

The Domain, a cloud forest of Tutamoe

Marley Ford

Introduction

The Domain is a 4.18 ha forest remnant surrounded by farmland, south of the Waipoua Forest, Northland, the North Island of New Zealand (Figs. 1, 2). Its vegetation composition was surveyed from 22 September 2020 – 29 April 2021 as part of a master's study by the author (Ford 2021). This article aims to present the floristic values of this site in more detail using notes from the study. Communities of vascular plants and lichens and a few bryophytes were examined. The Domain is part of the Tutamoe Ecological District (Miller & Holland 2008) and is administered by the Kaipara District Council. Before this it was administered by the Hobson Council and before this by Lands and Survey (Kevin Smith, pers. comm., 19 Feb 2022). The Domain is classed as 'cloud forest' following the definition of that vegetation association advocated by Fahey et al. (2016, p.1), modified from Grubb (1977), i.e., "[cloud] forests [are those associations] affected by frequent and/or persistent ground-level cloud". The Domain Forest remnant experiences an average annual rainfall of over 2,000 mm, and an annual temperature range of 11–12°C (Chappell 2014), as well as a high frequency of ground-level clouds (pers. obs., 22 Sep 2020).

The Domain is part of the Tutamoe Basin that forms part of the Kaipara catchment but it lies close to tributaries of the Waipoua River (Heron 2014) (Fig. 1). Following Heron (2014) the Domain has been mapped as the 20.44–15.97 Ma Waipoua subgroup of the Waipoua Basalts. Soils are derived from the underlying volcanic basalt (Heron 2014), with little azonal influence. These soils were mapped by Fieldes (1968) as brown granular loams and clays and associated soils in the Waimatenui and Waitakere Northern Association. The brown clays are strongly leached, occupying extensive areas of hilly land, previously vegetated by kauri (*Agathis australis*)–podocarp forest, and now mostly cleared and used for agriculture (Fieldes 1968). Where kauri is the dominant vegetation, the associated soils are very strongly leached (Steward & Beveridge 2010). The Domain location soils are classified as Perch-Gley Granular soils. These are clay soils formed from the strong weathering of volcanic rocks or tephra (Manaaki Whenua 2020).

