Wellington Botanical Society and Te Mārua Bush

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THE BEGINNING: 9 NOVEMBER 1989 TO 1999

This article describes the partnership of Greater Wellington Regional Council (GWRC) and Wellington Botanical Society (WBS), from 1989 to the present, working to restore the ecological health of Te Mārua Bush (TMB), Upper Hutt, in Kaitoke Regional Park, a Key Native Ecosystem. As WBS liaison person since 1990 for matters pertaining to TMB, I was asked by the WBS committee to write an article about it for the Bulletin (sources in Appendix 1).

Figure 1. Te Marua Bush. (1) The original Bush, (2) The first planting—jointly with the Conservation Corps, Upper Hutt Forest and Bird (F&B) members, and local residents, including school children, (3) The first SW extension—planted jointly with F&B, (4) The second SW extension—ex-Transit NZ block, planted jointly with F&B, (5) The NE extension—between Twin Lakes Road and the Pony Paddock, planted jointly with F&B. Photo: Greater Wellington Regional Council.

The story began on 9 November 1989 at Victoria University, where WBS was celebrating its 50th Jubilee, attended by hundreds of people. Addressing

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the Saturday morning seminar, Dr Ian Atkinson, long-term BotSoccer and internationally-known ecologist, presented a paper on the botanical and ecological significance of TMB, which is located in Te Mārua, at the intersection of Twin Lakes Road and State Highway 2 (SH2), Kaitoke Hill Road (Fig. 1).

Ian shared with the audience some extracts from his report written in 1986 on behalf of Botany Division, Department of Scientific and Industrial Research (DSIR): *Expected effects on indigenous vegetation, of proposed re-alignment of State Highway 2 between Te Mārua and Kaitoke.* His report described TMB as "… a closed-canopy, secondary stand of mataī-tōtara forest [on] Heretaunga stony silt loam; 13–16 m high, growing on an old alluvial terrace of the Hutt River. The soils of this site are exceptionally stony. ... Mataī-tōtara forest has not been recognised elsewhere in the Hutt catchment and is now a rare type of forest on a national scale. … Although very small and secondary in origin, [it] is probably replicating the composition of the forest originally present on the site. Such forest would have formerly grown on some of the younger terraces of the Hutt River where stony but otherwise fertile soils predominated. Forests of similar canopy composition are known to have grown extensively on the Canterbury Plains in pre-Polynesian times."

Ian's report recommended that:

1. "The small stand of mataī forest referred to as Te Mārua Bush warrants complete protection no matter what option for re-aligning State Highway 2 is chosen."
2. "The stand of black beech-rimu forest on the Kaitoke Research Farm … should be protected from road works if possible."
3. "With protection of (1) and (2) above, none of the proposed schemes would destroy indigenous vegetation that is not represented elsewhere in the proposed Kaitoke Regional Park and thus the Wellington Ecological District."

THE TMB FOREST REMNANT, PAST AND PRESENT

Describing it as unique in Wellington Ecological District, Ian warned the audience that TMB urgently needed attention from the botanical community. He estimated that some of the mataī trees could be 200-300 years old, and explained that the site itself, still being grazed by stock, was in a dilapidated state and would soon be under immediate threat if the re-routing of SH2 went ahead as planned. Encouraged by the audience's obvious concern, Ian proposed a WBS field trip there as soon as possible so that BotSoccers could see the reserve for themselves and be better prepared to advocate for its protection.

In that era, the main canopy and emergent trees (other than huge sycamores!) in TMB were *Podocarpus totara* (tōtara), *Prumnopitys taxifolia* (mataī), *Nestegis cunninghamii* (maire, black maire), *Kunzea ericoides* agg. (kānuka), and a solitary *Dacrycarpus dacrydioides* (kahikatea). The large, emergent *Plagianthus regius* (mānatu, lowland ribbonwood) died a few years ago, but fortunately its seedlings have survived and are now saplings. *Melicope simplex* (poataniwha) was, and still is, the predominant small tree species in the understorey, along with *Piper excelsum* (kawakawa), *Hedycarya arborea* (porokaiwhiri, pigeonwood), *Geniostoma ligustrifolium* var. *ligustrifolium* (hangehange), and *Coprosma grandifolia* (kānono). In the shrub tier, one *Melicytus micranthus* (swamp māhoe) was a surprise, given the relative dryness of the site, but seedlings later propagated from it in 1998 by Robyn Smith are still thriving. The major lianes were, and still are, *Passiflora tetrandra* (kōhia, New Zealand passion flower), and *Parsonsia heterophylla* (kaihua, New Zealand jasmine). The fern flora was, and still is, represented by about sixteen commonly-occurring Wellington species that can tolerate a fairly dry site; for example, *Cyathea dealbata* (ponga, silver fern) and *Asplenium oblongifolium* (huruhuruwhenua, shining spleenwort). Deep shade cast by the canopy trees is likely to have been a key factor in enabling ferns to survive on the bouldery substrate in the centre of TMB. Overall, other than having grown larger and being much more numerous, the indigenous components of the TMB ecosystem appear much as they were when WBS began working there in 1991 (see Appendix 2). I am not aware of any indigenous species losses. The estimated average canopy height today is 12–16 m.

In 1990 WBS delegated Margaret Aitken, Carol West, Kath Dickinson and me to write a submission on the Kaitoke Hill Road Re-development Environmental Impact Report. To familiarise ourselves with the issues, we first visited the site with Helen Hughes, Parliamentary Commissioner for the Environment, and later attended a special public meeting in Upper Hutt. A synopsis of the submission was featured on the front-page of the January 1991 issue of the WBS Newsletter:

- Preserve at all costs the entire mataī-tōtara grove at grid reference NZMS R26 894 106.
- Significantly upgrade the Wellington-Wairarapa railway, to provide incentives for commuters to use the service.
- Discard the re-routing option.
- Upgrade Kaitoke Hill Road, SH 2, to improve the worst danger spots, with minimal damage to vegetation or disruption to residents in the vicinity.

- Mount an extensive public education campaign to (i) raise consciousness regarding the need for protection of indigenous vegetation and (ii) explain the need to reduce speed in the area.
- Revise the speed limit downwards, over a portion of the road.
- Replant all damaged areas with genetically-appropriate species.

