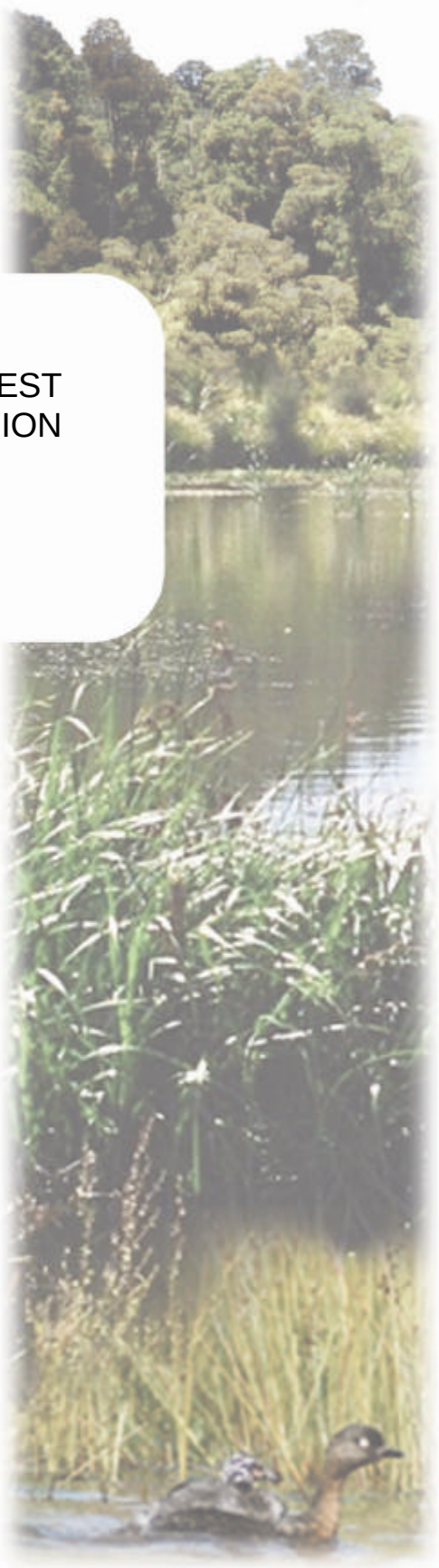

AERIAL MONITORING OF COASTAL INDIGENOUS FOREST IN THE BAY OF PLENTY REGION 2003

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1. Introduction

An aerial survey of indigenous forest along the Bay of Plenty coastline was undertaken on 20 and 21 March 2003. The purpose of the survey was to undertake a rapid assessment of canopy condition. An aerial survey was undertaken as this method is rapid, provides regional coverage, and is cost-effective. The survey was undertaken at this time of the year to avoid key periods and plant processes such as the spring flush, flowering, autumn (when coastal storms are common), and winter. Subject to findings from the survey, this would then provide a basis for either follow up ground surveys to further investigate areas of concern or interest, or repeat aerial surveys.

This report provides a brief outline of the methodology, the results obtained from the 2003 survey, and suggestions on future aerial surveys. Project outputs include maps showing the areas surveyed and evaluated (refer to Appendix 1) and a spreadsheet with a score and notes for each area of forest (refer to Appendix 2). Electronic copies (a digital GIS file and Excel file) of these outputs have also been provided to Environment Bay of Plenty for use in their biodiversity databases. A series of film and digital photographs were also taken (a selection are presented in Appendix 3).

2. ECOLOGICAL SIGNIFICANCE AND DYNAMICS

Coastal indigenous forest has been reduced significantly in extent along the Bay of Plenty coastline. The most extensive mainland examples occur east of Opotiki, near Whakatane (although this is all secondary forest), at Matata, and north of Waihi Beach. There are many other examples but they tend to be small and fragmented, such as most of the remnants adjacent to Ohiwa and Tauranga Harbours. All remaining examples are highly valued as they provide important ecological habitat, they are a characteristic feature of the Bay of Plenty coast, and they are a significant landscape feature.

Coastal forest is vulnerable to a range of threats, including local clearance (by felling or herbicide application), grazing by domestic stock, and introduced browsing pests. Pohutukawa (*Metrosideros excelsa*) in particular is vulnerable to possum browsing (Hosking *et al*. 1988). Possums tend to browse heavily on selected trees, and removal of leaf shoots results in the opening up of the canopy. The baring of twigs and branches, as a result of possum browsing, makes the canopy appear grey and this effect can be detected relatively easily by ground observation or from the air. Heavy browsing kills trees, even large mature examples (this has occurred previously along the Bay of Plenty coast and on the margins of the Rotorua lakes). Similar effects are evident in northern rata (*M. robusta*) and rata dieback, and tree death has occurred extensively as a result of possum damage.

Other coastal tree species also exhibit crown dieback and death syndromes. Mangeao (*Litsea calicaris*) commonly dies with no apparent cause, with the mortality affecting a wide range of age classes. The cause is unknown (Gardner and Dick 2002) but is likely to be a combination of environmental effects and a pathogenic organism (c.f. dieback of ti kouka or cabbage tree, *Cordyline australis*). Puriri (*Vitex lucens*) also commonly exhibits local crown dieback and contraction (Hosking 1999) and this is associated with root damage, ground pugging, and lower stem bark damage. There is no evidence that insects or disease are implicated, although the role of possums is unclear (Hosking 1999), and kokekohe (*Dysoxylum spectabile*) and totara (*Podocarpus totara*) are also heavily affected by possums.

