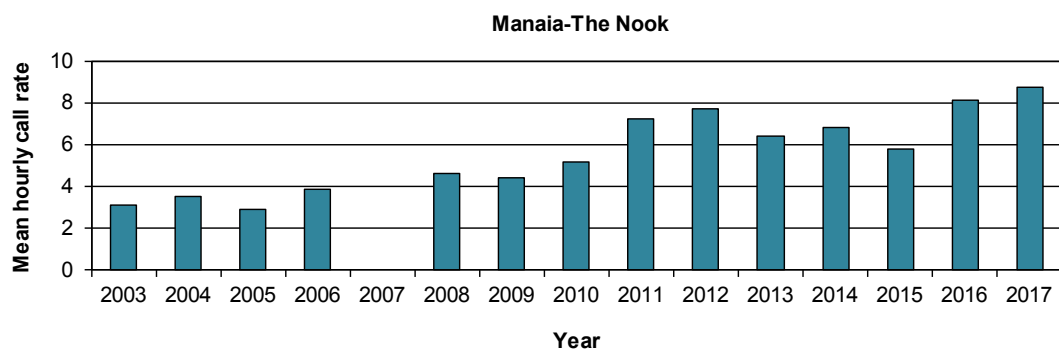


Figure 12. Trends in mean kiwi call rates at Manaia-Nook management area.

4.1.12 Kauri Mountain

After the large increase observed between 2015 and 2016, the mean number of kiwi calls heard at the Kauri Mountain area dropped slightly from 7.7 to 7.1 calls/hr (Fig. 13). It was good to see that the mean was still well above 5 calls/hr, as it had been since 2015. The mean number of kiwi calls heard for two stations increased from 2016 to 2017; Station 141 increased fractionally to 8.9 calls/hr, the highest on record for this station. Station 74 also returned the highest mean on record in 2017, increasing to 6.1 calls/hr (from 5.6 in 2016). Of the remaining three stations, two (Stations 54 and 73) had minor decreases of <1 call/hr, and one (Station 72) dropped by 2.5 calls/hr from 9.6 in 2016 to 7.1 in 2017 (7.1 calls/hr is the second highest on record for this station). All five stations had the full 4 nights of kiwi listening completed.

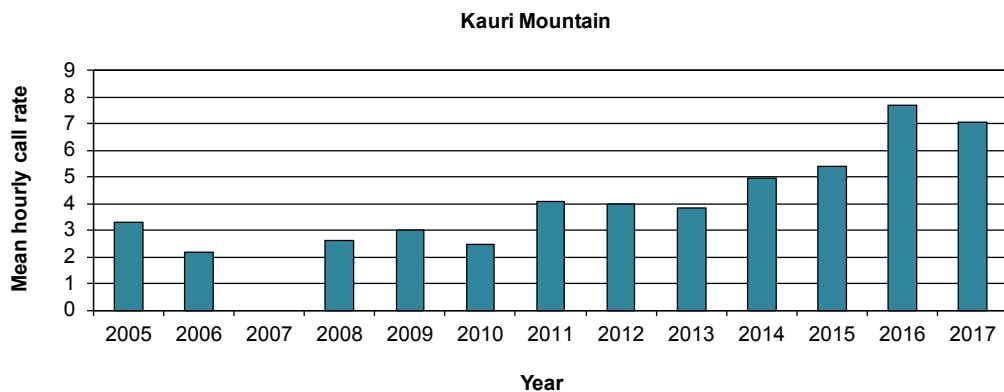


Figure 13. Trends in mean kiwi call rates at Kauri Mountain management area.

4.1.13 Bream Head/Taurikura

In 2017, the downward trend in mean kiwi call rates recorded over recent years at the Bream Head/Taurikura area continued (Fig. 14). The mean kiwi call rate in 2016 was 6.9 calls/hr. In 2017 it was 5.8, a decrease of just over 1 call/hr. Most of this decrease was due to Station 39, where the mean call rate dropped almost 5 calls/hr from 12.1 in 2016 to 7.4 in 2017. Some of this decrease was countered by an increase at Station 42, which almost doubled from 3.8 calls/hr in 2016 to 6.8 in 2017, the second highest recorded mean for this station. The other two stations both had small decreases, with the mean kiwi call count for Station 41 dropping from 6.9 calls/hr in 2016 to 6 in 2017 and Station 69 dropping from 5 calls/hr in 2016 to 3.25 in 2017. It is not known why this downward trend is being observed, but the lack of data from Station 44 may be partially responsible. Station 44 had typically high (9.6–12.6 calls/hr) mean kiwi call rates in the last 3 years it was listened from (2011–13), so the absence of this station from the analysis for 2014–17 could explain the lower mean call rates. It is pleasing to see that the mean is still above 5 calls/hr, and it is hoped that it will stabilise and begin to increase rather than dropping any further. All four stations used to calculate the mean were listened from for the full 4 nights.

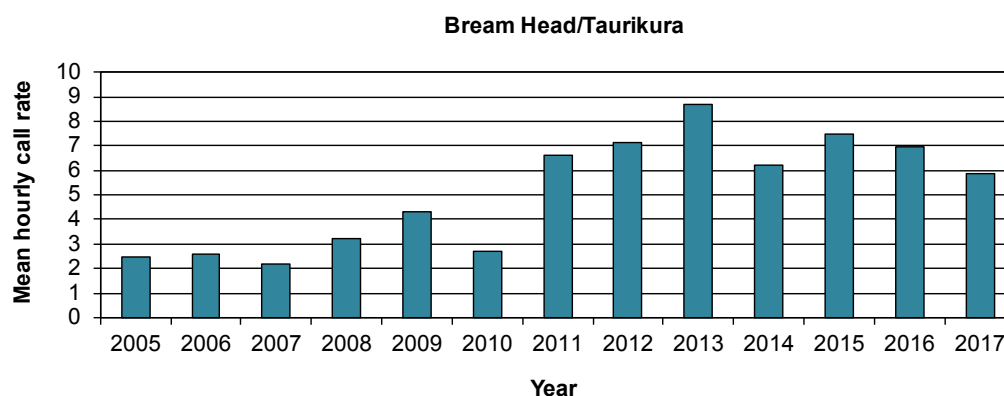


Figure 14. Trends in mean kiwi call rates at Bream Head/Taurikura management area.

4.1.14 Motatau-Marlow

As with 2016, the mean number of kiwi calls/hr has continued to increase for the Motatau-Marlow area, which was up from 11.5 calls/hr in 2016 to 12.9 in 2017 (Fig. 15). This area has recorded steady increases in mean call counts since 2010 and has been comfortably above 5 calls/hr since 2011. Three stations were used to calculate the mean for 2017, of which two increased (Station 23 from a mean of 18.8 kiwi calls/hr in 2016 to 21.1 in 2017 and Station 129 from a mean of 3.9 calls/hr in 2016 to 5.9 in 2017) and one remained stable (Station 68 had a mean of 11.9 calls/hr in 2016 and 11.8 in 2017). The three stations each had the full 4 nights of kiwi listening completed. These results are positive for this area and likely represent a healthy kiwi population on the ground. However, the mean for the area used to be derived from three additional stations which haven't been listened from in some years (Station 34 since 2015, Station 35 since 2013 and Station 36 since 2011). It would be beneficial to re-establish these stations to ensure the observed patterns of change in kiwi call rates are as robust as possible.

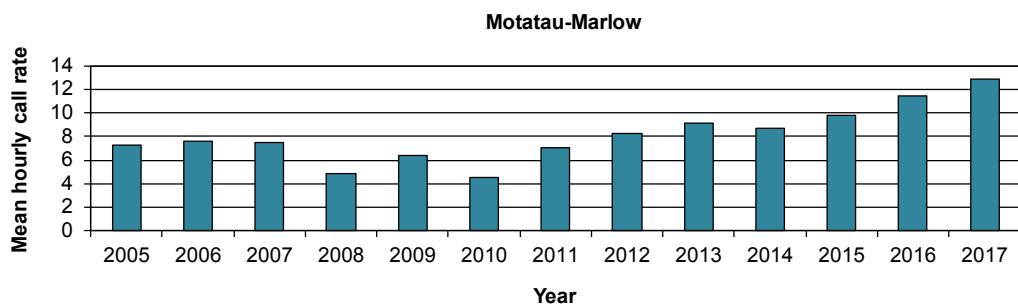


Figure 15. Trends in mean kiwi call rates at Motatau-Marlow management area.