The front page also carried a notification of the first WBS weeding work-bee in TMB on 2 February 1991. For that purpose I had obtained permission from Barry Chalmers, then Recreation Manager, Wellington Regional Council (WRC), for us to remove all weed species, including the huge sycamores, with as little damage to native plants as possible, on the small (0.6 ha) site. On the day, twenty-two WBS members attended (Figs. 2, 3), among them Ian with his chainsaw (Fig. 4), felling and stump-treating the sycamores that had reached the canopy, several of them with a diameter at breast height (d.b.h.) exceeding 30 cm. With us were some Conservation Corps members and interested local residents (Fig. 5). Ian later noted that the tally of volunteer hours worked that day was over 150. We were grateful for the assistance of the WRC ranger, who carried away a huge amount of debris in the ute, a practice that has continued throughout the twenty-two years of our restoration work in TMB.

I informed Barry Chalmers by letter on 4 February 1991 about the success of the work-bee and we agreed that there should be a joint management plan for TMB, so that WBS and WRC could be clear about their respective roles. A visit to TMB was then arranged for the parties to discuss relevant issues in situ. Those attending were Barry Chalmers, we WBS representatives, WRC officer Nigel Clarke, and ranger John Clay.

Figure 2. Ted Williams hauling sycamore branches at the first work-bee.

Figure 3. Dr Isobel Morice removing sycamore debris at the first work-bee.

Figure 4. Dr Ian Atkinson chain-sawing sycamores at the first work-bee.

Figure 5. Conservation Corps member, Joseph, helping with weeding at the first work-bee.

As a result of the meeting, WRC invited WBS to submit a report with recommendations on a weed control strategy for TMB. The report writers were: ecologist Dr Ian Atkinson (DSIR Land Resources, Lower Hutt), Susan Timmins (Plant Ecologist, Department of Conservation, Wellington, and immediate-past president of WBS), and I, newly-elected WBS president. Our finished report, delivered on 12 April, included a list of all the weed species identified on the site: sycamore, tradescantia, holly, hawthorn, old man's beard, Japanese honeysuckle, Franchet cotoneaster, ivy, Portuguese laurel, Himalaya honeysuckle, field bindweed, blackberry, broom, barberry and *Prunus* spp. All indigenous plant species seen in TMB on 2 February were separately recorded, and the following recommendations were made:

- Because of its significant scientific and educational values, Te Mārua Bush warrants protection from the many problem weeds which have invaded it, particularly sycamore and tradescantia.
- Weed control must be carefully planned to maximise its effectiveness.
- The worst weeds should be tackled first.
- Weed control should involve volunteer groups such as WBS, the Conservation Corps, local residents and the local scout group.
- It is vital that there are botanically knowledgeable individuals who know the plants well enough to help other volunteers identify the target plants, thus avoiding loss of native plants during weeding.
- Work parties need to be properly equipped, organised and supervised to ensure a coordinated plan of action.
- Regular follow-up is essential to ensure a successful outcome.

On 6 July 1993, Barry Chalmers responded to our report, apologising for the long delay, and enclosing in table form, a printed programme of suggestions for weed control in TMB, with a proposed time-frame. The letter drew a clear distinction between the respective roles of WBS and WRC, formalising the WRC-WBS cooperative partnership for restoration, within which both organisations still function today:

- WBS's role was to act in a botanical/ecological advisory capacity, using our expertise in plant identification to teach others those skills during weeding work-bees, as well as assisting in a practical, hands-on capacity.
- WRC's role was that of funder and administrator, with personnel and mechanised resources available as of need.
- WRC's Recreation Department's role was to use its mobile resources such as machines, spraying equipment and vehicles, to remove the larger invasive weed trees and the major infestations of weeds; these resources to be available to WBS work parties in TMB.
- Any work in TMB was to be coordinated by the WRC Senior Ranger.

WBS accepted these roles and responsibilities, which are still current.

THE NEED TO EXTEND THE AREA OF TMB

As early as 1993, WBS is on record in the April WBS newsletter advocating for a way to enlarge TMB (Fig. 6), and for a management plan to guide its restoration. To quote from the TMB trip report in that newsletter issue, "At only 0.6 ha., the bush is all too vulnerable." During the winter of 1994, WBS wrote to WRC suggesting fencing small remnants of indigenous vegetation, such as black beech and tōtara, north of TMB. The idea was to protect them from being grazed, and eventually to join them up with the barely-sustainable TMB reserve, but it was not taken up by WRC. In 2002 it was proposed again by landscape architects Clive Anstey and Jennifer Roy, in *Te Marua Development Plans, Kaitoke Regional Park*, but without success. Happily, however, the idea recently resurfaced in 2013, and with the current ranger Steve Edwards in charge, some members of the Upper Hutt Branch of Forest and Bird, assisted by various volunteer groups, are beginning to restore the remnants.

Figure 6. Standing on what was only grass in 1991, but is now a dense community of shrubs and trees, Chris Horne admires several mataī.

THE FIRST PLANTING IN TMB

Long-time BotSoccer Glennis Sheppard remembers the first recorded TMB planting: Arbor Day, 1 June 1994. Glennis recounts that in pouring rain, under an enormous umbrella, Ian Atkinson spoke on behalf of WBS to the group of invited locals, including several parties of school children, emphasising the importance of conserving indigenous ecosystems (Fig. 7). The next speaker was Hon. John Banks, who ceremoniously planted a lancewood (provenance unknown). The rest of us planted 200 seedlings of commonly-occurring indigenous species (also of unknown provenance), in a large bare patch from which an extensive infestation of blackberry had only just been cleared. Even today this former planting can still be clearly recognised because of its lower canopy, in comparison with the surrounding trees.

Figure 7. Ian Atkinson speaking on behalf of Wellington Botanical Society on the first planting day at Te Mārua Bush, 1 June 1994.

I have mentioned provenance above because in these more enlightened times, the provenance of plants for restoration is recognised as a key consideration. For example, in 2005 WBS submitted ten policy recommendations to WRC on the draft Kaitoke Regional Park Management Plan, one of which was that, "... any planting in/around the Bush [TMB], to include only those locally-sourced and locally-appropriate indigenous plant taxa already found in the Bush." This criterion was based on Ian Atkinson's advice at the time that "more information was needed in order to determine whether certain plant species not currently present in the stand, are in fact suitable."

Our next TMB work-bee was three days later and was written up in the August 1994 WBS newsletter: "The highlight of the day was a flying visit from Tony Silbery, who had not seen TMB before. He went into a medium rapture and departed, returning post-haste with fruit of *Ileostylus micranthus* from Upper Hutt's Benge Park. These he smeared, with their own mucilage, on the trunk of one of the many *Melicope simplex* in the Bush (Fig. 8). *Ileostylus* is known to enjoy a piece of *Melicope* real estate in the sun, and thus an instant addition to the species list was made, in the interests of extending the occurrence of this regionally-threatened mistletoe."