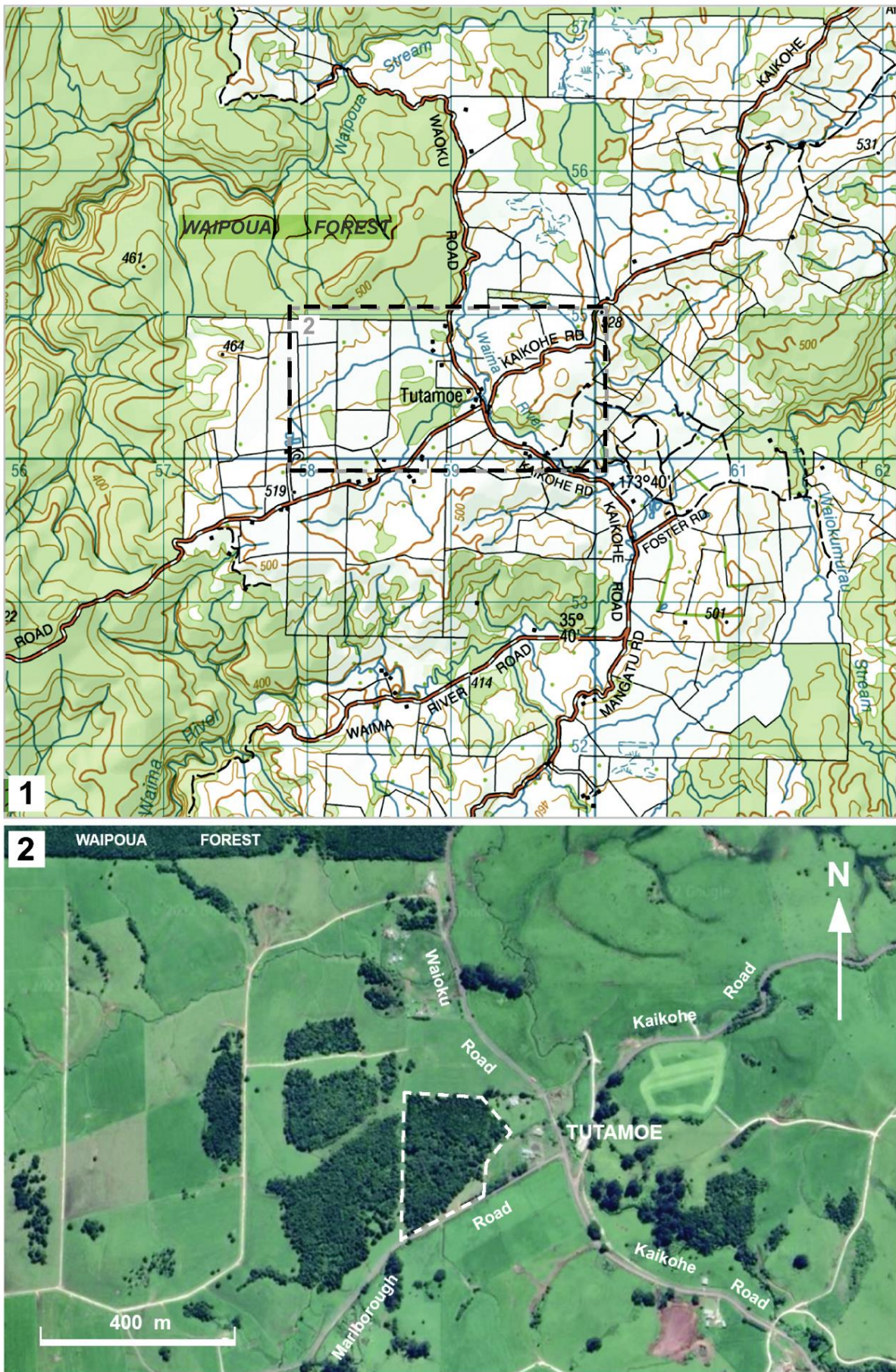
The mycorrhizal communities in association with ramarama (*Lophomyrtus bullata*) sampled at The Domain by the author (Ford 2021) were shown to be diverse, and supported arbuscular mycorrhizal associations. Arbuscular mycorrhizae have an ancient

association with vascular plants, forming a symbiotic relationship with 80% of plant species (Trappe 1987; Brundrett 2002). Typical of rainforest/cloud forest ecosystems (such as The Domain), arbuscular mycorrhizae live within the root cells, providing plants with nutrients and in return receiving carbohydrates (Husband et al. 2002; Leake 2004; Hogberg & Read 2006).

The dominant vegetation structure and floristic composition were recorded using the Atkinson Naming System (Atkinson 1985). The canopy is dominated by kahikatea (*Dacrycarpus dacrydioides*) and tōwai (*Pterophylla sylvicola* syn. *Weinmannia sylvicola*) (Fig. 3), with a subcanopy of wheki (*Dicksonia squarrosa*) and ramarama (Fig. 4). African clubmoss (*Selaginella kraussiana*) is a dominant ground cover around the forest margins, and further towards the intact forest centre the large liverwort *Schistochila appendiculata* is abundant on the ground. Epiphytes are common throughout, mainly ferns and lilies (*Hymenophyllum* spp., *Asplenium* spp. and *Astelia* spp.). Lianes, mainly supplejack / kareo (*Ripogonum scandens*) and kiekie (*Freyinetia banksii*), are seen throughout. The remnant contains intact bryophyte communities dominating the ground and trunks in the centre of the forest, indicative of a moist unmodified environment.

This forest association fits best the type MF8: kāmahī (*Pterophylla racemosa* syn. *Weinmannia racemosa*), broadleaved, podocarp forest (Rogers & Singers 2014), but instead of abundant kāmahī this forest association has the northern counterpart, towai. Like kamahi, tōwai is a common tree of disturbed habitats (de Lange 2021). This Ecosystem Unit has been classed in the 'mild sub-humid to cool humid' climatic zone (Rogers & Singers 2014). 'Cool humid' is characteristic of a cloud forest association (Wangda & Ohsawa 2010). Based on the species present, it is hypothesized here that historically this forest was once type MF13: kahikatea, northern rātā (*Metrosideros robusta*), kāmahī (again replaced with tōwai) forest (Rogers & Singers 2014). Large northern rātā trees are seen in the forest remnant but are not dominant in the vegetation structure.