Other causes of death, dieback, or ill-health in coastal indigenous tree species include fire, salt spray associated with on-shore storm winds, wind damage, local insect attack, erosion/landslides, roading, and shag colony roosts (large amounts of acidic shag faeces kill foliage). Mortality can also be caused by herbicide application to foliage, trunks, or roots.

3. PREVIOUS AERIAL SURVEYS

There have been at least three previous surveys of coastal forest canopy condition along the Bay of Plenty coastline, in the late 1980s - early 1990s.

3.1 1988

The 1988 survey was part of a larger survey of pohutukawa health which covered Northland, the Gulf Islands, Coromandel, Raglan-Kawhia, Bay of Plenty - East Cape, and inland stands (Hosking *et al*. 1989). The Bay of Plenty Regional Council coastline was covered in two flights: west of Bowentown on 8 July 1988, and between Mt Maunganui and East Cape on 22 June 1988.

West of Bowentown the following observations were made of seven sites in the vicinity of Homunga Bay - two sites had a 'thin' canopy with evidence of 'heavy' browse damage, three sites were 'healthy', and two sites were 'unhealthy' with sign of heavy browse damage.

Numerous sites were assessed between the eastern side of Tauranga Harbour and Lottin Point:

- Sites (9) on the eastern side of Tauranga Harbour, on Mauao (Mt Maunganui), and Moturiki were generally healthy, with some tree death on Mauao.

- One site at Te Puke was healthy.

- One site at Pukehina Beach was generally healthy but also included a group of dead and dying trees along the coastal cliff boundary to a cemetery. Human influences were suspected as being the most likely cause of the ill-health.

- Sites at Otamarakau, Hauone, and Pikowai were all classed as healthy.

- Sites (2) at Ohope were healthy.

- A site at Waiotahe Beach was healthy.

- A site at Maraenui Hill was healthy.

- A site at Omaio Bay was healthy.

- One site at Te Kaha was healthy, but another nearby at Wharekura was unhealthy.

- One site at Tokata Pt was healthy, although some tree(s) were dead.

- A site at the Mouriuri Stream was dead.

- One site at Tokatea (west of Whanarua Bay) was healthy, but another was unhealthy.

- Two sites at Lottin Point were healthy.

General

Apart from browsing, some evidence was seen of ill-health resulting from human influences, wind (a severe storm in 1982), roading, fire, shag colonies, erosion and slips, and insects and disease. Puriri was also showing extensive crown dieback and contraction, especially east of the Motu at Whitianga Bay, Pokohinu Point, and Tokata Point. Cabbage trees were also showing dieback and death throughout the coastal strip.

3.2 1989 - 1991

An aerial survey of pohutukawa health was carried out between Otamarakau and Waiotahe in late 1989 by the Department of Conservation (Gosling and Shaw 1990). Most stands and individual trees were in good health and showed signs of rigorous spring growth. Some trees were starting to flower. There were signs, however, of significant canopy ill-health at four locations: (i) in Kohi Point Scenic Reserve (only immediately adjacent to the coast), (ii) on Uretara Island and, to a lesser extent, (iii) in Ohope Scenic Reserve, and (iv) scattered trees on the margins of Ohiwa Harbour.

It was considered that the canopy ill-health was the result of possum damage (Gosling and Shaw 1990) and possum control operations were subsequently undertaken on Uretara Island and in Kohi Point and Ohope Scenic Reserves.

At least a further two aerial assessments were undertaken by the Department of Conservation, probably in 1990 and 1991 (Derek Gosling, pers. comm.).

4. METHODOLOGY

The flights were undertaken between 1100 and 1300 hrs in a Cessna 172, at an altitude of *c.*800' (250 m), flying at an oblique angle from sites of interest. Flight speed was 70-100 knots.

Areas of indigenous forest were delineated during the flight on printed sections of 1:50,000 scale NZMS260 topographic maps blown up to *c.*1:25,000.

Sites/mapping units were delineated and detailed vegetation mapping was not attempted (accordingly, areas mapped are only indicative of extent). A canopy condition score (see below) was assigned for each site and brief notes were often also recorded on the maps. A site number was assigned later in the office.

Canopy Condition Score

1 - Good condition; no obvious canopy damage.
2 - Condition moderate; limited canopy damage or opening evident.
3 - Poor condition, obvious canopy damage, opening, dead branches or trees.

The first flight, on 20 March 2003, was from Whakatane to Lottin Point and return. We travelled around Kohi Point, across Ohiwa Harbour, and then followed the coastline to Lottin Point. Flying conditions were clear and calm, with some wind between Cape Runaway and Lottin Point. Sites were recorded on the first leg and then checked on the return leg.