The translocation was considered justified because of (1) the short distance between the two reserves (c. 5 km); and (2) the TMB host species being the same as at Benge Park. As at June 2014, the *Ileostylus* branches are over 1 m long, bearing prolific fruit, and the poataniwha host appears to have remained healthy—we inspect both the host and the mistletoe at every work-bee.

Figure 8. Ripe fruit of *Ileostylus micranthus* (pirinoa, small-flowered mistletoe; arrowed) 'planted' on the trunk of a *Melicope simplex* (poataniwha) in Te Mārua Bush, 1994.

UNTOWARD EVENTS

Various forms of vandalism were frequent in this era; in fact TMB was being used as a local tip. Our workload was considerably increased by the need to deal with old fridges and washing machines, along with other obsolete household appliances and large bags of miscellaneous rubbish frequently dumped just inside the reserve, because it was still unfenced. The site remained unfenced for some years until Wellington Conservation Corps completed the job on contract to WRC, under the supervision of their manager at the time, BotSoccer Chris Ferkins.

A further example of lack of respect for the forest remnant confronted us on arrival for one of our work-bees. We were shocked to see that four beautiful, columnar mataī trees each with a d.b.h. of c. 25 cm, growing within 2 m of each other in approximately a square formation, had been used as corner-posts for a tree-hut floor, c. 1.5 m off the ground. Fifteen-centimetre nails had been driven deeply into their trunks to support the floor boards, but the hut had then been abandoned. We reported this illegal activity to WRC, who dismantled the structure, but it was too late to save the trees. Within a year or two they had rotted and collapsed, and it was obvious that the rot had originated from the nail holes.

In the December 1995 WBS newsletter, Ian's trip report mentioned some unfortunate mistakes made in TMB by an inadequately-supervised volunteer group who severed the trunks of several kōhia, native passionfruit, c. 10 cm in diameter, killing them outright. Having attained a diameter of that size, the vines would have been at least 80 years old. Perhaps they were mistaken for *Clematis vitalba* (old man's beard). This incident emphasises the importance of:

- adequate education of the community regarding the special nature of the reserve;
- adequate instruction and strict supervision of any groups of volunteer workers; and
- patrolling the reserve as often as possible.

The above considerations are at least as important today. Community involvement in caring for significant indigenous ecosystems can be very worthwhile but it must be subject to thorough on-site training and supervision because the natural values of the chosen site may otherwise be put at risk.

WBS BECOMES MORE INVOLVED IN DECISIONS ABOUT TMB

In April 1994 WBS was invited to submit comments, through WRC, on plans for re-developing the Te Mārua entrance to Kaitoke Regional Park, so we expressed our support for:

- WRC's plan to shift the existing Twin Lakes Road three metres to the north-west to avoid encroaching on TMB
- WRC's decision to include in the Park the large tōtara near the intersection of Twin Lakes Road and Kaitoke Hill Road/SH2
- WRC's proposal to plant dense buffers of, for example, karamu around the north-west margin to help prevent wind entry, and discourage vandalism such as the dumping of rubbish.

In the same year WBS wrote to WRC asking for an assurance that there would be no alteration to the water-table in the vicinity of TMB attributable to the proposed re-alignment of SH2. This assurance was promptly given.

PEST ANIMAL CONTROL

WBS also took the initiative to request in 1994 that:

- bait stations be installed in TMB, these to be serviced by the ranger
- herbicide sprays be banned in the vicinity because of the known sensitivity of some podocarps, especially kahikatea
- there be only one track in TMB and that it be no wider than that needed for wheelchair use
- there be no entry to, or exit from, TMB via Kaitoke Hill Road/SH2
- seed collection and propagation be started as soon as possible, hopefully involving the local community.

In a letter to Howard Stone, C.E.O. of WRC, WBS repeated its request to Council to install bait stations targeting possums and rodents in TMB, to encourage birdlife, so we were much relieved when this was implemented almost immediately. Before long we were able to report a noticeable increase in native seedlings, especially pigeonwood, *Parsonsia*, mataī and tōtara,

pointing out that this was partly due to pest control and partly to our having significantly reduced the extent of weed infestation. Meanwhile, our bi-annual weeding work-bees continued, but always with fewer participants than desirable.

An exception to this was the work-bee on 11 May 1996, when we had 31 participants! This wonderful result was thanks to Bev Allenson of Forest & Bird (F&B), who had listed the work-bee on the F&B trip programme, and had also notified the Conservation Corps, and Te Mārua residents as well. On the day, work-bee leader Ian Atkinson, who had just returned from presenting papers at international restoration seminars, gave us a briefing, and then it was a hands-on, all-out, weeding effort. Bird song was silenced that day, as chainsaws bit and growled their way through weed trees. Hand-tools levered out roots of *Clematis vitalba*; montbretia was ferociously attacked for the first time ever; trailer-loads of honeysuckle, ivy, broom, barberry, cotoneaster, hawthorn and wild plum were sawn and poisoned; furtive sycamore seedlings were pulled out or poisoned; and carpets of tradescantia were rolled up and heaved over the fence for ranger Mark Watt to take away.

HERBICIDES

WBS has come to accept that because of the extent, density and persistence of some weed infestations in TMB, in some circumstances, a weeding programme would not be possible without the use of herbicides. After recently enquiring (April 2014), I have been informed by GWRC that the following information is now given to contractors carrying out weed control for the Council: "Care must be taken when controlling designated pest plants including application of herbicide and when moving through the operations area, to avoid damage to non-target species both within and outside the operational area."

Following an approach from the Hutt Valley Y.M.C.A. in April 1999, WBS agreed to supply volunteer tutors for a practical, six-day course for their Y.M.C.A. Conservation Corps trainees, to be held in TMB. Ian Atkinson, Chris Horne and I were the tutors. Ian's course outline specified that the following units be covered:

- plant identification
- problem weeds
- weed control
- setting up transects
- monitoring plots
- mapping the forest canopy
- additional topics if time allowed.

The course went very well, enjoyed by students as well as by their volunteer tutors. The students showed their appreciation for the practical skills they had learnt by helping with weeding outside course hours. We tutors enjoyed being able to fill the official tutoring role, as specified by WRC when setting up the original WRC-WBS partnership in 1993.

RE-STOCKING TMB WITH NATIVE PLANT SPECIES

By this time we were realising that unfortunately we had under-estimated the size and rapidity of the weed invasion following the felling of the sycamore trees. The need to re-stock these weedy gaps with selected seedlings had become urgent, so Ian wrote to Barry Chalmers for permission to uplift seedlings from TMB to grow on and plant back when well grown. Permission was gladly given for this purpose, along with a timely reminder from WRC that WBS would need to *take full responsibility for selecting appropriate species for propagation and planting*. However, as we explained to WRC, there were still unanswered questions about who would look after the seedlings while they grew, and where they could be safely stored until big enough to plant out.