The forest canopy is dominated by kahikatea, a tree known to regenerate strongly after disturbance and to prefer wet habitats (Dawson et al. 2011). Since all kahikatea trees at the site looked relatively young (Fig. 5), and tōwai is a succession



Figs. 1 & 2: **1.** Map showing location of Tutamoe near eastern edge of Waipoua Forest, Northland, New Zealand. Dashed rectangle outlines the area shown enlarged in Fig. 2. Scale = 1 km squares. Topo50 map modified by Joshua Salter. **2.** Detail from Fig. 1, showing The Domain, outlined with a white dashed line, just west of Tutamoe. Scale bar = 400 m. Aerial view from Google Earth, modified by Joshua Salter.



Figs. 3–8: **3.** Mature forest of The Domain remnant. All photos taken by the author (28 Sep 2020). **4.** The dominant vegetation of The Domain, kahikatea forms the canopy with a sparse understorey (28 Sep 2020). **5.** Kahikatea on the forest margin of The Domain (28 Sep 2020). **6.** Cut tree stump at The Domain, the author's mother for scale (12 Dec 2020). **7.** The columnar growth of tree pōkākā (*Elaeocarpus hookerianus*) (28 Sep 2020). **8.** The male flowers of tree puka or *Griselinia littoralis* (28 Sep 2020).

tree also dominant in the canopy, it is highly likely that this forest has been cleared in the recent (100 years) past, most likely for agriculture. Figure 6 shows a large tree probably felled in the recent past.

Forests such as The Domain hold a diversity of species not common in the Far North, mainly colder-climate species. These species are confined to a few inland areas in the North and reflect a much colder past climate. Sites like The Domain are refugia for these colder-climate species, and with the world's increasing temperatures these sites should be monitored to understand the effects of climate change on the biodiversity and forest structure.

Threatened plants of The Domain

In total, 119 native plant species were found during the survey of The Domain. Plant threat statuses in this report are from the Conservation Status assessment (de Lange et al. 2018a) The threat status of plants categorises plants as, for instance, 'Threatened-Nationally Endangered'; or 'At Risk-Declining' or 'Data Deficient'. Data Deficient means a species may be Threatened or At Risk but there is a lack of current information about its distribution and abundance (de Lange et al.

2018a). The 'Regionally significant' status for plants of the Tutamoe Ecological Districts is outlined in Miller & Holland (2008).

Regionally significant

Astelia microsperma an epiphyte was seen throughout the forest. The tree daisy kohurangi (*Brachyglottis kirkii* var. *angustior*) was local in the reserve. The fern kiwakiwa (*Cranfillia fluviatilis*) formed local patches in the reserve. The fern *Cranfillia nigra* was scattered throughout the forest. A few plants of the stumpy tree fern (*Dicksonia lanata* subsp. *lanata*) were present. One tree of the tree pōkākā (*Elaeocarpus hookerianus*) was seen on the forest margin (Fig. 7). The tree puka (*Griselinia littoralis*) was scattered throughout the forest (Fig. 8). A few trees of the tree tawari (*Ixerba brexioides*) were present. One flowering rohtu (*Neomyrtus pedunculata*) was present. This tree is very rare in Northland (Fig. 9). *Raukaua anomalus* – this small tree was seen as understorey seedlings (Fig. 10).

Other uncommon or at-risk species

Ramarama (*Lophomyrtus bullata*) is a common understorey tree at The Domain (Fig. 11). It was seen here with myrtle rust (*Austropuccinia psidii*) (Fig. 12), the reason why the plant is assessed as 'Threatened – Nationally Critical'. A new population



Figs. 9–12: **9.** Flowers of rohutu (*Neomyrtus pedunculata*) (12 Dec 2020). **10.** A young plant of the divaricating *Raukawa anomalous* forming hexagons (28 Sep 2020). **11.** Ramarama tree in the forest understorey (28 Sep 2020). **12.** Myrtle rust on the leaves of ramarama (19 May 2021).

of the 'Threatened - Nationally Endangered' grass *Microlaena carsei* was found at The Domain (Fig. 13). The grass occurred in meadows amongst bryophytes (including *Schistochila appendiculata*) and the native iris *Libertia micrantha* (Figs. 14). *Senecio* aff. *minimus* (a) (AK 318727; Northland) a native fire weed (At Risk – Naturally Uncommon), was seen on the forest margin.