4.1.15 Purua-Rarewarewa

In the Purua-Rarewarewa area the mean number of kiwi calls increased from 10.5 calls/hr in 2016 to 12.1 in 2017 (Fig. 16). Although the mean for both years was within the typical range observed for the area, it was pleasing to see that the downward trend recorded in 2014–16 did not continue in 2017. The mean call rate for Station 139 halved from 23.1 calls/hr in 2015 to 11.8 in 2016, but has since increased to 16 calls/hr in 2017, closer to the norm for this station. Station 25 increased from a mean of 9.1 calls/hr in 2016 to 11.3 in 2017, the highest ever recorded for this station. The other three stations (24, 81 and 82) all had mean call rates within the normal range for 2017, although with some variation from previous years (Station 84 increased from a mean of 7.3 calls/hr in 2016 to 11.5 in 2017). Station 82 was not included in the 2016 analysis, so it is excellent that it was reinstated in 2017. All five stations had the full 4 nights of listening completed, but one station (24) had only 110 minutes completed for the first night of listening.

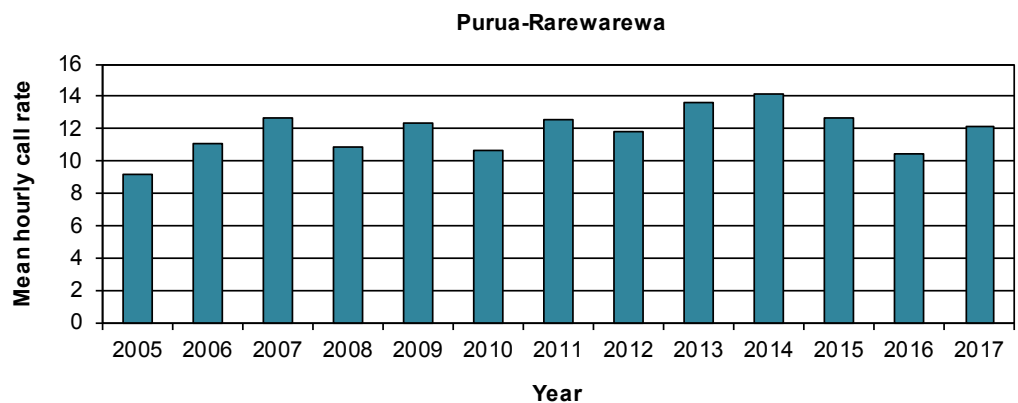


Figure 16. Trends in mean kiwi call rates at Purua-Rarewarewa management area.

4.1.16 Waipoua-Trounson

In 2017, the mean number of kiwi calls counted in the Waipoua-Trounson area declined to 7.3 calls/hr from 9.8 in 2016 (Fig. 17). This decrease was in part due to data from Station 16 being included in the analysis in 2017, but not in 2016. This station has been listened from sporadically since 1995, when it had a mean of 47.6 calls/hr, which is still one of the highest rates ever recorded in Northland. The call rate for this station gradually decreased over time before crashing around 2005. Since 2006, the mean call rate at Station 16 has been ≤ 4 calls/hr, including 0 calls heard in 2008, 2013 and 2014. It is promising that kiwi were still present in 2017, with a mean call rate of 1.5 calls/hr detected. Three of the other stations in the Waipoua-Trounson area had a decrease in call rates from 2016 to 2017, with Station 33 almost halving from 10.5 to 5.9 calls/hr, and stations 18 and 19 decreasing by ≤ 1 call/hr. Station 17 increased from 9.4 calls/hr in 2016 to 11.1 in 2017. These changes were all within the previously observed ranges for these stations and were likely due to natural variance. All five stations were listened from for the full 4 nights.

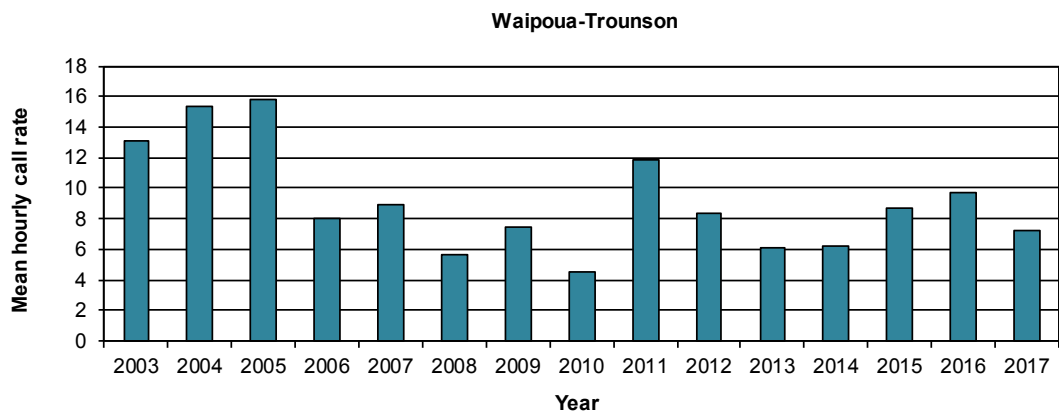


Figure 17. Trends in mean kiwi call rates at Waipoua-Trounson management area.

4.1.17 Tawharanui

In the Tawharanui area the mean kiwi call rate declined from 2016 to 2017, decreasing 1 call/hr from 5.6 to 4.6 (Fig. 18). A decrease was not expected for this expanding and well-protected population and likely reflects natural variation in call rates or the method used rather than a decrease in kiwi present. Six stations were listened from. One (Station 166) had only 1 night of listening completed, and another (Station 161) had 50- and 55-minute listening periods completed for the second night. Station 166 had the largest change in listening results from 2016 to 2017, dropping 3.4 calls/hr from 6.4 in 2016 to 3.0 in 2017. The incomplete data for this station may have returned an erroneous mean, and it would be advantageous to complete the full 4 nights of listening for this station in future years. Station 164 also experienced a decline, with the mean call rate almost halving from 4.6 calls/hr in 2016 to 2.4 in 2017. The remaining four stations (161, 162, 163, 165) all increased or decreased by < 1 call/hr. Hopefully the mean call rate for this area will return to and remain above 5 calls/hr in future years.

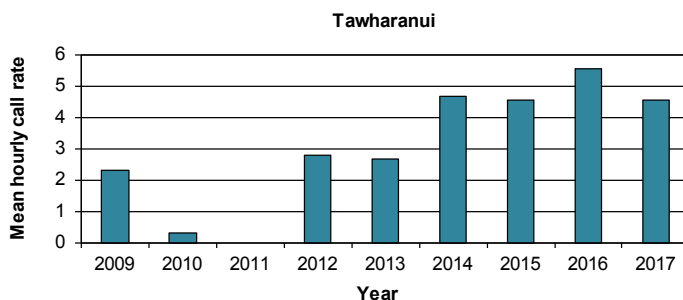


Figure 18. Trends in mean kiwi call rates at Tawharanui Open Sanctuary management area.

4.1.18 Marunui

The Marunui area had an increasing mean kiwi call rate for the second year in a row, growing from 3.6 calls/hr in 2016 to 5.1 in 2017 (Fig. 19). It is very encouraging to see this population grow to the point of having > 5 kiwi calls/hr, especially as kiwi have only been present in the area since 2013. It is hoped that data from 2018 and beyond will show that this population is continuing to burgeon. Two stations are listened from in this area; Station 253 decreased by 1 call/hr, from 4.3 in 2016 to 3.3 in 2017 and Station 275 more than doubled from 3 calls/hr in 2016 to 6.9 in 2017. Both stations had the full 4 nights of kiwi listening completed. As mentioned in previous reports, increasing the number of kiwi listening stations in this area would be beneficial.

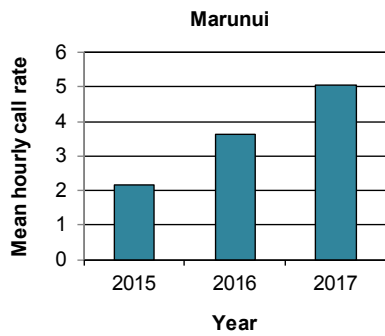


Figure 19. Trends in mean kiwi call rates at Marunui management area.

4.1.19 Mataia

As with previous years, the kiwi listening data for Mataia were collected via ALDs. Only 8 hours of ALD data were considered for this report, as per the standard kiwi listening method (Robertson & Colbourne 2003, 2017). Stations 254 and 255 were listened from in 2017, with mean call rates of 4 and 1.9 kiwi calls/hr respectively, providing an area mean of 2.9 calls/hr. The last time that both of these stations were listened from was 2014, when they had mean call rates of 1.0 and 1.5 calls/hr respectively, and an area mean of 1.25 calls/hr. These data show that adult kiwi are still present in the area, and the population is likely growing. Continuing to collect kiwi listening data over time for the Mataia area will show how the population fares in the long run. The kiwi listening coordinator may like to consider adding more stations to create a more robust sample size for this area.