In a letter to Howard Stone on 2 May 1999, WBS asked for assistance, explaining, with regret, that we did not have the numbers or the administrative structure to solve TMB's weed problems, and suggesting a meeting to devise a new strategy. Howard's reply on 18 May indicated concern for our predicament, and signalled that more help would be forthcoming from WRC's own Biosecurity team.

Unbeknown to us, in another part of the forest (so to speak), help was on the way, from an unexpected quarter. For some years, F&B had been running a continuous training module in native plant propagation at Rimutaka Prison, to equip pre-release inmates with some practical work-place skills. This innovative programme was progressing very well, until F&B were informed by the prison authorities that the module would have to close down because the prison was about to be much expanded, requiring upgraded security provisions. F&B then took the initiative to obtain permission from Upper Hutt City Council to repair the council's long-disused shade house and begin propagating appropriate plants for existing ecological restoration projects in the district. Permission was eventually granted, and the project was well under way when Nigel Clark, then WRC's Care Programme Coordinator, heard about it and suggested to WRC management that perhaps TMB could be included in this arrangement, thus providing TMB with a serendipitous solution. With keen support from Nigel's colleague, Ross Jackson (then WRC's Project Liaison

Officer), approval was finally gained from WRC management for F&B to be reimbursed out of a separate budget, for compost and plant bags, for Te Mārua Bush seedlings. F&B's propagating and planting work itself was to be entirely voluntary, as was our own TMB weeding work.

F&B JOINS THE TMB TEAM

This was the beginning of a combined WBS-F&B team working together to restore TMB to ecological health. Regular, bi-annual, work-bees continued, jointly now, so instead of just weeding, they were planting-and-weeding work-bees, the plants having been expertly propagated by F&B. Acting in our botanical advisory capacity as required by WRC, we checked that only propagules known to be *indigenous, locally-appropriate, naturally-occurring plant taxa already found in TMB itself and its immediate vicinity* were being used. Since that time, only very few taxa have had to be removed because they did not meet the required set of criteria. *Hoheria populnea* and *Sophora tetraptera* were two of them, with neither taxon occurring naturally in TMB or Wellington Ecological District.

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Meanwhile there were legal matters stirring. As an affected party, WBS was notified by letter in February 2000 of an appeal under Section 174 of the Resource Management Act by Upper Hutt City Council against Transit NZ, because Transit NZ had failed to take into account, or appropriately avoid, remedy or mitigate, the adverse environmental effects of the re-alignment of Kaitoke Hill Road.

Although significant gains regarding protection of TMB (especially the retention of the huge tōtara in the north-east corner) were later won in the Environment Court, some of the mitigation did not materialise on the ground. The tōtara was saved, but one of its huge limbs was removed, and there was significant damage to TMB's roadside vegetation on the east side.

Susan Edwards (then WRC's Manager, Parks and Forests, Strategy and Planning) gave us the good news on 8 March 2001 that TMB restoration would be included as a specific item in their annual budget. This made it easier for WBS to plan further ahead and make recommendations, such as WRC hiring a contractor to deal with occasional, otherwise-intractable problems. As before, all financial transactions continued to be officially authorised through WRC's accounting system, a highly satisfactory arrangement.

WBS submitted on the Te Mārua Development Plan in September 2002, expressing opposition to the proposed construction of a stone wall around the perimeter of TMB as if it were a landscaping entity, not a genuine

forest remnant. Instead, we recommended bulking up closely-planted, eco-sourced native shrubs to make a more natural boundary.

In 2003, Wellington Regional Council was re-branded as Greater Wellington Regional Council (GWRC).

In December 2004, during Joyce Stretton's presidency, WBS submitted ten recommendations to the draft Management Plan for Kaitoke Regional Park (Te Mārua Bush in particular) that:

- The existing joint management agreement begun in 1990 between Wellington Botanical Society Inc. and Greater Wellington Regional Council continue.
- Te Mārua Bush continue to be managed as an indigenous forest remnant, and not as a landscaped entity as suggested by the consultant.
- An ecological study be done to determine whether any plant taxa not currently present in Te Mārua Bush are appropriate for introduction to it; meanwhile, any planting in/around it to include only those locally-sourced and locally-appropriate indigenous plant taxa already found there.
- Te Mārua Bush be monitored yearly by an appropriately-qualified botanist or ecologist who shall report on its health to the Manager, Parks and Forests Division, GWRC, according to criteria agreed by GWRC and WBS.
- Because of its barely sustainable size, and its high edge-to-mass ratio, every possible opportunity be taken to extend the Bush by appropriate planting.
- Removal of any indigenous plant material from the Bush be by only those persons with a current GWRC collection permit.
- Any work undertaken in TMB be authorised in advance by GWRC and/or WBS, as appropriate.
- A notice describing the significance of TMB be erected nearby, specifying that it is an offence to deposit rubbish there.
- In addition to the bi-annual work-bees, weed and pest plant control be contracted out as of need.
- GWRC maintain and monitor pest-animal control in TMB.

In December 2004, with WBS's agreement, TMB was the subject of an article in a GWRC publication: *Protecting Your Bush Block, a guide to looking after indigenous forest remnants in the Wellington Region.* The article, *A Partnership For Protection*, was compiled by a writer on contract and was based largely on material supplied by WBS. It was particularly useful in that it publicised WBS as a good example of an appropriately-qualified volunteer group taking official responsibility for assisting in the restoration of a significant, indigenous forest remnant.

A LAND-SWAP PROPOSAL

On 8 May 2006, an on-site meeting of representatives of Transit NZ, GWRC, and WBS (which I represented), met to discuss a proposed land-swap as part of mitigation for the harmful impacts of the re-routing of SH2. Because Transit NZ had already taken over a strip of land on TMB's eastern boundary, they were offering GWRC in exchange the Transit NZ-owned triangle of land to the south, at the intersection of Twin Lakes Road and SH2 (Fig. 1). A well-drained site under rough pasture grasses, c. 60 m long, it tapers north-south, from 42 m to 19 m across, and is dominated by a large tōtara. This offer was proposed as utu for loss of land, as well as for damage and disruption to the vegetation on TMB's eastern side. The deal had been formally written-up on paper in principle, so the reason for our meeting was to do a walk-over, confirming on the ground, the terms of the proposed swap, accepted by GWRC. During the on-site discussion, Transit NZ agreed that:

- the area would be sprayed and ripped
- the remains of the 3 m × 3 m concrete slab (formerly the floor of the old cowshed!), beside the sole kahikatea, would be removed
- fencing, temporarily removed from the east side, would be replaced by the end of the year, and
- a new, lockable swing-gate would be provided so that WBS weeders and F&B planters would no longer have to climb the fence in order to work.