Lichens and bryophytes

Typical of cloud forest, most of the forest floor, tree trunks and branches in The Domain were covered in diverse bryophyte communities. The nature of the communities at The Domain were an indication that the forest was old growth, the vegetation never having been fully removed. There is no doubt that The Domain hosts a much larger diversity of bryophytes than given here (7 liverworts, 15 mosses) but they were not the main focus of this study. Further study of these communities should be undertaken. The large liverwort *Schistochila appendiculata* (see Fig. 14) dominated the forest floor in places. Another notable liverwort was the conspicuous *Dendromastigophora flagellifera* (Fig. 15), a common leafy liverwort seen on the bark of Hall's totara (*Podocarpus laetus*). The teddy bear

liverwort *Leiomitra lanata* (Fig. 16) formed small patches and the large epiphytic liverwort *Plagiochila intertexta* (Fig. 17) was local on tree trunks. The large epiphytic moss *Cyrtopus setosus* (Fig. 18) was local on the tree trunks of the forest centre. *Dicranoloma plurisetum* (Fig. 19) formed small patches on tree bases; this moss is uncommon in Northland. Another epiphytic moss *Dicnemon calycinum* (Fig. 20) formed large patches on trees on the forest margins.

Lichens were studied in more detail than liverworts or mosses. From The Domain 44 species of lichens are recorded, most obvious on the forest margins and also probably present in the forest canopy. Lichens generally tolerate higher-light habitats than bryophytes, but many species inhabit the shaded forest interior. There is no doubt that more species will be present epiphytically in cryptic crustose life forms.

On the heath-like margins of The Domain the large cup lichen *Cladonia pleurota* (Fig. 21) grew with *C. capitellata* var. *capitellata* and the moss *Campylopus introflexus*, the former characterised by its red apothecia and soredia nature. The small orange

foliicolous lichen *Enterographa bella* is local on the leaves of *Hymenophyllum* spp. (Fig. 22) and ramarama (Fig. 23). The Domain supports a diversity of *Pannaria* species (five species are noted), a genus that is hypothesized to have evolved its diversity in the ancient forests of Zealandia (Arve Elvebakk pers. comm.). *Pannaria aotearoana* (Fig. 24), a recently described species, was noted growing on a liverwort on a fallen branch. The two similar species *Pannaria minutiphylla* (Fig. 25) and *Pannaria pulverulacea* (Fig. 26) were local in the forest, both green and phyllidiate, the latter separated by the presence of soredia on these phyllidia. Related to *Pannaria*, the squamulose lichen *Psoroma asperellum* was noted growing on the moss *Cladomnion ericoides*. Another related lichen with similar form, *Degeliella versicolor* was seen sterile on tree bark. The 'At Risk – Naturally Uncommon' (de Lange et al. 2018b) large white foliose species *Parmotrema robustum* (Fig. 27) was local on the forest margins with the similar but

common *P. reticulatum*. *Pseudocyphellaria dissimilis* (Fig. 28) was growing on a discarded tyre in the forest and the closely related species *Pseudocyphellaria glabra* was seen forming a photosymbiodeme (a lichen with mixed phototypes, e.g. both algae and cyanobacterial) relationship very rarely seen in this species. The 'At Risk – Naturally Uncommon' foliose (de Lange et al. 2018b) lichen *Sticta babingtonii* (Fig. 29) was growing on the tree bases and the crustose *Trapeliopsis granulosa* (Fig. 30) was growing on the bases of dead tree ferns. A well-camouflaged stick insect - *Clitarchus hookeri* (Fig. 31) made the most of the lichen communities.

Weeds

In total, 19 exotic plants are recorded from The Domain, most confined to the forest margins except these two shade-tolerant species, African clubmoss and tradescantia (*Tradescantia fluminensis*), which were seen invading the centre of the forest. They are



Figs. 13–18: 13. Flowers of the native grass *Microlaena carsei* (28 Sep 2020). 14. Patch of the threatened grass *Microlaena carsei* amongst bryophytes, including the large leafy liverwort *Schistochila appendiculata* and the native iris *Libertia micrantha* (28 Sep 2020). 15. The leafy liverwort *Dendromastigophora flagellifera* growing on the bark of Hall's totara (12 Dec 2020). 16. The teddy bear liverwort *Leiomitra lanata* on the forest floor (28 Sep 2020). 17. Epiphytic liverwort *Plagiochila intertexta* on a tree trunk (12 Dec 2020). 18. The large epiphytic moss *Cyrtopus setosus* in shaded forest (12 Dec 2020).