5. Discussion and general recommendations

The majority of monitoring areas had lower mean kiwi call rates in 2017 than they did in 2016, with eight areas trending up and 11 trending down. This was a reversal of the pattern observed in 2016 when mean call rates trended up in 13 of the 19 areas and trended down or were data deficient in the remaining six. However, when we look at the original 1995 stations, three of the areas trended up (Southern, Western and Northern), with only the fourth trending down (Eastern). It is probably no coincidence that seven of the eight upward-trending areas are part of the Whangarei Kiwi Sanctuary, the Kiwi Coast, or newly established kiwi populations where there is significant work being done to control predators and promote responsible dog control. Having said that, there are also areas where the same amount of effort is being applied but a downward trend was observed. A reduction in the mean number of kiwi calls heard can happen for a number of reasons, including listening error/bias (e.g. a listener with diminishing hearing), changing environmental conditions (e.g. more wind or background noise), animal behaviour (e.g. a male kiwi looking for a mate in one year v. having found one the next), and population decline (e.g. due to dog predation).

Following the distribution of the 2016 report (Craig & Topia 2017) there were several queries regarding the interpretation and application of the Northland kiwi listening data. It cannot be stressed highly enough that kiwi call count monitoring is a crude method designed to allow listeners to ascertain if there are kiwi present, and to look at general trends over time. It is a method that detects relative rather than absolute abundance, thus it is not able to predict the actual number of kiwi present (Colbourne & Digby 2016; Robertson & Colbourne 2017). There is some correlation between call rates and the numbers of kiwi present, but this can change due to population density, the age and relationship status of the kiwi present (newly paired and territorial kiwi call more than those in established pair bonds or non-territorial individuals (Robertson & Colbourne 2017)) and because, in areas of high kiwi density, peak calling tends to occur early in the night to maintain territories, whereas in areas of lower kiwi density calling is more uniform throughout the night (Colbourne & Digby 2016). Some monitoring groups are choosing to collect additional data and make their own population predictions about this (as mentioned in the 2016 report), and they are welcome to continue with these analyses. If the aim is to ascertain true population size, Colbourne & Digby (2016) recommend using kiwi listening alongside other methods that will also detect chicks and juveniles, namely banding and recapture using kiwi detection dogs and handlers, as this will remove the inherent kiwi listening bias of only detecting adults.

In terms of how an area is managed, being able to confirm that kiwi are present is generally the main information required, as management should be the same wherever kiwi are present (primarily controlling stoats and dogs), regardless of the number of calls heard. There are valid arguments for protecting both the lone kiwi that has survived down the back of someone's farm for decades, and the well-protected pockets of kiwi where there may be hundreds of birds. We should protect as many kiwi in Northland as we can, for many reasons, but particularly to maintain the widest possible genetic representation in the population. History has sadly shown that high kiwi call rates don't necessarily indicate a low risk of a population crash, and that call rates can drop away and disappear very rapidly. The protection measures that are in place in the areas with high call rates need to remain and be continually checked and tweaked to ensure they are working efficiently and maximising kiwi survival. A short period of complacency can very quickly undo decades of time and effort.

A few areas have used ALDs (automated listening devices/acoustic recorders) in their surveys, and there have been recommendations for these to be deployed at core stations that would otherwise not be listened from. The use of ALDs has several advantages, the key ones being that they avoid the need for a human to be on site during the listening period, and that the acoustic

data files can be stored permanently to be checked later if need be. However, these devices only detect around 80% of calls heard by a human listener, so the results are not directly comparable; and they cannot give a directional bearing (unless several are used together and the distance data is triangulated), so estimating the number of individuals calling is not generally possible. Another important consideration is that the time and effort put into human kiwi listening surveys creates a sense of ownership and responsibility for the kiwi heard, which may be lacking if the data is collected via ALDs (Robertson & Colbourne 2017). Anecdotally, there were several reports from the 2017 listeners of seeing kiwi at close range during the listening period. This is excellent evidence that kiwi were about, and also an exciting reward for the listener for all that sitting around in the cold and the dark! When these factors are considered it is clear that human listeners should still be deployed if at all possible, with ALDs only used when it is not practical to use a human listener.

It is important that coordinators ensure that all core stations are listened from, and that listeners include all relevant data on each kiwi listening card. Please note that kiwi listening data should address the following:

- That the station is 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 every kiwi listening card must include the individual station number (see Appendix 2), 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.
- That there is consistency in kiwi listeners. Ideally this will mean the same person will listen from the same station for each of the 4 nights, and in subsequent years. If this is not practical, aim for at least having the same person covering the same stations for all 4 nights. The exception to this would be if the listener is no longer able to adequately detect kiwi calls, in which case a permanent replacement should be sought.
- That each station is covered for 4 nights if possible. If this can't be accomplished in the first scheduled kiwi listening period (window), it is possible to use the second window. It is more important that fewer stations are listened from for 4 nights than more stations for only 1 or 2 nights. This will produce more robust data and will give a more accurate measure of kiwi in your area.
- That kiwi call cards are filled out in full, including all the fields, each night.
- That groups enter their kiwi listening data into the spreadsheet themselves (because of reduced capacity in the Whangarei Kiwi Sanctuary team). The spreadsheet then needs to be sent to Rolf Fuchs at the DOC Whangarei Area Office no later than 31 August in the year in which it was collected. If it is not submitted by 31 August, it will not be included in the annual kiwi monitoring report.
- That the data are accurate. If you notice any errors or inconsistencies in the data used for this report, please advise Rolf Fuchs immediately.

5.1 Other recommendations

- Provide new listeners with adequate training. This not only includes how to identify the difference between male and female kiwi calls, other species' calls that may be mistaken as kiwi, compass use and judging distances, but also how to fill out the forms fully, correctly and legibly. The updated Kiwi Best Practice Manual (Robertson & Colbourne 2017) is a useful tool.
- Try to map the location of calling birds during the 4 nights of listening. This will help to identify the minimum number of individuals and pairs heard from each station. As discussed above, this data is not used in this report at present, but it may be in the future.

In the meantime, those groups who are analysing these data themselves are finding some interesting results.

- 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 2. If any of these numbers are not accurate, please let Rolf Fuchs (rfuchs@doc.govt.nz) know as soon as possible.

Kiwi listening 2018

Kiwi listening for 2018 should preferably be carried out over the period 2 June – 20 June, with a back-up window of 1 July – 20 July.

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

6. Acknowledgements

Thank you to all the people who carried out kiwi listening in 2017. 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 kiwi listening co-ordinators and to those who took the time to enter the data into the spreadsheets again this year.

7. References

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- Pierce, R.J.; Gardiner, C.; Moodie, H.; Robertson, H.A.; Sporle, W. 2006: Sustainable management of brown kiwi and other threatened birds in Northland. Wildland Consultants contract report No. 1193.
- Robertson, H.A.; Colbourne, R. 2003: Kiwi (*Apteryx* spp.) best practice manual. Department of Conservation, Wellington.
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Appendix 1

Kiwi call survey methods (from the Kiwi Best Practice Manual, Robertson & Colbourne 2017)

1. Go through the Kiwi Call Scheme card methods and fields before you go out. You may also wish to practice or refresh your skills by listening to the calls of kiwi at: <http://nzbirdsonline.org.nz/>
2. Choose listening sites that cover a wide listening area, preferably on a prominent knob, spur, hilltop, ridgeline or riverflat, away from loud river, stream, sea, traffic or hut noise. However, do not be put off listening from a campsite in thick bush if that is the most practical way of conducting a count.
3. Neighbouring listening sites should preferably be at least 1 km apart to increase the overall coverage.
4. On a topographical map, or GIS map system, estimate the listening range from each listening site – at many places, a ridge or spur will cut out distant calls from certain directions or the habitat in some directions may be unsuitable for kiwi, and so the listening range may be far from circular.
5. Before departing to the listening sites, remember to synchronise your watch with others who are listening in the same general area, so that you can better determine if a bird was heard at multiple sites.
6. Arrive at the listening site with enough time to get ready for recording. Remember that if your listening site is on a hill, you will require some time to cool off and to then pile some clothing on and prepare your forms before you will be ready to listen. Have all of your clothing and gear handy, so that you do not make unnecessary noise during the survey.
7. Start your listening period no earlier than 30 minutes after local sunset. Sunset times are available from <http://www.linz.govt.nz/hydro/nautical-info/astronomical-info> and on many GPS units.
8. Preferably do your listening in the first 2 hours of darkness (from 30 minutes after local sunset). Listening conditions are often best on a dark night, with little or no wind, rain or other noise, but counts in any conditions will still be valuable. Try to listen for a 2-hour period, because call rates will tend to average out, but listening periods of different durations are acceptable. Avoid doing a short listen simply to include a call that you heard when you were not otherwise intending to do a survey – in this situation, you are better off filling out a Kiwi Reporting Scheme card. Record any birds that called outside your planned listening period in the 'Notes' section, rather than, for example, adding onto the count the pair that called when you were packing up your gear!
9. At the end of each hour of listening, total up the number of calls heard and estimate the number of individual males and females you heard calling (allowing for movement of birds during your listening period) in the 'Notes' section.
10. Do not solicit calls from kiwi by using tapes or shepherd's whistles in the first hour of listening, and only do so later in the night if it is important to determine if kiwi are present at the site. In this case, make sure that this is clear in your notes, along with the times that the calls were broadcast.
11. If you hear other teams broadcasting calls from another site, record this information on your card, along with the time, estimated distance and direction – it may be that you have heard a bird responding to their broadcast rather than the broadcast itself.