In addition we were invited to help ourselves to a huge pile of left-over mulch, a valuable addition to the very poor soil which covered most of the new site (Fig. 9).

On 22 August, as reported in the WBS newsletter of September 2006, we had our first planting work-bee there, made feasible by the new, stock-proof fence. Below is a list of the plant species sourced from TMB, which Ian and I had earlier recommended for propagating and planting in this southern extension:

Aristotelia serrata	makomako	wineberry
Coprosma robusta	karamu	karamu
Hedycarya arborea	porokaiwhiri	pigeonwood
Myrsine australis	māpou	māpou
Nestegis cunninghamii	maire	black maire
Pennantia corymbosa	kaikōmako	kaikōmako
Plagianthus regius	mānatu	lowland ribbonwood
Podocarpus tōtara	tōtara	tōtara
Prumnopitys taxifolia	mataī	mataī

Figure 9. Sue Millar bucketing mulch from the mound christened "Mt Te Mārua" for planting the southern extension, August 2008.

On the day, two hundred, light-tolerant, hardy, well-grown plants propagated by F&B, plus some young tōtara, sourced from inside the original bush and propagated by ranger Steve Edwards, awaited the spades and grubbers of our team of twelve WBS and F&B members. We were grateful that ranger Mark McAlpine volunteered his help as well, because massive piles of road-surfacing material and a fleet of huge, earth-moving, road-making vehicles had been stored there every night throughout winter, consolidating the substrate.

As we planted, in rank, waist-high grass, we had our first view of the impressive information board installed by GWRC to mark the beginning of this newly-developed southern entrance to Kaitoke Regional Park, to which our work had contributed. We were very pleased to see that it acknowledged WBS's help in ensuring the sustainability of the small but highly significant TMB reserve.

THE NORTHERN EXTENSION

On 14 June 2008, following ranger Steve Edwards' excellent suggestion to plant the c. 150 m × 2.5 m newly-fenced strip running northeast alongside Twin Lakes Road from TMB and christened the northern extension (Fig. 1), we had our first planting work-bee there. Together with the southern extension, this acquisition almost doubled our work area, from 0.6 ha to 1.1 ha. Since we were still heavily involved in bulking-up the planting on the southern extension, we had to reduce the time spent on that, and

concentrate on planting the northern extension, which fortunately had been ripped in preparation. We were grateful that Steve had been skilfully wielding GWRC's post-hole borer on the site, saving us from having to dig hundreds of holes.

On our next northern extension work-bee we were disappointed to find that rabbits and hares had seriously damaged the plantings, something we had never experienced on the original site. As a result, F&B bought "hare nets" from their share of the GWRC budget allocated to TMB, and secured them around the lower trunks of the newly-planted palatable species. These included: karamu, koromiko, tī kōuka, mānatu, black maire, white maire, five-finger and pigeonwood. F&B's Sue Millar recently observed that simply leaving tall, dense tufts of grass growing tightly around the plants has subsequently been just as successful in deterring both rabbits and hares, a useful, cost-saving solution for future use. Six years later, at the time of writing (June 2014), the plants along this strip are thriving, have at least doubled their height and have overtopped the fence.

ANOTHER EXTENSION FOR TMB

To increase the size of TMB, and thus improve its long-term sustainability, GWRC are fencing off 135 square metres of rough pasture (currently part of the contiguous pony paddock), as a northeastern extension for TMB. It will share a boundary with part of TMB's existing northern boundary, and will also extend alongside Kaitoke Hill Road/SH2. In shape it is roughly a slender triangle. It has already been retired from grazing for some months, and will provide a significantly large space for seedlings and future plantings to colonise. The first WBS planting work-bee there will be in autumn next year. This area includes some planted mānuka, a species not naturally present in TMB. The plants were sourced from nearby Kaitoke Hill.

SOME OF THE CHALLENGES OF TMB

The stock-proof fencing of the whole 1.1 ha reserve has only slightly reduced the incidence of vandalism and littering. People continue to throw rubbish from their cars and dump their garden waste, especially on the SH2 side. Planted TMB trees have also been stolen from that area, and a second "occupation" in the form of a tent camp was discovered there in the prolonged summer of 2009–2010, during one of our work-bees. We found that illegal campers had suspended a 4 m × 4 m awning between several healthy mataī, hammering 100 mm nails into the trunks to secure the guy ropes. Some of these beautiful trees, with a d.b.h. of c. 25 cm representing many decades of growth, had also been disfigured by graffiti. The camp was 'furnished' as a lounge, complete with a rock fireplace, a table, armchairs,

a couch, and of course, dozens of empties. After photographing and then dismantling everything for the ranger to take to the local tip, we applied 'bush first aid' (vaseline) to the nail holes, fervently hoping that the damage would not be fatal, and fortunately the mataī have survived. Although we reported the camp to the local police and to GWRC, we received no feedback about who might have been responsible for it.

Among such adverse events, snowfall, a natural but very unusual event in Wellington, caused considerable damage to TMB in June 2011. The solitary kahikatea lost its crown, a large old emergent kānuka was toppled and many canopy trees lost substantial branches, broken by the weight of snow. The solitary kahikatea has recovered, as have the other trees which lost biomass, but unfortunately these losses in the canopy have opened up more light gaps, providing new opportunities for weed seeds to germinate in the interior of the reserve, previously reasonably weed-free.

F&B and WBS have now enjoyed fifteen years of active partnership to restore the ecological health of TMB, during which the bi-annual work-bees have continued throughout, though numbers attending have always been too small to be effective in keeping TMB weed-free. Fortunately, communication between WBS and GWRC has always been free-flowing, the rangers being a frequent point of contact, ensuring that any vehicles which might be needed would be available, and that a staff member would be on hand if required. In recent years, TMB work-bee dates have been arranged by WBS committee member Sunita Singh, who organises the trip programme. F&B's Sue Millar, Glennis and Allan Sheppard have sourced, propagated and supplied the plants (now totalling well over two and a half thousand), taking turns to lead the work-bees, and to author or co-author informal TMB work-bee reports for the WBS newsletter. These reports, by a variety of authors, have been a feature of the WBS newsletter since April 1991.