Figs.19–23: **19.** *Dicranoloma plurisetum* forming small patches among filmy ferns on tree bases (19 May 2021). **20.** The epiphytic moss *Dicnemon calycinum* forming large patches on trees of the forest margins (12 Dec 2020). **21.** The terricolous cup lichen *Cladonia pleurota* in open heath-like margins of the forest (12 Dec 2020). **22.** *Enterographa bella* forms an orangey-brown growth on the leaves of the filmy fern *Hymenophyllum dilatatum* (28 Sep 2020). **23.** *Enterographa bella* on the leaves of ramarama, looking almost like a rust (19 May 2021).

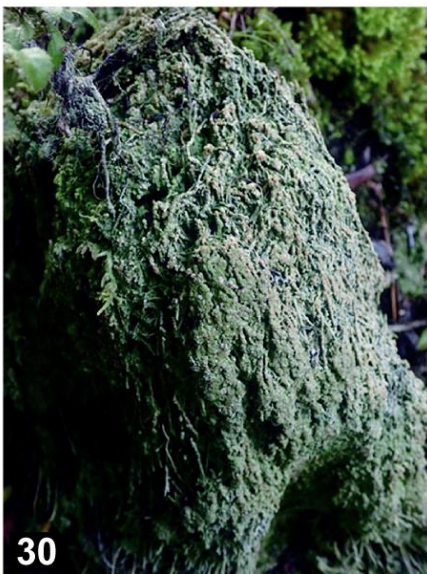
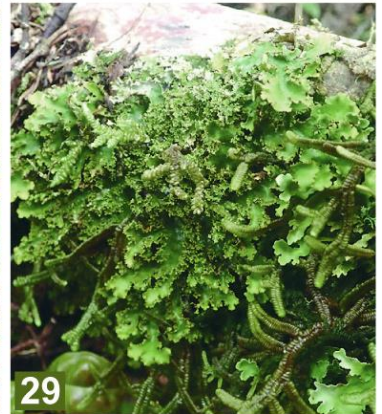
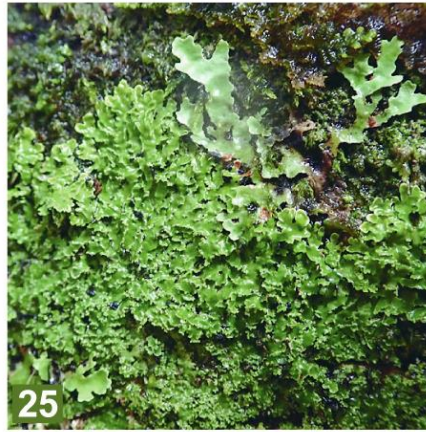
also considered a risk to the native biodiversity, by smothering native grasses, herbs and seedlings. African clubmoss was smothering bryophytes and the threatened grass *Microlaena carsei* (Fig. 32), and ramarama seedlings (Fig. 33). Infestations of tradescantia were seen on the forest margin and pose a risk to the inner more intact bryophyte communities of the forest remnant.

Naturalised species of interest included English cinquefoil (*Potentilla anglica*), an uncommon weed in New Zealand, noted in the pasture surrounding The Domain. On the heath-like margins, yellow

sedge (*Carex demissa*) and gum grass (*Sieglingia decumbens*) (Fig. 34) were local weeds.

Acknowledgements

I would like to thank: Matthew Calder (Department of Conservation) for his excellent research site suggestions and the permission granted from Kaipara District Council to survey this forest; Kevin Smith for his local knowledge; Yuli Heled and Rhys Gardner for reviewing the draft; Jessica Beever for expertise on moss identification; and John Braggins for his on liverworts.