12. At the end of the second hour, summarise your data in the field (while information is fresh in your mind):
 - Total up the number of calls heard in the second hour and estimate the number of individual kiwi you heard calling.
 - Add the two counts together and estimate the total number of birds heard during the 2-hour period, again allowing for movement of birds over the whole 2-hour period. Note that one male calling four times is a quite different biological result from four males which each called once.
13. Describe the listening site well (e.g. at cairn on terrace 5 m south of where the track drops down the true right (eastern) bank of the large stony creek, 1200 m west of Cameron's Hut, North Hurunui Valley) so that the exact same listening spot can be used in future surveys.
14. Photocopy or scan the card for your own records, and then send the original card or the scanned copy to the Kiwi Call Scheme Coordinator.

How to complete the Kiwi Call Scheme card:

CARD NUMBER Leave the top right-hand space blank. If you wish to link the card to the number of a listening station in the area surveyed, use the 'Notes' section on the card.

OBSERVER If more than one person listened from a listening station, give the name of the most experienced observer first. For each new observer, provide the address and affiliation on the first card only. This information is not required on subsequent cards unless addresses or affiliations change.

LOCALITY NAME Provide, in order, the province, the offshore island name (if applicable), the forest or reserve name and the nearest named locality or feature (such as river, stream, trig, etc.), followed by a brief description of the exact location of the listening station (use the 'Notes' section if you run out of space). For example, Southland, Stewart Island/Rakiura, Rakiura National Park, Mason Bay, sand hill 100 m east of Island Hill Homestead. This location will be further verified by the grid reference. This enables all records from Southland or Stewart Island/Rakiura to be sorted. If possible, include a photocopy of a map of the area with the listening stations marked on it, and the estimated listening extent over suitable habitat, even if you did not hear any birds calling throughout the marked area.

GRID REFERENCE Wherever possible, use the Topo50 map series, which is the official topographical map series used by the New Zealand emergency services. These maps cover the entire country. If you are using a GPS system, you should change the settings on your GPS receiver to 'NZGD2000', the datum used by Topo50, or to the 'New Zealand TM' (Transverse Mercator) position format and 'WGS 84' map datum, which is coincident with NZGD2000. If you do not have access to these maps or have a lot of data in the older grid reference, you can still use the metric NZMS 260 series maps and keep your GPS unit set to the 'New Zealand' position and the map datum set as 'NZGD49' or 'NZGD1949'. However, the grid references will need to be converted later from the NZ Map Grid to the NZ Transverse Mercator projection (NZGD2000) using a conversion programme such as that available at <http://apps.linz.govt.nz/coordinate-conversion>. For the section labelled 'Series', either put T50 to indicate Topo50, or 260 to indicate that you have used the NZMS260 map series. Ignore the N S X on old versions of the card and enter the Sheet Name for NZMS 260 maps. You should use grid references rather than the alternative decimal latitude/longitude system. Grid references are easy to interpret on maps and it is straightforward to work out how far each point is from adjacent points – something that cannot be done with latitudes/longitudes. The grid reference should be given to 7 places for the easting (horizontal) and 7 places for the northing (vertical), i.e. to the nearest metre, even though old versions of the Kiwi Call Scheme card have only 5 spaces available. You can download maps as image files (TIFF and GeoTIFF formats) and data files (Shape and IFF formats), or you can purchase paper maps from local retailers.

NOTES If kiwi are heard in the area but do not call during the listening period, please note this fact. This information is important for distribution analyses. If more space is required for notes, continue writing under the entry of the last call heard on the back of the card (upon completion of the listening period).

WIND This is a subjective score of the average influence of wind on your count. In general, calm and light winds will not reduce the ability to hear birds calling, moderate winds may result in the loss of distant calls, and strong winds will make distant calls very difficult to detect, especially if there is a lot of noise from the wind in trees nearby. If the weather or noise conditions change markedly during a count, fill in separate cards for the different parts of the count.

RAIN This is a subjective score of the average influence of rain during your count. Noise from rainfall can reduce the listening range, and so moderate rain should be scored when you feel that the results have been affected by the noise of rainfall.

TEMPERATURE This is a subjective score of the average temperature during your count. Note accurate readings if you have them available.

CLOUD COVER This is a subjective score of the average cloud cover during your count.

GROUND CONDITIONS This is a subjective score of the average ground conditions during your count.

NOISE This is a subjective score of interference to listening caused by other types of noise, such as river, waterfall, traffic or sea noise, talking by non-listening members of the party, or noise from other animals, e.g. petrels calling, cows mooing or frogs croaking. Avoid noisy conditions wherever possible. **MOONLIGHT** This is a subjective score of how bright the moonlight was, averaged over the listening period. Some early studies on brown kiwi, in particular, showed that they called noticeably less often on bright, moonlit nights. Interim results of more recent work indicate that this may not always be the case; however, until these data are fully analysed, it is best to continue to plan surveys on dark nights wherever possible.

LISTENING COVERAGE When listening from a ridge on a calm night, choose 'wide' as the descriptive term. When listening from a campsite in a gully, underline 'narrow'. When listening in a gully with a noisy creek and pouring rain ... head back to your tent!

MAJOR HABITAT TYPES Mark a maximum of three categories of vegetation types found within the listening zone. If the types of vegetation present are not listed, circle 17 and explain in the notes. Developed farmland is typical New Zealand pasture, and is well fenced, intensively grazed and has few trees. Undeveloped farmland has rank grasses interspersed with mānuka, gorse and other scrub throughout, and may include extensively grazed river flats or frost flats.

MINUTES LISTENED Give the total time that calls were listened for, in minutes. The number of calls will eventually be expressed as a number of calls per hour. As a general rule of thumb, 1 hour per station is a good continuous period for listening for kiwi calls. Do not listen for more than 3 consecutive hours in a single night, as your concentration will rapidly diminish beyond this. Do not be tempted to 'start' listening as soon as you hear a kiwi calling or to 'finish' a count as soon as a bird has called.

CALLS Record calls according to the species calling, sex (M/F), time, compass bearing that the kiwi called from and the estimated distance (metres). If you are not confident of estimating distance, then write 'near', 'moderate' or 'distant'. A call is made up of a series of notes, ranging from just 1-2 to about 25. Because it is the call rate that is important, if two calls from the same individual are more than a minute apart, record these calls on separate lines. If a pair duet (male or female responds during or shortly after the call of its partner), indicate that these calls are linked. In some species, a duet will comprise alternating calls, with a number of notes from one bird followed by a number of notes from its partner, and then a number from the original bird, and so on; regard this series of calls as being just one call from each member of the pair, unless

one of the calls is obviously from a third bird. At the completion of listening, estimate the number of individuals you heard during the listening period, taking into account the possibility that birds may have moved around during this time.