The second flight, on 21 March 2003, was from Whakatane to east of Waihi Beach (to the regional boundary) and return. We initially travelled along the coast to Maketu and then inland to Tauranga Harbour and across the Harbour. The route was then up the coast to the regional boundary and then back down the coast to Mauao, out to Motiti Island, back to Maketu, and then along the coast to Whakatane. Flying conditions were calm and clear.

A series of film and digital photographs were also taken along the entire coastline.

5. RESULTS 2003

Maps showing survey coverage and site numbers are presented in Appendix 1. A table summarising observations for each site is presented in Appendix 2. General observations are recorded below for various segments of the Bay of Plenty coastline:

5.1 North of Tauranga Harbour (Sites T13/1 - T13/6)

Overall, this area was one of the worst seen in terms of crown condition. Canopy deterioration was evident over large areas, with local areas of dead pohutukawa. Site T13/1, adjacent to Mataora Bay, was in good condition, in marked contrast to pohutukawa on steep coastal faces to the south.

5.2 Bowentown-Otawa: Adjacent to Tauranga Harbour (Sites T13/7, U13/1-10, U14/1-25)

These are generally small sites on the margins or adjacent to Tauranga Harbour. There is some sign of local canopy 'greying' but it is on a small scale and no sites of concern were seen. The generally good condition of these sites probably reflects the close proximity of residential settlements or dispersed residential development.

5.3 Motiti Island (Site V14/10)

Pohutukawa are present in a narrow strip around the margins of the island. Possums are not present on Motiti and the stands were generally in good condition, with only a few scattered trees having a slightly grey appearance. Motiti was the only offshore island covered in the survey and it was included because it involved little extra flight time and because of the relatively modified character of much of the island (pohutukawa is restricted to a narrow strip on the edge of the island).

5.4 Maketu-Matata (Sites V14/1-9, V15/1-5)

Small stands on the Maketu headland are generally in good condition. There was evidence of visible crown dieback in a small stand (V14/7) between Rogers Beach and Pukehina, probably related to a local shag colony. The narrow strip of pohutukawa between Otamarakau and Matata was in generally good condition, with local evidence of some minor crown deterioration. One site (V15/6) showed evidence of apparent damage from spray drift (unconfirmed).

The relatively large area of indigenous forest that includes the Burt QE2 covenant, Ohinekoao Scenic Reserve, and Matata Scenic Reserve was in generally good condition. Most pohutukawa appeared to be healthy, with some local patches with grey crowns. Some trees were in worse condition and some kamahi dieback was evident at the top of gullies. This is a site that would warrant further monitoring and also discussion with DOC and other landowners to see what possum control has been undertaken or is planned.

5.5 Matata-Whakatane (Site V15/7)

The coastal kanuka stands between the Rangitaiki and Tarawera Rivers appeared to be in good condition despite fragmentation issues.

5.6 Whakatane-Ohope (Sites W15/1-8)

These areas were in generally good condition, apart from a patch of dead/dying mangeao in Kohi Point Scenic Reserve (Site W15/3). The remainder of the reserve was generally in good condition, with only local evidence of canopy ill-health. Possum control has been undertaken in this area and the timing of recent operations should be checked.

Other reserves in this area - Mokorua Bush and Ohope - were in similar condition (possum control is currently underway in Ohope). There was evidence of canopy "greying" throughout Mokorua Bush, with local dieback in Ohope, on the northern and southern sides of the Stock Route.

5.7 Port Ohope-Opotiki (Sites W15/9-21)

There are many stands of pohutukawa in this area, particularly on headlands and islands in Ohiwa Harbour. Pohutukawa crowns were generally in good condition, with only local evidence of canopy opening. On Uretara Island there was some wattle dieback (a common feature as wattle matures) and local deterioration of pohutukawa and puriri crowns. It would be advisable to check the recent history of possum control on Uretara Island as possums have previously caused severe vegetation damage on the island.

Some dead kanuka crowns were evident on Pataua Island - also a common feature as stands mature and undergo self-thinning.

Wattle dieback was also evident on the eastern side of Ohiwa Harbour, in the vicinity of Ruatuna Road and Ohiwa Loop Road. Pohutukawa in the area bounded by Ohiwa Road was generally in good condition, with only local canopy greying, which was similar for small stands on the hill country inland from Waiotahe Beach (the strip of pohutukawa along SH2 was in good condition).

5.8 Opotiki-Motu River (Sites W15/22-23, X15/1-20)

These areas are in generally good condition, although dead trees were common at the base of spurs in site X15/2 - which appeared to be caused by spray damage. Coastal pohutukawa and large tracts of forest immediately

inland from the coast were generally in good condition. There was evidence of local dieback near Opape.

5.9 Motu River-Kereu River (Sites X15/21-37, X14/1-7)

Similar to the Opotiki-Motu River sites. Most sites are in generally good condition, with local evidence of crown deterioration.

5.10 Kereu River-Raukokore River (Sites X14/8-15, Y14/1-11)

Stands of coastal pohutukawa are generally in good condition, with only local evidence of crown deterioration. It is evident though, that there is a slight but consistent deterioration of the canopy of hill country forest, with local crown dieback of pohutukawa and puriri.