Figs. 24–34: **24.** *Pannaria aotearoana* growing on a leafy liverwort on a windfall twig (28 Sep 2020). **25.** *Pannaria minutiphylla* growing on a branch (28 Sep 2020). **26.** *Pannaria pulverulacea* on a tree trunk (28 Sep 2020). **27.** The large white foliose species *Parmotrema robustum* (28 Sep 2020). **28.** The dark coloured *Pseudocyphellaria dissimilis* growing on a discarded tyre on the forest floor, with mosses, ferns and seedlings (28 Sep 2020). **29.** The foliose *Sticta babingtonii* growing on tree bases, competing with a leafy liverwort (29 Apr 2021). **30.** The crustose *Trapeliopsis granulosa* growing on the bases of dead tree ferns (29 Apr 2021). **31.** A lichen-camouflaged stick insect (*Clitarchus hookeri*) (28 Sep 2020). **32.** African clubmoss smothering the threatened grass *Microlaena carsei* (28 Sep 2020). **33.** A ramarama seedling in a sea of African clubmoss (28 Sep 2020). **34.** Gum grass - *Sieglingia decumbens* was local on the forest margin (12 Dec 2020).

References

- Atkinson, I.A.E. 1985: Derivation of vegetation mapping units for an ecological survey of Tongariro National Park, North Island, New Zealand. *New Zealand Journal of Botany* 23 (3): 361-378. <https://doi.org/10.1080/0028825X.1985.10425343>
- Brundrett, M.C. 2002: Coevolution of roots and mycorrhizas of land plants. *New Phytologist* 154(2): 275-304.
- Chappell, P.R. 2014: The climate and weather of Northland. *National Institute of Water and Atmospheric Research*. Vol 59: 40.
- Dawson, J., Lucas, R., Connor, J., & Brownsey, P.J. 2011: *New Zealand's Native Trees* (pp. 317-318). Nelson, New Zealand: Craig Potton.
- de Lange, P.J. 2021: *Weinmannia racemosa* Fact Sheet. New Zealand Plant Conservation Network. <https://www.nzpcn.org.nz/flora/species/weinmannia-racemosa/>
- de Lange, P.J., Rolfe, J.R., Barkla, X.X., Courtney, S.P., Champion, P.D., Perrie, L.R., Beadel, S.M., Ford, K.A., Breitwiser, I., Schonberger, I., Hindsmarsh-Walls, R., Heenan, P.B., Ladley, K. 2018a: Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series* 22. Department of Conservation, Wellington.
- de Lange, P., Blanchon, D., Knight, A., Elix, J., Lucking, R., Frogley, K., Harris, A., Cooper, J., Rolfe, J. 2018b: Conservation status of New Zealand indigenous lichens and lichenicolous fungi. *New Zealand Threat Classification Series* 27. Department of Conservation, Wellington.
- Fahey, T.J., Sherman, R.E., Tanner, E.V. 2016: Tropical montane cloud forest: environmental drivers of vegetation structure and ecosystem function. *Journal of Tropical Ecology*, 32 (5), 355-367.
- Fildes, M. 1968: Soils of New Zealand, Part 1. *New Zealand Soil Bureau Bulletin* 26(2): 33.
- Ford, M. 2021: The mycorrhizal communities of *Lophomyrtus bullata* Burret (Myrtaceae) within three natural forest associations of New Zealand. [unpublished master's thesis]. University of Auckland, Auckland, New Zealand.
- Grubb, P.J. 1977: Control of forest growth and distribution on wet tropical mountains: with special reference to mineral nutrition. *Annual Review of Ecology and Systematics* 8(1): 83-107.
- Heron, D.W. 2014: Geological map of New Zealand 1: 250,000-Digital data. *GNS Science Geological Map 1, 1 CD*.
- Högborg, P., Read, D. J. 2006: Towards a more plant physiological perspective on soil ecology. *Trends in Ecology & Evolution* 21(10): 548 - 554.
- Husband, R., Herre, E.A., Turner, S.L., Gallery, R., Young, J.P.W. 2002: Molecular diversity of arbuscular mycorrhizal fungi and patterns of host association over time and space in a tropical forest. *Molecular Ecology* 11(12): 2669-2678.
- Leake, J. R. 2004: Myco-heterotroph/epiparasitic plant interactions with ectomycorrhizal and arbuscular mycorrhizal fungi. *Current Opinion in Plant Biology* 7(4): 422-428.
- Miller, N. C., Holland, W. 2008: *Natural areas of Tutamoe Ecological District: reconnaissance survey report for the Protected Natural Areas Programme*. Department of Conservation, Northland Conservancy.
- Steward, G.A., Beveridge, A.E. 2010: A review of New Zealand kauri (*Agathis australis* (D. Don) Lindl.): its ecology, history, growth and potential for management for timber. *New Zealand Journal of Forestry Science* New Zealand Forest Research Institute Ltd (trading as Scion) 40: 33-59
- Trappe, J. M. 1987: *Phylogenetic and ecologic aspects of mycotrophy in the angiosperms from an evolutionary standpoint*. Ecophysiology of VA mycorrhizal plants, 525.
- Rogers, G.M., Singers, N.J. 2014: A classification of New Zealand's terrestrial ecosystems. *Science for Conservation* 325. Department of Conservation, Wellington.
- Wangda, P. & Ohsawa, M. 2011: *Temperature and humidity as determinants of the transition from dry pine forest to humid cloud forests in the Bhutan Himalaya*. Tropical Montane Cloud Forests: Science for Conservation and Management. 156-163.