OTHER ANIMALS HEARD Record other animal species that you heard calling during the listening period, and make an estimate of their abundance using the following criteria: Few 1-2 individuals Moderate 3-6 individuals Many 6+ individuals

Appendix 2

Mean call count data for all Northland stations 1995–2017

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
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	-	-	-	-	2.75	0.88	
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	5.25	2.38	0.13	0.00	-	
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	0.13	0.25	0.75	0.25	0.25	0.00	0.13	-	
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	2.00	-	-	
7	Puketi	6.60	5.40	2.10	3.00	6.00	7.60	6.40	3.50	5.00	3.40	1.50	2.30	0.80	3.90	4.00	6.88	9.38	6.25	6.25	5.88	5.63	5.63	9.75	
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	5.38	9.25	9.00	
Mangatete																									
3	Lightning Hill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.50	13.50	10.00	17.63	20.5	17.13	
256	Baigents home drive	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.00	14.13	15.38	14.75	
Honeymoon Valley																									
271	H-moon Valley Green Bach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.38	0.50	-	
272	H-moon Valley Lost Valley track	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.63	-	-	
273	H-moon Valley Central Ridge of Beth's	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.63	-	-	
274	H-moon Valley Greg's driveway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	-	
	NZFRT reserve, campsite																						5.63	5.13	
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	14.13	4.88	-	
132	Whakaangi 3	-	-	-	-	-	-	-	-	-	-	13.50	14.60	9.00	10.75	12.17	12.17	5.50	3.13	6.75	3.88	4.38	5.88	-	
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	7.13	6.75	-	
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	9.00	5.25	0.50	
136	Whakaangi 8	-	-	-	-	-	-	-	-	-	-	14.10	29.00	11.80	18.80	15.25	10.50	20.00	15.25	12.75	13.00	10.88	4.50	6.75	
137	Whakaangi 9	-	-	-	-	-	-	-	-	-	-	4.80	8.40	5.60	6.50	4.88	8.13	5	-	-	2.63	3.00	0.75	4.75	

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
138	Whakaangi 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.75	4.00	5.83	4.33	3.75	2.88	0.50	-	-
140	Whakaangi 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.63	7.63	3.88	7.13	7.25	7.63	7.63
Mahinepua-Radar Hill																								
90	Mahinepua 0	-	-	-	-	-	-	-	-	-	-	-	-	2.90	2.90	3.38	3.63	4.00	7.13	4.38	3.25	4.88	5.63	5.38
83	Mahinepua 1	-	-	-	-	-	-	-	-	3.50	2.60	2.60	4.10	3.50	2.60	2.38	2.25	3.13	7.50	6.75	4.25	4.75	4.25	7.88
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	4.25	7.29	6.25
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	5.38	7.29	6.38
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	6.88	9.25	7.50
87	Mahinepua 5	-	-	-	-	-	-	-	-	-	-	-	-	2.40	0.90	2.00	-	-	-	-	-	-	-	-
86	Mahinepua 6	-	-	-	-	-	-	-	-	1.00	2.50	2.30	-	0.40	0.75	1.25	-	-	-	-	-	-	-	-
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	160	9.63	6.88	11.00	10.88	9.29
92	Mahinepua 14	-	-	-	-	-	-	-	-	-	-	-	-	0.6	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	-	-	-	-	-	-	-	-
Eastern																								
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	30.38	38.63	38.75
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	12.75	-	11.00
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	15.90	15.25	11.38	10.75	12.75	11.25	12.83	9.50	10.88	10.13
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	4.75	7.50	11.50
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	7.88	10.88	8.25
15	Tikiti Kiore	10.80	13.50	6.10	6.10	4.50	6.50	2.90	3.30	3.10	6.10	3.38	13.00	7.90	11.00	12.25	12.25	13.50	17.75	14.50	12.38	15.13	25.50	20.38
Russell Peninsula																								
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	10.13	-	13.50
60	Flagstaff/Te Maiki	-	-	-	-	-	3.70	1.30	1.30	-	-	-	4.30	-	6.38	-	2.50	4.25	3.88	3.25	3.25	3.88	3.38	5.75

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
61	Milne Ct	-	-	-	-	-	-	-	-	-	-	-	6.30	5.80	-	-	-	-	-	-	-	-	-	-	
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	6.88	15.00	21.63	11.13	
156	Russell Heights	-	-	-	-	-	-	-	-	-	-	-	9.80	4.80	5.00	2.50	5.00	-	-	-	-	-	-	-	
170	Nikau Block	-	-	-	-	-	-	-	-	-	-	12.88	10.00	12.00	12.00	12.00	8.88	14.25	9.13	20.75	14.63	14.88	12.00	10.38	
171	Mace/Farmer	-	-	-	-	-	-	-	-	-	-	-	-	-	6.63	4.75	17.63	10.38	6.25	4.00	4.00	14.25	12.75	21.63	
172	Pihiroa Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	3.00	2.00	2.75	6.00	5.38	5.63	3.00	3.25	3.57	
173	Shortlands	-	-	-	-	-	-	-	-	-	-	-	2.00	2.50	1.38	1.13	1.25	-	2.33	1.13	2.00	-	-	1.25	
174	Johnsons	-	-	-	-	-	-	-	-	-	-	-	10.00	9.75	12.75	10.00	10.00	11.38	8.5	10.13	10.25	11.25	12.75	12.25	
176	Jarvis	-	-	-	-	-	-	-	-	-	-	5.38	4.30	-	-	-	-	-	-	-	-	-	-	-	
177	Soloman's Gate	-	-	-	-	-	-	-	-	-	-	11.50	6.38	-	-	-	-	5.38	6.25	4.88	14.00	9.50	-	9.25	
210	Paroa Bay, Russell	-	-	-	-	-	-	-	-	-	-	-	-	4.30	-	-	-	-	-	-	-	-	-	-	
211	Eagles Nest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	-	-	-	-	-	-	-	
Bay of Islands																									
146	Kauri Cliffs 1 (Pink Beach)	-	-	-	-	-	-	-	-	9.00	-	-	4.00	4.25	1.75	5.00	6.50	-	-	-	-	-	-	3.25	-
147	Kauri Cliffs 2 (Puiriri)	-	-	-	-	-	-	-	-	-	-	-	1.50	3.00	2.75	1.00	-	-	-	-	-	-	-	-	-
148	Wiwiki Beach	-	-	-	-	-	-	-	-	-	-	-	32.10	-	-	-	-	-	-	-	-	-	-	-	-
149	Mataka Stn Gate, Purerua	-	-	-	-	-	-	-	-	-	-	-	4.00	4.10	8.25	6.75	18.5	3.25	10	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	-	-	-	-	-	-
152	Waitoto Block	-	-	-	-	-	-	-	-	-	-	-	4.00	-	-	-	-	-	-	-	-	-	-	-	-
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	5.50	7.00	-	-	-	-	-
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	-	-	-	-	-

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
189	Doves Bay, Kerikeri (Lockyer)	-	-	-	-	4.17	-	-	2.00	-	3.78	2.46	-	-	4.50	7.50	15.25	18.25	-	-	-	-	-	-
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	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	-	-	-	-	-	-	-	-	-	-	-	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 Cliffs	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	5.00	13.13	-	-	-	-	-	6.88	-
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	-	-	-	-	-

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
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	-	-	-	-	-	-	-
219	Achtzehner, 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, Mangapareraua Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	9.00	-	6.50	-	5.38	4.63	-	-	-	-
227	Puketotara Rd = 709	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.00	-	-	-	-	-	-	13.75
228	Puketotara Rd = Kearney	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	-	-	-	-	12.88	-	-
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, Mangapareraua	-	-	-	-	-	-	-	-	-	-	-	4.00	-	-	-	-	-	-	-	-	-	-	-
232	Waitoto, Rhyolitic dome, Mangapareraua Road	-	-	-	-	-	-	-	-	-	-	-	4.50	4.60	8.00	5.00	-	-	-	-	-	-	-	-
233	Wharau Rd, Kerikeri (Manning)	-	-	-	-	-	-	-	-	-	-	-	-	3.60	2.50	-	5.50	3.50	4.50	-	-	-	-	-
234	Wharau Rd, Kerikeri (Starr)	-	-	-	-	-	-	-	-	-	-	-	-	6.25	7.00	-	-	-	-	-	-	-	-	-
	Lodore Rd																							6.88