Other challenges:

- Concentrating on the two new areas of planting has left much less time for weeding, and our small work-bee numbers have been unable to keep up with the task. However, now that there is much less need for planting in the original reserve and its two extensions, this should leave more time for weeding, which was our original commitment agreed to in 1993.
- Time and expertise need to be available on work-bee days for shared discussion and decision-making on priorities for the day.
- Some form of regular surveillance is needed to prevent or deal with occasional untoward events in TMB, such as those reported above.

- There have been incidents when lack of supervision and/or training has resulted in unacceptable damage in TMB. If community groups are to be involved in TMB, they need supervision and training.
- Weed vines that have climbed into the canopy, for example, Japanese honeysuckle (*Lonicera japonica*) and Chilean flame creeper (*Tropaeolum speciosum*) sometimes escape notice during the course of WBS work-bees, unless they happen to be in flower and are dropping petals.
- Since the re-alignment of Kaitoke Hill Road/SH2 in 2006**,** the eastern side of the original reserve has become infested with assorted rank grasses, montbretia, wall lettuce, foxglove, radish and turnip, convolvulus, Scotch thistle, dock, broom, celandine, etc. Rubbish, especially garden rubbish containing weeds and other unwanted taxa such as garden discards, is a continuing problem on the same side.
- Rank grasses, ivy, tradescantia, broom and blackberry invade the northern boundary from the contiguous pony paddock, leased by GWRC to the Te Mārua Pony Club. Piles of pony turds, 'weed bombs' as I call them, are occasionally thrown into the reserve, possibly with generous intentions, but they are loaded with weed seeds which of course germinate and spread rapidly before the next work-bee. Their gratis fertility does not compensate for the effort involved in having to return these 'gifts' to their donors.
- It is possible that climate warming will bring challenges to the survival of TMB.

CLIMATE WARMING AND TMB

With climate warming, I believe WBS can expect that TMB, on its elevated, bouldery, well-drained, former river terrace, may experience increased drying-out. This may mean that eventually some susceptible taxa will be lost. However, higher rainfall and increased frost conditions may also pertain, so it would be unwise to speculate further, other than to say that WBS may need to investigate ways to respond appropriately to TMB's changing needs. The following excerpts are from an unpublished internal GWRC report, reproduced here with permission: "Wellington region's unique indigenous biodiversity (assemblage of plants and animals) exists here because each species has adapted over time to the local environmental conditions (e.g., climate, soils, topography). Accelerated climate change over the next 100 years is likely to alter some of the fundamental drivers of species distribution in the Wellington region – for example, predominant wind direction, rainfall intensity, average temperatures and extreme temperatures." "… average air temperature is predicted to warm by 2.1

degrees by 2090, … and heavy rainfall events to become more frequent. However, the key conclusion to draw from the existing climate-change impact predictions is that climate-change is occurring and the effects are being seen at global, national and regional scales. Climate-change affects biodiversity directly by altering the physical conditions to which species are adapted."

RECENT CHANGES AT GWRC AFFECTING TMB

Until 2012, as the designated liaison person between WBS and GWRC on matters pertaining to TMB, I used to email a report on each work-bee to Philippa Crisp, Senior Policy Adviser, Parks and Planning. Under the new system (i.e., since GWRC's restructuring), I email the work-bee reports to Kim Broad, one of five GWRC Biodiversity Coordinators, and our WBS contact on matters pertaining to TMB. A copy also goes to WBS Secretary Barbara Clark for circulation to the WBS committee.

Any issues which need to be discussed will now be notified to, or by, Kim, and can become the subject of a meeting if needed. In 2008, under the old system, concerned about the apparent decline in health of some of the *Nestegis cunninghamii* (black maire) just inside TMB's western boundary fence, I referred the matter to the ranger, who kept them under periodic observation for several summers until they recovered. Under the new system, the matter would in the first instance, be reported to Kim. Similarly, in 2011 the matter of a contractor inadvertently causing spray damage to some planted shrubs and a mature black maire just inside the western boundary fence, which I reported to the ranger at the time, would now be reported to Kim instead. Another recent change is that ranger Steve Edwards is to be the contact person regarding arranging WBS-F&B work-bees.

TMB lies within, and is part of, Kaitoke Regional Park, which is a Key Native Ecosystem (KNE). Each regional park now comes under the over-arching GWRC Biodiversity Strategy, 2011–2021, which provides a common focus across all the council's departments, and guides activities relating to biodiversity. One of the strategy's goals is to protect high-value biodiversity areas from threats, including pest animals, pest plants and other weed species.

Whereas each regional park used to have its own Management Plan, it now has its own Biodiversity Plan instead. These plans have currently (May-June 2014) been circulated to interest groups for discussion and comment. Along with other interest groups, WBS was represented at a small meeting at GWRC's Upper Hutt depot, convened to discuss the draft biodiversity

plans for Kaitoke Regional Park, Pakuratahi Forest and the Hutt Water Collection Area. Copies of information about the draft KNE programme were also distributed.

The new plans are a product of the GWRC Biodiversity Department. Funding for TMB now comes from the Biodiversity Department's KNE programme.

After consulting the committee and interested WBS members, Bev Abbott (WBS submissions coordinator) submitted at the end of May 2014 on the draft plan for Kaitoke Regional Park, which includes TMB. It contained a statement of our commitment to continue in our current role for the duration of the plan; that is, to:

- run two TMB weeding work-bees per year;
- encourage members to participate; and
- provide expert botanical advice on forest health and the selection of taxa for planting.

Our submission also suggested that TMB is such a significant forest remnant that it should be subject to regular monitoring and recording of changes in its composition and structure.

MONITORING KNES

GWRC is developing a programme of monitoring to measure the outcomes of the KNE programme as a whole. Any concerns observed by GWRC regarding the health of the TMB ecosystem will be notified to WBS. TMB will also be annually inspected to assess the results of what are referred to as 'operational activities', such as pest control.

We look forward to more years of the privilege of caring for the special remnant of indigenous environmental heritage that is TMB, in partnership with GWRC's Biodiversity Team and F&B.

ACKNOWLEDGEMENTS

Sincere thanks to: all those who have so staunchly participated over the years in WBS-F&B workbees in TMB; GWRC staff, who have always been ready with assistance in various forms; and Chris Horne, Editor, WBS newsletter, which has been an invaluable source of information.