Appendix 1. List of vascular plant species of The Domain, Tutamoe, Northland

* = adventive # = iNaturalist entry

Taxa (119 native + 19 adventive = 138 total)

Lycophytes (1 + 1 = 2)

Pseudodiphasium volubile (syn. *Lycopodium volubile*)
Selaginella kraussiana *

Pteridophytes (38 + 0 = 38)

Asplenium bulbiferum
Asplenium flaccidum
Asplenium polyodon
Asplenium oblongifolium
Austroblechnum membranaceum (syn. *Blechnum membranaceum*)

Austroblechnum lanceolatum (syn. *Blechnum lanceolatum*)
Cranfillia fluviatilis (syn. *Blechnum fluviatile*) #
Cranfillia nigra (syn. *Blechnum nigrum*)
Cyathea medullaris
Cyathea smithii
Dicksonia lanata subsp. *hispida*
Dicksonia squarrosa
Diplazium australe
Diploblechnum fraseri (syn. *Blechnum fraseri*)
Hiya distans (syn. *Hypolepis distans*)
Hymenophyllum demissum

Hymenophyllum dilatatum
Hymenophyllum flabellatum
Hymenophyllum frankliniae
Hymenophyllum multifidum
Hymenophyllum nephrophyllum
Hymenophyllum rarum
Hymenophyllum revolutum
Hymenophyllum sanguinolentum
Hymenophyllum scabrum
Leptopteris hymenophylloides
Lomaria discolor (syn. *Blechnum discolor*)
Loxogramme dictyopteris
Lygodium articulatum
Notogrammitis heterophylla
Notogrammitis pseudociliata
Pneumatopteris pennigera
Polyphlebium venosum (syn. *Trichomanes venosum*)
Pteridium esculentum
Pyrrosia elaeagnifolia
Rumohra adiantiformis
Tmesipteris elongata
Zealandia pustulata (syn. *Microsorium pustulatum*)

Gymnosperms (4 + 0 = 4)

Dacrycarpus dacrydioides
Dacrydium cupressinum
Pectinopitys ferruginea (syn. *Prumnopitys ferruginea*)
Podocarpus laetus

Magnolids (3 + 0 = 3)

Beilschmiedia tawa
Beilschmiedia tarairi
Hedycarya arborea

Monocots I (11 + 1 = 12)

Acianthus sinclairii
Astelia hastata
Astelia microsperma
Caladenia chlorostyla
Corybas acuminatus
Crocasmia ×crocosmiiflora *
Dendrobium cunninghamii
Dianella nigra
Earina autumnalis
Earina mucronata
Ripogonum scandens
Thelymitra pauciflora

Monocots II – Commelinids (12 + 8 = 20)

Anthoxanthum odoratum *
Carex demissa * #

Carex dissita
Carex lessoniana
Carex zotovii #
Festuca rubra subsp. *rubra* *
Gahnia xanthocarpa
Holcus lanatus *
Isolepis sepulcralis
Isolepis reticularis
Juncus edgariae
Juncus effusus var. *effusus* *
Juncus planifolius
Libertia micrantha
Luzula congesta *
Microlaena avenacea
Microlaena carsei # (AK381545)
Microlaena stipoides
Sieglingia decumbens * #
Tradescantia fluminensis *