5.11 Raukokore River-Whangaparaoa River (Sites Y14/12-28)

There was a noticeable deterioration in canopy condition in this area. Most of the sites with pohutukawa showed signs of canopy damage and puriri was also in poor health in places (e.g. Site Y14/25). The history and current extent of possum control should be checked.

5.12 Whangaparaoa River-Potikirua Road (Sites Y14/29-39)

Most pohutukawa was in reasonable condition although there was noticeable crown deterioration in sites (Y14/29-30) at Cape Runaway and a few of the scattered trees east of Cape Runaway were in poor condition.

6. DISCUSSION

One hundred and seventy-five sites were assessed along more than 220 km of coastline, including two major harbours and an offshore island, in about four hours of flying time. The survey provided a cost-effective rapid overview of the condition of indigenous forest along the entire Bay of Plenty coastline.

This survey was a timely assessment of the condition of indigenous forest along the Bay of Plenty coastline. A previous survey of the entire coastline was undertaken in 1988, with a segment of the eastern Bay of Plenty coast (Otamarakau-Waiotahe) surveyed in the period 1989-91.

It was clearly evident that there are significant issues with possum damage to pohutukawa east of the Raukokore River and also north of Waihi Beach. Smaller scale dieback was also evident west of Matata, between Whakatane and Ohope, and on Uretara Island. Most other sites appeared to be in good condition, although there was local evidence of dieback resulting from probable herbicide application and small scale damage associated with shag colonies. Wattle (*Acacia mearnsii*) dieback was evident adjacent to Ohiwa Harbour and this is a natural process as these stands mature and senesce, hopefully allowing indigenous species to become more prominent in the canopy over time. (It should be noted, however, that wattles regenerate rapidly from a large seed bank and it is difficult for indigenous species to become dominant even when wattles die.) Local mangeao dieback was evident at Kohi Point and this has subsequently been confirmed by a ground inspection (W.B. Shaw pers. obs.).

It is important that the results of this survey are compared with the history and present extent of possum control. There may be sites where dieback was evident but possum control is in progress or has been undertaken recently. There are also likely to be sites where significant damage has just become evident as possum numbers increase.

It will be necessary to undertake ground-based inspection of key areas and sites identified during the survey, particularly north of Waihi Beach and east of the Raukokore River. Environment Bay of Plenty plans to undertake these inspections in early 2004. Aerial surveys should, at least for the next 2-3 years, be undertaken on an annual basis. Depending on survey results, the frequency could then be reduced to, say, a 3-yearly cycle; although sites exhibiting poor canopy condition should be assessed more frequently.

Environment Bay of Plenty plans to undertake surveys of other indigenous forest areas within the Bay of Plenty region during 2004. These include: forest with a pohutukawa element on the margins of the Rotorua Lakes and a more general aerial survey of lowland forest. The latter will require careful planning (and mapping) prior to undertaking any aerial inspections. These surveys should be undertaken using methods and producing outputs similar to this survey.

ACKNOWLEDGMENTS

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REFERENCES

Gardner J.F. and Dick M.A. 2002: The dieback of mangeao (*Litsea calicaris*) in the Bay of Plenty. Unpublished report. New Zealand Forest Research Institute.

Gosling D. and Shaw W.B. 1990: Pohutukawa survey in the eastern Bay of Plenty. *Rotorua Botanical Society Newsletter 21*: 16-17.

Hosking G. 1999: The health of puriri (*Vitex lucens*). *Conservation Advisory Science Notes No. 245*. Department of Conservation, Wellington. 24 pp.

Hosking G.P.; Hutcheson J.A.; Dick M.A. and Herbert J.W. 1989: Conservation of pohutukawa. Regional assessment. Final report. Prepared for Department of Conservation, Wellington. 42 pp.

Appendix 1 Maps Showing Survey Coverage and Site Numbers

Appendix 2 Scores and Observations Recorded for each Survey Site

Key

KUNeri *Kunzea ericoides*, kanuka
LITcal *Litsea calicaris*, mangeao
METexc *Metrosideros excelsa*, pohutukawa
VITluc *Vitex lucens*, puriri
Refer to text for condition scores (1-3)
Refer to Appendix 1 for the locations and extent of each site.

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
T13/1	T13	690 280	1	METexc	Pohoutukawa on the flats on both sides of the Mataora Bay appear healthy.
T13/2	T13/U13	700 255	2-3	METexc	The pohutukawa along these cliffs are in the worst condition of any seen west of Whakatane. A large amount of grey foliage is present with dead trees scattered throughout.
T13/3	T13	696 216	2	METexc	The pohutukawa in this area are all class 2.
T13/4	T13/U13	700 320	1-2	METexc	Most of the pohutukawa along here looks OK, but the frequency of grey crowns needs reassessment in 2004.
T13/5	T13/U13	703 200	2-3	METexc	Pohutukawa in the gullies are showing signs of crown dieback and some of the trees are completely dead, probably possum damage.
T13/6	T13	694 174	1-2	METexc	Most pohutukawa looks OK
T13/7	T13	688 125	1-2	METexc	Most of these pohutukawa appear to be healthy, with a small number showing slightly grey foliage.
U13/1	U13	738 018	1	METexc	Pohutukawa looks good
U13/10	U13	708 001	1-2	METexc	These small patches of pohutukawa are showing signs of a small amount of crown dieback.
U13/2	U13	745 015	1-(2)	METexc	Mostly class 1, a few trees are 2.
U13/3	T13/U13	703 082	1-2	METexc	Most of these pohutukawa look good, with a small number showing slightly grey foliage.
U13/4	U13	725 073	1	METexc	All pohutukawa along the harbour margin are healthy.
U13/5	U13	729 066	1	METexc	All pohutukawa along the harbour margin are healthy.
U13/6	U13	730	1	METexc	All pohutukawa along the harbour margin are