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Puketi Forest																								
102	Bramley's Rd	-	-	-	-	-	-	-	-	-	-	-	2.50	0.50	2.00	2.00	2.75	2.75	2.5	2.00	-	3.38	2.38	2.25
103	Pirau Ridge	-	-	-	-	-	-	-	-	-	-	-	0.00	-	0.00	1.00	0.50	1.25	1.25	1.38	0.50	1.63	0.88	1.00
104	Pond	-	-	-	-	-	-	-	-	-	-	-	4.50	1.00	3.75	5.00	3.50	8.00	6.88	4.63	5.88	3.25	4.88	2.88
105	Pudding Bowl Hill	-	-	-	-	-	-	-	-	-	-	-	0.30	0.75	1.13	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	-	1.13	1.88	4.88
107	Takapau/Pirau Rd Junction	-	-	-	-	-	-	-	-	-	-	-	0.50	-	1.00	2.75	1.38	3.50	1.50	1.13	0.88	1.63	1.50	1.38
108	Totara Ridge	-	-	-	-	-	-	-	-	-	-	-	5.75	-	0.75	7.13	3.50	6.13	4.63	5.88	5.00	1.75	4.13	2.38
109	Waihoanga Gorge	-	-	-	-	-	-	-	-	-	-	-	2.00	-	3.75	5.38	3.25	6.25	4.5	4.25	-	5.75	5.50	4.38
110	Waihoanga Gorge 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.50	2.50	1.50	-	4.50	-	-	-	-
111	Walnut	-	-	-	-	-	-	-	-	-	-	-	4.25	2.5	1.25	3.29	3.00	5.25	4.00	4.75	6.13	4.88	7.88	5.25
112	Stoat line 9 - Puketi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.13	4.00	3.63	1.38	4.00	1.00	3.63
259	Puketi Nature Trail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.13	-	3.25	-	-	-	-
Waimate North																								
113	W1	-	-	-	-	-	-	-	-	-	23.50	15.80	24.75	-	-	25.50	25.75	23.63	23.13	23.75	27.13	30.75	34.50	31.38
114	W2	-	-	-	-	-	-	-	-	-	12.25	7.00	9.50	7.90	11.50	5.75	14.5	11.63	12.50	7.13	5.13	8.60	4.75	8.83
115	W3	-	-	-	-	-	-	-	-	-	14.90	-	-	-	-	-	-	1.00	0.00	1.00	1.38	2.00	1.25	1.13
116	W4	-	-	-	-	-	-	-	-	-	9.40	10.50	6.00	-	8.00	-	8.50	13.50	10.50	10.88	8.50	8.00	7.00	12.13
117	W5	-	-	-	-	-	-	-	-	-	5.90	1.83	3.00	-	-	-	-	-	-	-	-	-	-	-
118	W6	-	-	-	-	-	-	-	-	-	22.30	11.00	5.70	8.50	7.30	9.13	5.63	10.63	8.00	7.50	10.38	11.00	13.25	10.88
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	8.13	7.13	5.25
121	W9	-	-	-	-	-	-	-	-	-	5.20	3.50	2.125	2.30	3.50	-	-	-	-	1.00	5.50	2.88	7.25	2.63
122	W10	-	-	-	-	-	-	-	-	-	-	-	7.33	8.30	5.90	5.25	4.13	7.25	5.13	4.13	8.00	4.43	5.25	-
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	8.13	7.38	6.13
178	W13	-	-	-	-	-	-	-	-	-	-	-	-	-	4.50	2.80	-	-	-	-	-	-	-	-
127	W14	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	0.88	0.50	0.00	-	-	-	-	-	-
128	W16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	2.17	-	-	-	-	-	-	-
	Sacro Bosco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.88
Hupara																								
258	Hupara Land Care 1 (Bill's Plateau)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.25	15.13	21.38	25.00	26.38	21.38

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
245	Hupara Land Care 2 (Mike Sullivan's)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.88	11.00	16.00	-	-
246	Hupara Land Care 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.38	-	-	-	-
257	Hupara Land Care 4 (Home Orange Tree)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.63	9.00	17.13	12.13
	Hupara Land Care Harrison's Property	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35.29	-
Tutukaka & Sandy Bay																								
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	7.38	11.50	13.75
126	TLC 2	-	-	-	-	-	-	-	-	-	8.40	7.80	9.80	10.25	6.50	-	7.38	2.75	10.00	-	6.83	10.88	9.50	16.88
142	TLC 3	-	-	-	-	-	-	-	-	-	-	3.00	4.60	3.60	3.00	-	-	9.25	8.50	7.13	5.38	4.13	8.63	-
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	-	-	-	-	-	-	-	-	-	-	-	-	-
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	3.88	5.75	6.25
260	Sandy Bay 2	-	-	-	-	-	-	-	-	-	-	-	4.50	-	-	3.83	3.50	2.50	4.50	-	3.00	5.88	6.38	9.25
261	Sandy Bay 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00	-	4.00	7.50	3.88	3.88	8.50	5.50
	Rayonnier Forest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.13
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	10.00	12.13	7.38
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	6.13	6.88	6.00
42	Bream Hd 4	-	-	-	-	-	-	1.20	2.00	1.25	2.10	2.40	2.00	1.50	3.10	2.00	2.00	5.38	5.33	7.63	2.13	6.25	3.75	6.75
69	Bream Hd 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.88	6.75	4.38	-	5.00	3.25
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	8.63	11.25	10.25
46	Taurikura 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.50	1.88	5.88	4.63	4.00	7.50	4.75	6.00	-
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	1.50	9.38	8.75
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	15.13	15.63	13.50
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	7.50	7.13	9.25

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
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	-	3.25	4.75	3.88	
262	Manaia 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.75	3.63	6.88	9.13	6.00	-	10.00	
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	3.75	7.38	6.50	
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	6.75	9.63	7.13	
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	6.88	7.00	6.75	
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	4.75	5.63	6.13	
141	Kauri Mtn 5	-	-	-	-	-	-	-	-	-	-	2.30	1.90	1.25	2.50	3.13	3.25	4.75	4.13	3.00	4.88	4.75	8.86	8.88	
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	1.63	3.88	8.50	
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	-	-	-	-	-	
263	Craig Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.00	14.13	12.25	9.25	13.50	12.25	10.63	
75	McCleod Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.63	5.88	8.75	7.38	
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	-	-	-	1.88	
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	2.00	-	5.25	
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	20.13	18.75	21.13	
24	Purua North	12.10	13.00	10.30	10.50	10.60	15.00	12.75	12.50	13.25	10.90	12.60	13.60	18.30	9.90	13.50	10.00	16.13	16.00	17.63	14.88	16.25	13.75	13.50	
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	7.50	9.14	11.25	
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	9.63	10.75	14.63	
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	-	-	4.86	-	-	
35	Motatau 2	-	-	-	-	-	-	4.80	2.70	-	-	1.50	3.00	2.50	-	-	-	4.25	-	5.50	-	-	-	-	
36	Motatau 3	-	-	-	-	-	-	1.50	1.25	0.90	1.00	3.50	4.60	4.00	0.90	-	-	5.50	-	-	-	-	-	-	
38	Motatau 5	-	-	-	-	-	-	1.50	11.70	11.75	17.60	13.50	10.50	-	-	-	-	-	-	-	-	-	-	-	
68	Motatau 9/ Marlow 1	-	-	-	-	-	-	-	-	14.75	15.90	14.40	14.10	14.60	10.50	12.5	11.13	17.50	10.75	7.25	18.63	9.50	7.25	11.50	
81	Purua South	-	-	-	-	-	-	-	-	9.75	6.60	4.00	8.50	7.90	10.40	11.38	11.38	11.88	12.13	10.00	7.88	6.88	-	8.13	
82	Rarewarewa North	-	-	-	-	-	-	-	-	-	7.10	7.50	10.90	9.00	5.75	2.17	3.38	5.00	5.38	7.75	2.25	4.50	3.88	5.88	
129	Motatau 10/ Marlow 2	-	-	-	-	-	-	-	-	-	-	9.80	13.00	16.10	17.75	15.50	16.63	9.50	13.75	28.63	22.00	23.13	11.75	16.00	
139	Hodges Bush	-	-	-	-	-	-	-	-	-	-	-	6.00	6.00	10.25	13.38	10.75	24.29	13.50	9.38	7.75	4.38	10.00	5.38	
145	Whangaruru	-	-	-	-	-	-	-	-	-	-	-	-	8.50	11.60	15.00	8.38	7.25	3.75	2.88	-	-	-	-	
167	Kaikanui Rd	-	-	-	-	-	-	-	-	-	-	-	-	1.80	2.40	2.00	5.75	1.38	-	-	-	0.13	2.00	-	
168	Worsp Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
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	-	-	-	1.50
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	7.63	9.38	11.13	
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	7.13	7.13	6.13	
19	Waipoua L/Out	30.9	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	12.38	12.00	11.63	
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	-	-	-	-	1.17	-	3.38	
33	Trounson South	-	-	-	-	-	-	12.25	-	23.75	19.10	-	-	8.20	8.90	-	11.13	12.33	10.00	6.00	7.75	7.75	10.50	5.88	
79	Toronui Track	-	-	-	-	-	-	-	-	1.75	2.40	-	-	-	-	-	-	-	-	-	-	-	-	-	
96	Kawerau Rd Cr	-	-	-	-	-	-	-	-	3.40	2.00	0.30	0.40	1.00	-	-	-	-	-	-	-	-	-	-	
157	Opouteke CHH	-	-	-	-	-	-	-	-	-	-	-	6.60	6.10	2.80	11.25	-	-	-	-	-	-	-	-	
158	Piawai CHH	-	-	-	-	-	-	-	-	-	-	-	7.30	0.50	1.50	-	-	-	-	-	-	-	-	-	
179	Marlborough 13	-	-	-	-	-	-	-	-	-	-	-	-	-	6.50	-	-	-	-	-	-	-	-	-	
244	Maunganui Bluff	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	
265	River Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	-	-	-	2.63	-	5.00	
266	Wekaweka LC 1 (Alf's Cottage)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.20	-	-	-	-	-	-	
267	Wekaweka LC 2 (Rob's Place)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.67	-	0.13	
268	Wekaweka LC 3 (Libby's track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	1.25	
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	0.38	0.50	1.00	
18b	Site 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-	
28b	Site 28 SH12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.25	8.88	3.63	4.13	5.13	-	7.63	4.50	8.43	
30b	Site 30 SH12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.00	3.00	0.88	-	-	-	1.50	-	-	
31b	Site 31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-	
32b	Site 32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.88	-	-	-	-	-	-	-	-	
Tawharanui																									
161	TWN 1 Marine triangle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.16	0.50	-	1.25	2.25	2.88	2.63	4.00	4.38	