Eudicots (1 + 1 = 2)

Clematis paniculata
Ranunculus flammula *

Core Eudicots (48 + 9 = 57)

Acaena anserinifolia
Ackama rosifolia
Alseuosmia quercifolia
Berberis glaucocarpa * #
Brachyglottis kirkii var. *angustior*
Cardamine flexuosa *
Centella uniflora
Coprosma autumnalis
Digitalis purpurea *
Elaeocarpus dentatus var. *dentatus*
Elaeocarpus hookerianus # (AK381548)
Elatostema rugosum
Euchiton japonicus
Fuchsia excorticata
Gonocarpus incanus
Gonocarpus micranthus subsp. *micranthus*
Griselinia littoralis # (AK381546)
Griselinia lucida
Hydrocotyle dissecta
Hydrocotyle microphylla #
Hypericum androsaemum *
Hypericum pusillum
Hypochaeris radicata *
Ixerba brexioides
Leptospermum aff. *scoparium* (a) "Auckland" - (de Lange et al. 2018)
Leptostigma setulosum

Leycesteria formosa *
Lobelia anceps
Lophomyrtus bullata # (AK381544)
Lotus pedunculatus *
Melicytus macrophyllus
Melicytus ramiflorus
Metrosideros albiflora
Metrosideros diffusa
Metrosideros fulgens
Metrosideros robusta
Montia fontana
Myrsine salicina
Neomyrtus pedunculata # (AK381547)
Nertera depressa
Nestegis lanceolata
Olearia rani var. *rani*

Parsonsia capsularis #
Pittosporum cornifolium
Pittosporum tenuifolium
Potentilla anglica *
Prunella vulgaris *
Pseudopanax arboreus
Pseudopanax crassifolius
Pterophylla sylvicola (syn. *Weinmannia sylvicola*)
Raukiau anomalous #
Raukiau simplex
Rubus australis
Rubus cissoides
Senecio minimus
Schefflera digitata
Syzygium maire

Appendix 2. List of nonvascular taxa present in The Domain, Tutamoe, Northland

= iNaturalist entry

Liverworts (7)

Dendromastigophora flagellifera
Leiomitra lanata
Plagiochila intertexta #
Porella sp.
Schistochila appendiculata
Symphyogyna hymenophyllum
Trichocolea sp.

Mosses (15)

Achrophyllum sp.
Campylopus introflexus
Cladomnion ericoides
Cyrtopus setosus
Cyathophorum bulbosum
Dawsonia superba
Dicranoloma billardiarei #
Dicranoloma plurisetum #
Dicranoloma menziesii #
Hypopterygium didictyon
Leucobryum javense
Dicnemon calycinum #
Ptychomnion aciculare
Thuidiopsis furfurosa
Trachyloma planifolium #
Weymouthia mollis

Lichens (44)

Biatoropsis usnearum
Cladia aff. *inflata*
Cladonia capitellata
Cladonia darwinii
Cladonia pleurota
Collema subconveniens #
Collema glaucophthalmum
Degelia gayana
Degeliella versicolor
Dibaeis absoluta #
Enterographa bella #
Leioderma pycnophorum
Gabura fasciculare var. *fasiculare*
Heterodermia casarettiana #
Hypogymnia subphysodes
Lefidium tenerum
Lepraria finkii
Leucodermia leucomelos
Menegazzia neozelandica
Pannaria aotearoana #
Pannaria araneosa
Pannaria immixta
Pannaria minutiphyllo #
Pannaria aff. *minutiphyllo*

Pannaria pulverulacea #
Parmotrema reticulatum #
Parmotrema robustum
Peltigera sp.
Phlyctis sp.
Pseudocyphellaria chloroleuca
Pseudocyphellaria dissimilis
Pseudocyphellaria glabra
Pseudocyphellaria hookeri
Pseudocyphellaria lividofusca
Poroma asperellum
Ramalina celastri
Sticta babingtonii #
Sticta filix
Sticta latifrons
Sticta menziesii
Teloschistes flavicans
Usnea angulata
Usnea cornuta #
Usnea rubicunda
Yarrumia coronata

Other fungi

Psilocybe werarora