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		051			healthy.
U13/7	U13	708 041	1-2	METexc	These small patches of pohutukawa are showing signs of a small amout of crown dieback.
U13/8	T13/U1	698 039	1-2	METexc	These small patches of pohutukawa are showing signs of a small amout of crown dieback.
U13/9	U13	700 008	1-2	METexc	These small patches of pohutukawa are showing signs of a small amout of crown dieback.
U14/1	U14	778 980	1	METexc	Pohutukawa looks good.
U14/10	U14	820 898	1	METexc	Few scattered pohutukawa, all healthy.
U14/11	U14	855 875	1	METexc	Pohutukawa appear to be healthy.
U14/12	U14	900 924	1	METexc	The pohutukawa on Mauao appears healthy with the notable exception of the area damaged in the 2003 fire.
U14/13	U14	911 914	1	METexc	The pohutukawa on Mt Drury is healthy.
U14/14	U14	913 919	1	METexc	The pohutukawa on Moturiki Island is healthy.
U14/15	U14	921 918	1	METexc	The pohutukawa on Motuotau Island is healthy.
U14/16	U14	894 835	1	METexc	A few scattered pohutukawa around the harbour margins , all look good.
U14/17	U14	896 830	1	METexc	A few scattered pohutukawa around the harbour margins , all look good.
U14/18	U14	891 817	1	METexc	A few scattered pohutukawa around the harbour margins , all look good.
U14/19	U14	909 845	2	METexc	Pohutukawa trees around harboiur margins are mostly healthy, a few scattered trees are showing signs of grey foliage.
U14/2	U14	781 960	1-2	METexc	Pohutukawa generally healthy, some are showing signs of greying foliage.
U14/20	U14	911 824	2	METexc	Pohutukawa trees around harboiur margins are mostly healthy, a few scattered trees are showing signs of grey foliage.
U14/21	U14	925 840	2	METexc	Pohutukawa trees around harboiur margins are mostly healthy, a few scattered trees are showing signs of grey foliage.
U14/22	U14	929 828	2	METexc	Pohutukawa trees around harboiur margins are mostly healthy, a few scattered trees are showing signs of grey foliage.
U14/23	U14	947 835	1	METexc	A single healthy pohutukawa tree.
U14/24	U14	003 796	1	METexc	Small pocket of pohutukawa.
U14/25	U14	873	1	METexc	These few scattered pohutukawa trees on scarp are

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		882			looking healthy.
U14/3	U14	796 952	1	METexc	
U14/4	U14	762 929	1-2	METexc	Pohutukawa generally healthy, some are showing signs of greying foliage.
U14/5	U14	748 921	1	METexc	
U14/6	U14	790 924	1	METexc	Pohutukawa 10m strip around harbour edge, all look very healthy
U14/7	U14	792 919	1	METexc	Few scattered pohutukawa, seem healthy.
U14/8	U14	810 915	1	METexc	Few scattered pohutukawa, all healthy.
U14/9	U14	815 912	1	METexc	Few scattered pohutukawa, all healthy.
V14/1	V14	154 781	1	METexc	Pohutukawa on sea cliffs.
V14/10	V14	130 913	1-2	METexc	Motiti Is. Pohutukawa is present around the island margins and mostly healthy, however a few scattered trees are looking grey.
V14/2	V14	159 782	2	METexc	Most of these pohutukawa look fine, however a small number are class 2.
V14/3	V14	163 775	2	METexc	Most of these pohutukawa look fine, however a small number are class 2.
V14/4	V14	164 770	1	METexc	These pohutukawa all look healthy.
V14/5	V14	157 756	1	METexc	These pohutukawa all look healthy.
V14/6	V14	153 747	1	METexc	These pohutukawa all look healthy.
V14/7	V14	216 724	2-3	METexc	This is a probable shag colony and the crowns of these pohutukawa are showing visible signs of dieback.
V14/8	V14	217 714	1	METexc	These small patches of pohutukawa all look healthy.
V14/9	V14	226 718	1	METexc	These small patches of pohutukawa all look healthy.
V15/1	V15	251 669	1	METexc	These small patches of pohutukawa all look healthy.
V15/2	V15	267 681	1	METexc	The occasional pohutukawa in this area is class 1.
V15/3	V15	298 657	1-2	METexc	This small patch of pohutukawa is class 1-2.
V15/4	V15	340 646	1-(2)	METexc	Pohutukawa along the road on the cliffs look healthy and are mostly class 1 with about 15 trees in class 2.
V15/5	V15	380 620	1-2;(3)	METexc, WEIrac	Most pohutukawa look OK with locally scattered patches of trees with grey crowns. Most of the area