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STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
162	TWN 2 Trig triangle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16	0.67	-	3.88	1.88	1.25	2.88	6.63	5.88	
163	TWN 3 Top ecology track	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50	0.33	-	1.63	2.00	4.63	6.00	5.00	4.50	
164	TWN 4 Possum gully	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	-	2.75	1.38	8.00	2.75	4.63	2.38	
165	TWN 5 Twin hills	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.16	0.00	-	2.25	1.88	3.25	3.50	6.75	7.25	
166	TWN 6 South coast water tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.83	0.33	-	4.88	6.50	8.00	9.50	6.38	3.00	
Kawau Island																									
269	Bostaquet Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	-	-	-	-
270	South Cove	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.40	-	-	-	-	-	-
Maranui																									
253	Marunui 1 (House 17 deck)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.13	2.63	4.25	3.25	
275	Marunui 2 (Pebblebrook Rd)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.67	3.00	6.88	
Mataia																									
254	Mataia 1 KLD (Top of fishing track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.04	-	-	4.00	
255	Mataia 2 KLD (Mid pa track)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.46	-	0.50	1.88	
	Mataia 3 KLD (Cliffs)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.75	-	

Appendix 3

Summary of Northland kiwi listening data for stations listened from in 2017

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
Northern												
1	Diggers Valley	R. Renwick	3	2	0	0	1	0	1	0	7	0.88
7	Puketi	D. O'Halloran	6	4	14	13	15	10	12	4	78	9.75
8	Puketi SR	S. & K. Grimmw	7	12	6	8	17	4	7	11	72	9.00
Mangatete												
3	Lightning Hill	L. Baigent	21	20	11	15	16	11	22	21	137	17.13
256	Home drive	A. & L. Baigent	15	8	19	15	17	16	13	15	118	14.75
Honeymoon Valley												
	NZFRT reserve, campsite	M. Schmid	6	7	7	6	5	6	3	1	41	5.13
Whakaangi												
135	Wha 7	B. Jarvis	1	1	0	0	0	0	0	2	4	0.50
136	Wha 8	P. & P. Johnston	6	7	7	4	4	12	4	10	54	6.75
137	Wha 9	M. Langridge	7	5	3	5	4	2	7	5	38	4.75
140	Wha 11	J. Langridge	9	6	13	8	5	9	7	4	61	7.63
Mahinepua												
90	Site 0	R. Lawler/N. Redmond et al.	4	0	12	3	3	5	8	8	43	5.38
83	Site 1	K. Heath/B. Ross et al.	5	2	16	11	7	7	11	4	63	7.88
84	Site 2	V. Wright/J. & H. Owens	6	3	13	2	5	4	9	8	50	6.25
85	Site 3	F. Barnes/J. Atwell et al.	11	2	8	7	7	10	3	3	51	6.38
88	Site 4	M. Schaab/A. Gilhespy et al.	16	4	6	5	9	6	8	6	60	7.50
99	Site 13	N. Cox et al.	11	5	12	15	9	7	6	-	65	9.29
	Taupo Bay Harlan's Section	E. Whyte	17	9	32	10	22	7	9	12	118	14.75
Eastern												
10	Marsden Cross	C. Hambrook	40	25	46	24	56	33	47	39	310	38.75
11	Puketotara	A. Mentor/A. Kearney	8	10	12	4	12	11	15	16	88	11.00
12	Rangitane	A. Walker	6	14	14	8	8	5	12	14	81	10.13
13	Waitangi No. 12	D. Lawson	5	12	15	16	13	10	7	14	92	11.50
14	Mt Bledisloe	S. McManus	10	5	4	11	8	15	6	7	66	8.25
15	Tikitikiore	L. Gordon et al.	22	27	21	20	19	21	23	10	163	20.38
Bay of Islands												
227	Puketotara Rd = 709	A. Kearney	27	8	13	9	14	11	19	9	110	13.75
	Lodore Rd	J. Hutchings	2	8	4	7	11	10	9	4	55	6.88
Russell												
59	Opito Farms	E. Harwood	12	12	14	6	14	19	14	17	108	13.50
60	Te Maiki/Flagstaff	H. Lindauer/C. Matnard	4	12	7	5	7	6	3	2	46	5.75
62	Uruti Road	C. Richmond	10	9	14	12	12	5	10	17	89	11.13
170	Nikau Block	D. McKenzie	10	10	12	7	18	10	7	9	83	10.38
171	Mace/Farmer	M. Cadogan	29	27	16	14	15	9	30	33	173	21.63
172	Pipiroa	M. Pasco	1	0	3	-	5	8	7	1	25	3.57
173	Shortlands	S. Western et al.	1	0	1	2	1	0	4	1	10	1.25
174	Johnsons	M. Frankum	16	11	18	7	15	10	9	12	98	12.25

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
177	Soloman's Gate	S. Sharpe	16	13	17	3	1	13	7	4	74	9.25
Puketi Forest												
102	Bramley's Ridge	G. Adams et al.	6	3	1	1	2	1	2	2	18	2.25
103	Pirau Ridge	I. Wilson/B. Sutton	1	2	1	0	2	1	1	0	8	1.00
104	Pond	J. Mortensen et al.	4	1	6	6	3	0	2	1	23	2.88
106	Takapau Track	P. Hodgson	6	2	5	4	2	10	8	2	39	4.88
107	Takapau/Pirau Rd Jn	B. Sutton et al.	1	2	0	0	0	3	2	3	11	1.38
108	Totara Ridge	J. Mortensen et al.	0	0	4	1	1	1	7	5	19	2.38
109	Waihoanga Gorge	C. & R. Robinson	5	2	5	8	2	9	1	3	35	4.38
111	Walnut	S. Manunui/G. Adams	10	5	9	3	3	3	5	4	42	5.25
112	Stoat line 9 - Puketi	D. France et al.	5	4	5	4	2	2	3	4	29	3.63
Hupara												
258	Hupara Land Care 1 (Bill's Plateau)	S.B. Brown	24	28	17	33	20	17	19	13	171	21.38
257	Hupara Land Care 4 (Orange Tree)	S.B. Brown	8	3	14	19	11	24	5	13	97	12.13
Waimate North												
113	W1	S.B. Brown	47	26	47	33	34	14	28	22	251	31.38
114	W2	P. Saunders	5	11	7	4	17	9	-	-	53	8.83
115	W3	A. P. Taylor	2	4	1	0	1	0	1	0	9	1.13
116	W4	N. O'Brien	14	14	12	16	7	11	19	4	97	12.13
118	W6	D. Way/T. Upperton	11	8	7	12	11	20	11	7	87	10.88
120	W8	A. Chiaroni et al.	3	8	6	5	9	4	3	4	42	5.25
121	W9	B. Brown	2	4	1	3	1	2	4	4	21	2.63
124	W12	C. Matthews et al.	8	6	7	1	14	5	8	0	49	6.13
	Sacro Bosco	B. Gables	4	6	2	0	11	0	0	0	23	2.88
Sandy Bay												
27	Sandy Bay 1	N. Pullman	7	11	1	7	6	6	8	4	50	6.25
260	Sandy Bay 2	ALD	8	9	7	12	12	12	7	7	74	9.25
261	Sandy Bay 3	N. Pullman	7	4	7	7	1	3	6	9	44	5.50
Tutukaka												
125	TLC 1	M. Camm	20	14	9	10	17	14	17	9	110	13.75
126	TLC 2	N. Davies	22	9	25	12	14	25	11	17	135	16.88
	Rayonnier Forest	D. & S. Young	5	5	5	7	4	4	6	5	41	5.13
Whangarei Heads												
39	Bream Head 1	W. Newbold	11	5	7	8	4	6	11	7	59	7.38
41	Bream Head 3	O.A. Petel	6	10	6	4	4	4	9	5	48	6.00
42	Bream Head 4	T. Hall/E. Davies	2	10	5	7	10	2	9	9	54	6.75
69	Bream Head 6	C. Cook	3	4	5	3	4	5	0	2	26	3.25
54	Kauri Mt 1	J. Nairn	9	5	6	7	8	10	3	4	52	6.50
72	Kauri Mt 2	M. Barteldres	11	4	4	1	13	2	19	3	57	7.13
73	Kauri Mt 3	T.D. Bull	4	2	10	7	10	7	9	5	54	6.75
74	Kauri Mt 4	G.&R. Faber	9	14	8	4	3	5	4	2	49	6.13
141	Kauri Mt 5	L. Brown	9	9	4	7	9	12	10	11	71	8.88
47	Manaia 1	L.W. Ogle/L. Higgison	2	8	13	10	11	2	7	17	70	8.75
48	Manaia 2	F. Clayton et al.	16	18	14	13	17	7	16	7	108	13.50
49	Manaia 3	P. Richards	6	11	4	11	6	11	13	12	74	9.25
71	Manaia 8	S.W.F. Fieldhouse	8	9	1	1	2	4	3	3	31	3.88
262	Manaia 9	J. Williams	11	6	9	7	16	15	9	7	80	10.00
56	Nook 2	M.R. & J.A. Butcher	2	6	22	8	7	1	13	9	68	8.50
45	Taurikura 2	G. Pike	7	15	8	9	11	9	9	14	82	10.25