APPENDIX 1: SOURCES OF INFORMATION

- Personal recollections; participation in work-bees; 35 mm slides.
- Informal notes of meetings; personal telephone conversations with Sue Millar, Glennis and Allan Sheppard, and Kim Broad.
- Personal and WBS correspondence to/from WRC/GWRC, 1999 – present.
- Personal emails to/from GWRC and WRC, 1990s – present.
- *Te Mārua Development Plans.* Kaitoke Regional Park. GWRC. 2002.
- *Managing Your Bush Block. A guide to looking after indigenous forest remnants in the Wellington Region.* GWRC. 2004.
- *Wellington Botanical Society Newsletter.* October 1991 – present.
- Short reports to GWRC on Te Mārua Bush work-bees, 2007 – present.
- GWRC Biodiversity Strategy, 2011–2021.
- GWRC Biodiversity Department, excerpts from an unpublished paper on climate change; with permission per Kim Broad.

APPENDIX 2: SPECIES LIST FOR TE MĀRUA BUSH, KAITOKE REGIONAL PARK, UPPER HUTT

The TMB species list, like all species lists, is considered temporary. Although it has always been made available at work-bees, there has never been time available for updating it. On 31 December 2013, Chris Horne, Jeremy Rolfe and I spent a few hours on site with a view to doing that, but in the time available, all we managed to do as we waded through the dense, waist-high grass in high heat was to add twenty-one adventive taxa to the already extensive list of adventives in the southern extension.

Maps: NZTopo50-BP32 Paraparaumu, centred on grid reference 79324895; NZMS 260 R26 Paraparaumu, centred on grid reference 893106.

Catchment: Hutt River.

Elevation: c. 100 m above sea level.

Landform: river terrace, between the Hutt River and "Collins Stream", a true right tributary of the Mangaroa River.

Area: forest remnant—1.1 ha, including a northern and a southern extension, both fenced and planted between 1999 and 2013.

Geology: Upper Quaternary, Castlecliffian Stage, sedimentary rocks: terrace gravels deeply weathered, but still intact; includes early glaciation deposits. *NZ Geological Survey, Sheet 12, Wellington. 1:250,000, 1st edition.* D.S.I.R. 1967.

Soils: Heretaunga stony silt loam (Ian Atkinson pers. comm.). Greywacke gravels with interstitial and covering silts, etc., of similar composition,

mainly alluvial (undifferentiated). *NZ Soil Bureau Map 106/1. 1:1,000,000.* D.S.I.R. 1973.

Aspect: southwest; virtually flat.

Rainfall: 12-year average: 1756 mm (rain gauge at Te Mārua Treatment Plant).

Ecological District: Wellington Ecological District 39.01.

Forest classification: mataī-tōtara-black maire.

Status: Scenic Reserve; Key Native Ecosystem.

Tenure: Greater Wellington Regional Council (GWRC).

Management: Part of Kaitoke Regional Park; managed by GWRC since 1988, in partnership with Wellington Botanical Society. Over the period 1999 to the present, Upper Hutt Branch, Royal Forest and Bird Protection Society and Wellington Botanical Society have conducted bi-annual weeding and planting working bees in the remnant forest, including, in more recent years, two extensions, fenced to exclude stock. These have been planted with material eco-sourced from Te Mārua Bush and its immediate vicinity.

Fencing: stock-proof since 2008.

Pest control: GWRC maintains possum and rodent bait stations in the forest remnant, and employs contractors to fell, spray, or eradicate pest-plants and other weeds.

Lists compiled by Wellington Botanical Society; latest additions, 31/12/2013.

Abbreviations:
(P) = planted
sp. = species
subsp. = subspecies
var. = variety
# = indigenous to New Zealand but not naturally occurring in Wellington Ecological District 39.01

List 1: Indigenous Vascular Plants

BOTANICAL NAME	MĀORI NAME	COMMON NAME
Gymnosperm trees		
Dacrycarpus dacrydioides	kahikatea	kahikatea
Podocarpus totara	tōtara	tōtara
Prumnopitys ferruginea (P)	miro	miro
Prumnopitys taxifolia	mataī	mataī

BOTANICAL NAME	MĀORI NAME	COMMON NAME
Monocotyledonous trees		
Cordyline australis	tī kōuka	cabbage tree
Dicotyledonous trees and shrubs		
Alectryon excelsus subsp. *excelsus*	tītoki	tītoki
Aristotelia serrata	makomako	wineberry
Brachyglottis repanda	rangiora	rangiora
Beilschmiedia tawa	tawa	tawa
Coprosma grandifolia	kanono	kanono
Coprosma rhamnoides		a coprosma sp.
Coprosma rigida		a coprosma sp.
Coprosma robusta	karamu	karamu
Coprosma rotundifolia		round-leaved coprosma
Elaeocarpus dentatus	hīnau	hīnau
Geniostoma ligustrifolium var. *ligustrifolium*	hangehange	hangehange
Hebe stricta (P)	koromiko	koromiko
Hedycarya arborea	porokaiwhiri	pigeonwood
# Hoheria populnea	houhere	a lacebark sp.
Ileostylus micranthus (P)	pirinoa	small-flowered mistletoe
Kunzea ericoides agg.	kānuka	kānuka
Lophomyrtus obcordata	rōhutu	NZ myrtle
Melicope simplex	poataniwha	poataniwha
Melicytus micranthus	manakura	swamp māhoe
Melicytus ramiflorus subsp. *ramiflorus*	māhoe	māhoe
Myrsine australis	māpou	māpou
Myrsine salicina	toro	toro
Nestegis cunninghamii	maire	black maire
Nestegis lanceolata	maire	white maire
Pennantia corymbosa	kaikōmako	kaikōmako
Piper excelsum subsp. *excelsum*	kawakawa	kawakawa
# Pittosporum crassifolium	karo	karo
Pittosporum eugenioides	tarata	lemonwood
Pittosporum tenuifolium	kōhuhu	kōhuhu
Plagianthus regius subsp. *regius*	mānatu	lowland ribbonwood
Pseudopanax arboreus	whauwhaupaku	five-finger
Pseudopanax crassifolius	horoeka	lancewood
Solanum laciniatum	poroporo	poroporo
Monocotyledonous lianes		
Ripogonum scandens	kareao	supplejack