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
					is class 1-2. A few trees are in worse condition (class 3).
V15/6	V15	378 620	2	METexc	Small amount of spray damage on margins.
V15/7	V15	481 595	1	KUNeri	Healthy canopy, although somewhat fragmented.
W15/1	W15	615 508	1-2	METexc	Mokorua SR. Signs of canopy greying throughout.
W15/10	W15	681 491	1	METexc	Ohakana Island
W15/11	W15	682 471	1-2	METexc	Various areas adjacent to Paparoa Road/Ohiwa Harbour.
W15/12	W15	698 473	1-2	METexc	Te Kauri Point, Ohiwa Harbour.
W15/13	W15	718 476	1-2	METexc	Generally good condition.
W15/13 A	W15	716 479	1-(2)	Wattle, METexc	Pohutukawa generally healthy - scored 1 with some class 2. Some dead wattle. North-western point on Uretara Island.
W15/13 B	W15	722 479	2	Wattle, METexc	Some dead wattle and pohutukawa. North-eastern point on Uretara Island.
W15/13 C	W15	721 473	1-2	VITluc	VITluc - dead crowns.
W15/14	W15	717 440	1-2	METexc	A relatively large area on the Hiwarau block, local pohutukawa showing signs of ill-health.
W15/15	W15	729 454	1-2	METexc	Hokianga Island.
W15/16	W15	738 438	1-2	KUNeri	Payaua Island. Local dead KUNeri crowns.
W15/17	W15	749 453	1-(2)	METexc, Wattle	Patchy forest remnants north of Ruatuna Road. Pohutukawa generally healthy - scored 1. Some dead wattle.
W15/18	W15	741 455	2	Wattle	Adjacent to Ohiwa Loop Road.
W15/19	W15	765 478	1-(2)	METexc	Generally 1 but a few 2.
W15/2	W15	626 540	1	METexc	
W15/20	W15	791 481	1-(2)	METexc	1-(2) generally OK though.
W15/21	W15	810 460	1-2	METexc	Generally OK, but very local crown grey.
W15/22	W15	883 470	1-2	METexc	Local METexc 1-2 above scarp.
W15/23	W15	895 475	1-2	METexc	Local METexc 1-2.
W15/3	W15	630	3	LITcal	Dead Crowns - very local LITcal. Rest of Kohi Point

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		536			mainly class 1 with occasional patches of class 2.
W15/4	W15	636 532	1	METexc	West end of Ohope.
W15/5	W15	634 496	1-2	METexc	Southern part of Ohope Scenic Reserve.
W15/6	W15	639 523	1	METexc	Coastal cliffs at Ohope.
W15/7	W15	643 509	1-2	METexc	Local crown dieback, including on south side of road (W15/5).
W15/8	W15	658 513	1	METexc	Coastal cliffs at Ohope.
W15/9	W15	680 501	1-2	METexc	Local dieback only.
X14/1	X14	215 205	1	METexc	Narrow strip adjacent to coast.
X14/10	X14	273 790	2	Various	Adjacent to road.
X14/11	X14	278 807	1	METexc	Narrow strip on coast.
X14/12	X14	284 768	1-2	Various	Class 2 on ridges.
X14/13	X14	291 808	2	METexc	Waikawa
X14/14	X14/Y14	292 780	2	Various	Large area inland from Waikawa Point.
X14/15	X14	298 807	1-2	METexc	Small example adjacent to coast.
X14/2	X14/X15	232 704	1-2	METexc, VITluc, KUNeri	METexc, VITluc, KUNeri (Dieback locally more evident in gullies).
X14/3	X14	241 715	1-2	METexc	Inland from Hariki Beach.
X14/4	X14	227 746	1	METexc	Matakaoa Point, Te Kaha.
X14/5	X14	237 755	1	METexc	Wharekure Point.
X14/6	X14	260 740	1-2	Various	Local dieback but better than previous block to south.
X14/7	X14	252 762	1	METexc	Narrow patchy strip along coast.
X14/8	X14	263 781	1	METexc	Narrow patchy strip along coast.
X14/9	X14	266 795	1	METexc	Narrow patchy strip along coast.
X15/1	X15	914 479	1-2	METexc	Local METexc - generally good but slight greying.
X15/10	X15	030	1	Various	Large area inland from Haurere Point.