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	2	1	2	1	2	1	2		
263	Craig Rd	C. McNamara	22	10	9	14	6	6	3	15	85	10.63
75	McLeod Bay	W. & V. Biddle	13	4	10	3	8	2	13	6	59	7.38
Southern												
21	Glenbervie 7A	ALD	4	1	5	2	0	1	0	2	15	1.88
22	Glenbervie 9A	ALD	4	5	2	5	4	10	6	6	42	5.25
23	Marlow Rd	G. Coulston	10	17	23	21	15	20	28	35	169	21.13
24	Purua N	R. Reigel	21	11	10	18	9	9	9	21	108	13.50
25	Rarewarewa S	C. Robles	15	13	20	7	13	7	10	5	90	11.25
26	Mimiwhangata	R. Taylor	9	11	6	17	25	17	16	16	117	14.63
68	Motatau 9	N.H. Hawkins	13	7	7	18	17	11	5	16	94	11.75
81	Purua S	V.F. Crabb	3	16	13	15	12	10	11	12	92	11.50
82	Rarewarewa N	R.F. Fuchs	5	11	10	2	11	5	11	10	65	8.13
129	Motatau 10	I.K. King	5	13	8	4	6	3	0	8	47	5.88
139	Hodges	G.J. Lovell	19	17	12	12	12	24	15	17	128	16.00
145	Whangaruru	R. & D. Hughes, R. Sullivan	6	3	11	7	6	3	5	2	43	5.38
	Tanekaha 1	E. Smith	3	1	2	0	6	5	4	3	24	3.00
	Tanekaha 2	J. Vulgar	1	0	0	1	0	7	0	8	17	2.13
Western												
16	Katui	R. Booth et al.	0	4	0	5	1	2	0	0	12	1.50
17	Trounson Nth	M. Leach	5	8	20	9	14	5	15	13	89	11.13
18	Cathedral	J. McLaughlin/N. Krivec	5	10	6	6	5	8	9	0	49	6.13
19	Lookout	O. Knox	10	14	9	13	13	13	14	7	93	11.63
31	Te Matua Ngahere	N. Krivec/J. McLaughlin	5	4	3	1	5	3	4	2	27	3.38
33	Trounson Sth	M. Topia	4	7	13	3	7	8	2	3	47	5.88
16b	Malborough Rd Site 16	M. Calder	0	2	0	0	2	0	2	2	8	1.00
28b	Site 28 SH12	I. Farrent/S. Downey	4	7	9	15	7	6	11	-	59	8.43
265	River Road	J. Matthews/Z. Birch	5	6	4	6	3	6	-	-	30	5.00
267	Wekaweka LC 2 (Rob's Place)	R. Anderson	0	0	1	0	0	0	0	0	1	0.13
268	Wekaweka LC 3 (Libby's track)	E. Hooten	2	0	2	0	2	1	2	1	10	1.25
Tawharanui												
161	TWN 1 Marine triangle	A. Burt/G. Barruel et al.	10	4	6	9	0	3	3	0	35	4.38
162	TWN 2 Trig triangle	S. Penny/P. Beer et al.	5	4	9	9	1	5	7	7	47	5.88
163	TWN 3 Top ecology track	T. Williams/A. Burt et al.	3	9	5	3	3	2	8	3	36	4.50
164	TWN 4 Possum gully	G. Burt/S. Richardson et al.	5	1	1	1	3	4	3	1	19	2.38
165	TWN 5 Twin hills	D. Moodey/C. Binstead et al.	6	6	8	2	3	10	20	3	58	7.25
166	TWN 6 South coast water tank	R. Williams/N. Convery	5	1	-	-	-	-	-	-	6	3.00
Marunui												
253	House 17 Deck	J. Hawley	1	1	4	9	2	4	0	5	26	3.25
275	Pebblebrook Rd	G. Stretch	12	8	2	3	9	8	10	3	55	6.88
Mataia												
254	Mataia 1	ALD	4	10	8	2	1	3	0	4	32	4.00
255	Mataia 2	ALD	1	6	2	3	0	0	1	2	15	1.88

Appendix 4

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

AREA	NO. STNS	STATION NUMBERS	2017 STATION NUMBERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mangate	2	3, 256	3, 256	-	-	-	-	-	-	-	-	-	-	-	11.00	15.88	17.94	15.94
Honeymoon Valley	4	271-274	Insufficient data	-	-	-	-	-	-	-	-	-	-	-	-	1.47	-	-
Whakaangi	7-9	29, 130-137	135-137	-	-	11.80	10.70	10.10	10.80	11.68	12.23	10.88	9.93	7.33	6.52	8.08	4.67	4.00
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	6.45	7.79	7.46
Russell Peninsula	5	15, 59, 62, 170, 173	15, 59, 62, 170, 173	-	-	4.53	4.01	7.04	5.35	4.61	5.54	11.44	9.77	11.4	12.83	13.8	19.7	11.33
Puketi Forest	6	102, 104-106, 108, 111	102, 104, 106, 108, 111	-	-	-	2.88	1.15	1.48	3.66	3.00	4.25	4.11	3.60	5.67	2.88	4.23	3.53
Hupara	3-4	245, 246, 257, 258	257, 258	-	-	-	-	-	-	-	-	-	-	18.46	14.7	16.7	21.8	16.75
Waimate North	5	114, 118, 120, 122, 124	114, 118, 120, 124	-	10.46	4.28	-	6.80	6.48	4.68	8.05	8.98	8.43	6.6	8.55	8.06	7.55	7.77
Sandy Bay	3	27, 260, 261	27, 260, 261	-	-	-	-	-	-	-	3.25	-	4.22	4.33	3.71	4.54	6.88	7.00
Tutukaka	5	125, 126, 142, 143, 144, 28	125, 126	-	-	6.24	7.30	8.21	8.68	5.67	6.77	7.05	10.17	9.63	6.25	7.46	9.88	15.31
Manatia-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	5.80	8.15	8.78
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	5.38	7.7	7.08
Bream Head-Taurikura	5	39, 41, 42, 44, 69	39, 41, 42, 69	-	-	2.50	2.60	2.20	3.20	4.29	2.70	6.59	7.14	8.68	6.19	7.46	6.94	5.84
Motatau-Marlow	6	23, 34-36, 68, 129	23, 68, 129	-	-	7.30	7.60	7.50	4.90	6.39	4.54	7.08	8.28	9.13	8.67	9.83	11.5	12.92
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	12.70	10.50	12.08
Waipoua	4	16-19, 33	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	5.60	8.72	9.75	7.25
Tawharanui Open Sanctuary	6	161-166	161-166	-	-	-	-	-	-	2.30	0.31	-	2.77	2.65	4.67	4.54	5.56	4.56
Maranui Conservation Limited	2	253, 275	253, 275	-	-	-	-	-	-	-	-	-	-	-	1.13	2.15	3.63	5.06
Mataia Restoration Project	2	254, 255	254, 255	-	-	-	-	-	-	-	-	-	-	-	1.25	-	1.13	2.94

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.