BOTANICAL NAME	MĀORI NAME	COMMON NAME
Dicotyledonous lianes		
Clematis foetida	pikiarero	a clematis sp.
Metrosideros diffusa	rātā	white rātā
Muehlenbeckia australis agg.	pōhuehue	pōhuehue
Parsonsia heterophylla	kaiwhiria	a parsonsia sp.
Passiflora tetrandra	kōhia	NZ passionfruit
Rubus schmidelioides agg.	tātarāmoa	bush lawyer
Ferns		
Asplenium bulbiferum	manamana	hen & chickens fern
Asplenium flaccidum	makawe-o-Raukatauri	hanging spleenwort
Asplenium hookerianum var. *hookerianum*		Hooker's spleenwort
Asplenium oblongifolium	huruhuru whenua	shining spleenwort
Asplenium polyodon	petako	sickle spleenwort
Blechnum novae-zelandiae	kiokio	kiokio
Cyathea dealbata	ponga	silver fern
Dicksonia squarrosa	whekī	whekī
Hymenophyllum demissum	irirangi	drooping filmy fern
Hymenophyllum dilatatum	matua mauku	
Hymenophyllum sanguinolentum	piripiri	scented fern
Hymenophyllum scabrum	mauku	rough filmy fern
Microsorum pustulatum subsp. *pustulatum*	kōwaowao	hound's tongue fern
Pellaea rotundifolia	tarawera	round-leaved fern
Polystichum neozelandicum × *P. vestitum*		a polystichum hybrid
Polystichum sp.	pikopiko	shield fern
Pyrrosia eleagnifolia	ota	leather-leaf fern
Orchids		
Dendrobium cunninghamii	winika	winika
Earina mucronata	peka-a-waka	Spring orchid
Pterostylis banksii agg.	tutukiwi	a greenhood sp.
Grasses		
Austroderia fulvida (P)	toetoe	toetoe
Microlaena stipoides	pātītī	meadow rice grass
Sedges		
Carex sp.		a carex sp.
Uncinia uncinata	matau-a-Māui	a hooked sedge sp.

BOTANICAL NAME	MĀORI NAME	COMMON NAME
Dicotyledonous herbaceous plants, other than composites		
Cardamine sp.	panapana	NZ bitter cress
Hydrocotyle sp.		a pennywort sp.
Stellaria parviflora	kohukohu	NZ chickweed

Note: no indigenous rushes, monocotyledonous herbaceous plants, or composite herbaceous plants have been recorded.

List 2: Adventive Vascular Plants

BOTANICAL NAME	COMMON NAME
Dicotyledonous trees and shrubs	
Acer pseudoplatanus	sycamore
Banksia integrifolia	coastal banksia
Berberis darwinii	Darwin's barberry
Cotoneaster sp.	a cotoneaster sp.
Crataegus monogyna	hawthorn
Cytisus scoparius	Scotch broom
Genista (*Teline*) *monspessulana*	Montpellier broom
Hypericum androsaemum	tutsan
Ilex aquifolium	English holly
Leycesteria formosa	Himalaya honeysuckle
Prunus campanulata	wild cherry
Prunus lusitanica	Portuguese laurel
Prunus sp.	a wild plum species
Rosa rubiginosa	sweet brier
Sambucus nigra	elderberry
Syzygium australe	brush cherry
Ulex europaeus	gorse
Monocotyledonous lianes	
Asparagus scandens	climbing asparagus
Dicotyledonous lianes	
Clematis vitalba	old man's beard
Convolvulus arvensis	field bindweed
Hedera helix subsp. *helix*	English ivy
Lonicera japonica	Japanese honeysuckle
Rubus fruticosus agg.	blackberry
Rubus laciniatus	cut-leaved blackberry
Tropaeolum speciosum	Chilean flame creeper

BOTANICAL NAME	COMMON NAME
Grasses	
Agrostis capillaris	browntop
Anthoxanthum odoratum	sweet vernal
Dactylis glomerata	cocksfoot
Ehrharta erecta	veld grass
Holcus lanatus	Yorkshire fog
Lolium perenne	perennial rye grass
Schedonorus arundinaceus	tall fescue
Rushes	
Juncus effusus	soft rush
Monocotyledonous herbaceous plants, other than orchids, grasses, sedges, rushes	
Allium triquetrum	onion weed
Arum italicum	arum lily
Crocosmia ×crocosmiiflora	montbretia
Iris foetidissima	stinking iris
Tradescantia fluminensis	wandering willie
Composite herbaceous plants	
Achillea millefolium	common yarrow
Bellis perennis	English daisy
Cirsium vulgare	kotimana, Scotch thistle
Crepis capillaris	hawksbeard
Hypopchaeris radicata	catsear
Jacobaea vulgaris	ragwort
Lactuca serriola	prickly lettuce
Leontodon taraxacoides	hawkbit
Leucanthemum vulgare	oxeye daisy
Mycelis muralis	wall lettuce
Sonchus oleraceus	pūha
Dicotyledonous herbaceous plants, other than composites	
Anagallis arvensis var. *arvensis*	scarlet pimpernel
Brassica rapa subsp. *sylvestris*	wild turnip
Conium maculatum	hemlock
Digitalis purpurea	foxglove
Euphorbia peplus	milkweed
Foeniculum vulgare	fennel
Fragaria vesca	wild strawberry
Fumaria muralis	scrambling fumitory
Galium aparine	cleavers

BOTANICAL NAME	COMMON NAME
Geranium molle	dove's-foot cranesbill
Hypericum perforatum	a St. John's wort sp.
Linaria purpurea	purple linaria
Linum bienne	pale flax
Lotus pedunculatus	birdsfoot trefoil
Myosotis arvensis	field forget-me-not
Plantago lanceolata	narrow-leaved plantain
Prunella vulgaris	self-heal
Ranunculus ficaria	celandine
Ranunculus repens	creeping buttercup
Raphanus raphanistrum ssp. *raphanistrum*	wild radish
Rumex acetosella	sheep's sorrel
Rumex obtusifolius	broad-leaved dock
Silene gallica	catchfly
Solanum nigrum	black nightshade
Solanum pseudocapsicum	Jerusalem cherry
Stachys arvensis	staggerweed
Stellaria media	chickweed
Trifolium pratense	red clover
Trifolium repens	white clover
Vicia sativa	vetch

Note: no adventive ferns, orchids, or sedges have been recorded.

List 3: Indigenous birds heard/seen in Te Mārua Bush

Cyanoramphus sp.	kākāriki	kākāriki
Gerygone igata	riroriro	grey warbler
Hemiphaga novaeseelandiae novaeseelandiae	kererū	NZ pigeon
Prosthemadera novaeseelandiae novaeseelandiae	tūī	tūī
Rhipidura fuliginosa placabilis	pīwaiwaka	North Island fantail
Zosterops lateralis	tauhou	waxeye

List 4: Adventive birds heard/seen in Te Mārua Bush

Fringilla coelebs	chaffinch
Platycercus elegans	eastern rosella
Turdus merula	blackbird

List 5: Other indigenous biota

Oligosoma polychroma	common skink
Wainuia sp.	a landsnail sp.