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		480			
X15/11	X15	055 510	1-2	Various	Inland from Torere.
X15/12	X15	052 529	1-2	VITluc, METexc	Local VITluc dieback. 4-5 trees class 2. 1 METexc not healthy.
X15/13	X15	076 516	1-(2)	Various	Extensive area between Torere and Hawai.
X15/14	X15	091 549	2	METexc, VITluc	METexc and VITluc not looking good. Also possibly local mahoe.
X15/15	X15	117 552	1-2	Various	North of Hawai River.
X15/16	X15	101 563	1-2	METexc	METexc, VITluc crown dieback.
X15/17	X15	104 579	2	METexc	METexc, VITluc crown dieback.
X15/18	X15	112 588	1-2	METexc	METexc, VITluc crown dieback.
X15/19	X15	126 594	1	METexc	
X15/2	X15	933 466	3	KUNeri?	Dead trees common at base of spurs, appears to be spray damage.
X15/20	X15	138 594	1-2	METexc, VITluc	METexc, VITluc, local unhealthy crowns.
X15/21	X15	139 625	1	METexc	Motu River mouth.
X15/22	X15	149 634	1	METexc	Coastal strip between Tokata Point and Whitianga Bay
X15/23	X15	152 630	2		Whitianga. Species not recorded - check when next assessment made.
X15/24	X15	164 630	1-2	METexc, VITluc	North of Motu River to Omaio.
X15/25	X15	158 646	2	METexc	Coastal strip.
X15/26	X15	162 648	2	METexc	Coastal strip.
X15/27	X15	164 652	1	METexc	Coastal strip.
X15/28	X15	165 659	1	METexc	Coastal strip.
X15/29	X15	167 666	2	METexc	Pokohinu Point
X15/3	X15	934 455	1-2	Various	Manaia
X15/30	X15	185 657	2		Omaio. Species not recorded - check when next assessment made.
X15/31	X15	191 661	2		Omaio. Species not recorded - check when next assessment made.

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
X15/32	X15	195 664	2		Omaio. Species not recorded - check when next assessment made.
X15/33	X15	197 654	1-(2)	METexc, VITluc	Local crown dieback of METexc and VITluc.
X15/34	X15	195 688	1-(2)	METexc	Motunui Island.
X15/35	X15	200 686	2	METexc	Coastal strip.
X15/36	X15	202 695	1	METexc	Coastal strip.
X15/37	X15	208 689	2	METexc	Awanui
X15/4	X15	992 473	1-2	Various	Inland from Opape.
X15/5	X15	989 491	2	METexc	Adjacent to Opape.
X15/6	X15	995 493	1-2	METexc, VITluc	METexc and VITluc patchy in places.
X15/7	X15	005 504	1-2	METexc	4 dead trees.
X15/8	X15	008 490	3		Local dieback. Species not recorded - check when next assessment made.
X15/9	X15	016 503	1-(2)	METexc	Steep coastal face.
Y14/1	Y14	305 806	1	METexc	Small headland west of Whanarua Bay.
Y14/10	Y14	390 817	2	METexc, VITluc	Small remnants on river flats/scarps.
Y14/11	Y14	398 819	2	METexc	Eastern side of Raukokore River.
Y14/12	Y14	405 824	2	Various	Wairuru Stream
Y14/13	Y14	417 827	1		Awaroa Road. Species not recorded - check when next assessment made.
Y14/14	Y14	415 842	2	METexc	Small remnants adjacent to road.
Y14/15	Y14	419 836	1-2		Waiokaha Stream. Species not recorded - check when next assessment made.
Y14/16	Y14	417 848	2		Species not recorded - check when next assessment made.
Y14/17	Y14	397 826	2	KUNeri	KUNeri, locally grey.
Y14/18	Y14	433 823	1-2	Various	Waiokaha Stream
Y14/19	Y14	432 844	2	METexc	Orete
Y14/2	Y14	312	2	Various	West of Whanarua Stream.

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		799			
Y14/20	Y14	443 859	1	METexc	Small remnant, Waihau Bay.
Y14/21	Y14	445 849	2	METexc, VITluc	Waihau Bay
Y14/22	Y14	452 856	2	METexc	Waihau Bay
Y14/23	Y14	463 860	2	METexc	Oruaiti Beach
Y14/24	Y14	470 859	2	METexc	Oruaiti Beach
Y14/25	Y14	487 868	2	METexc, VITluc	Canopy generally grey, obvious crown damage throughout. Local patches / indidivual trees or class 3.
Y14/26	Y14	503 878	2	Various	Otamaroa
Y14/27	Y14	511 898	2	METexc	Whangaparoa
Y14/28	Y14	518 886	2	Various	Whangaparoa, Waitawaka Stream.
Y14/29	Y14	504 941	3	METexc	Cape Runaway
Y14/3	Y14	313 806	2	METexc	West of Whanarua Stream.
Y14/30	Y14	509 932	2	METexc	Class 2 throughout.
Y14/31	Y14	514 939	2-3	METexc	Patchy condition on steep slopes.
Y14/32	Y14	537 935	1-2	METexc	Patches of pohutukawa along coast.
Y14/33	Y14	529 927	1	METexc	Between Ngarue Road and coast.
Y14/34	Y14	536 923	1	Various	Ngarue Road
Y14/35	Y14	553 991	1-2	Various	Adjacent to SH35.
Y14/36	Y14	567 930	1-2	Various	Potikirua
Y14/37	Y14	579 938	1-2	METexc	Dead METexc all along this section of coast. Local Class 3.
Y14/38	Y14	594 933	2	Various	Inland from Potikirua Point.
Y14/39	Y14	588 916	1-2	Various	Potikirua
Y14/4	Y14	326 801	1-2	METexc	Whanarua Bay
Y14/5	Y14	329	2	Various	Inland from Whanarua Bay.

SITE NO.	MAP	GRID REF	SCORE	SPECIES	NOTES
		790			
Y14/6	Y14	355 805	2	METexc	Generally healthy but some local crown dieback.
Y14/7	Y14	334 813	1-2	METexc	Motu Kaimeanui Island.
Y14/8	Y14	358 822	1	METexc	Narrow coastal strip.
Y14/9	Y14	380 790	2	Various	South and west of Raukokore River.

Appendix 3 Selected Site Photos

Plate 1: Site T13/2 - north of Homunga Bay.

Plate 2: Site T13/2 - north of Homunga Bay.

Plate 3: Site T13/4 - north of Waihi Beach.

Plate 4: Site U13/2 - Bowentown Head.

Plate 5: Site U14/12 - Mauao 2003 fire scar.

Plate 6: Site U14/26 - Mauao, eastern flanks

Plate 7: Site U14/13 - Mt Drury, Mt Maunganui.

Plate 8: Site U14/26 - Motiti Island.

Plate 9: Sites V14/3 and V14/4 - Little Waihi.

Plate 10: Site V15/7 - Kanuka forest between the Rangitaiki and Tarawera Rivers.

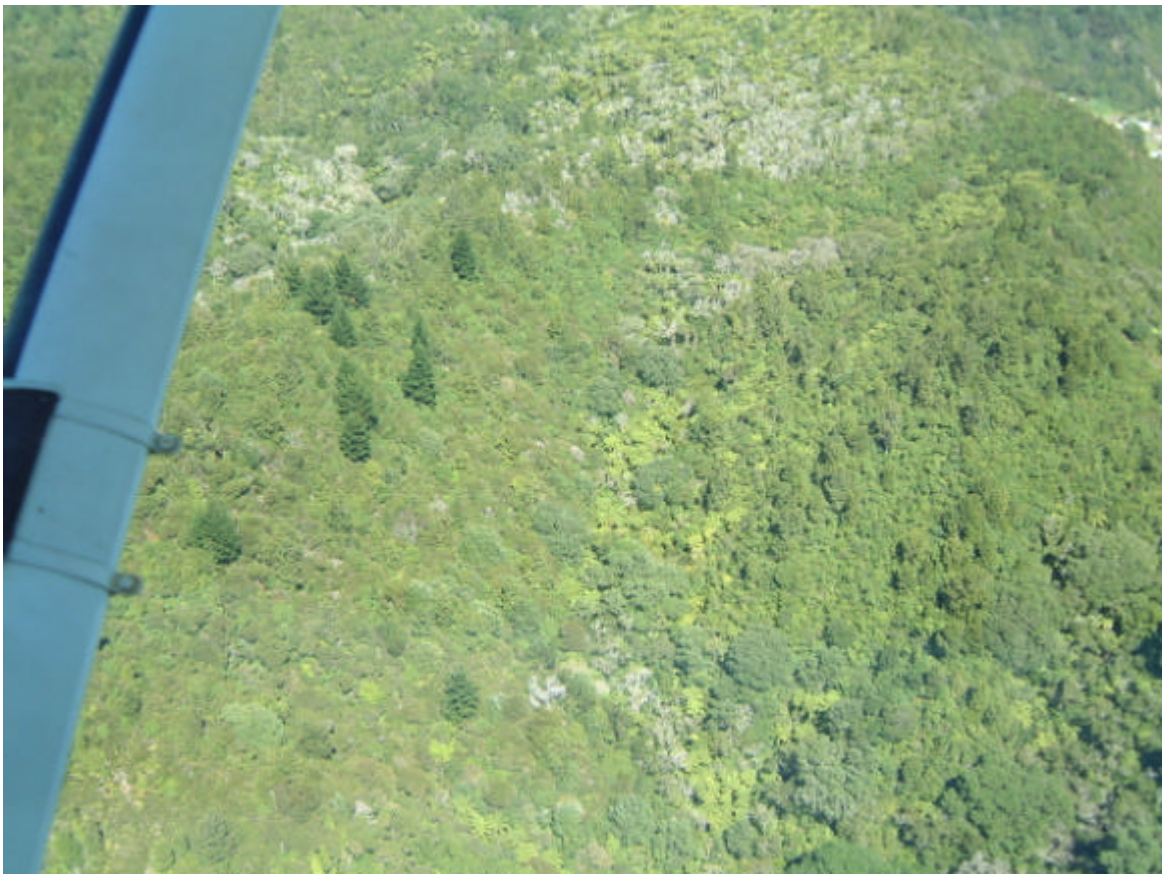

Plate 11: Sites W15/2 and W15/3 - Kohi Point Scenic Reserve.

Plate 12: Site W15/13B - Uretara Island, Ohiwa Harbour. Wattle and pohutukawa

Plate 13: Site W15/13C - Uretara Island, Ohiwa Harbour. Pohutukawa, kanuka, and and puriri.

Plate 14: Sites W15/17 and W15/18 - Ruatuna Road, Ohiwa Harbour.

Plate 15: Site X15/4, East of Hawaii Beach.

Plate 16: Site X15/16 - Maraenui Hill, west of Motu River.

Plate 17: Sites X15/21, X15/22, X15/24 - eastern side of Motu River Mouth

Plate 18: Site Y14/24 - Waihau Bay Motorcamp.

Plate 19: Site Y14/37 - east of Cape Runaway.