

Appendix S1. Study site details

Plant names follow the New Zealand Plant Names Database (Landcare Research 2002–2015: <http://nzflora.landcareresearch.co.nz/>)

Small native remnants

Mt Lees Reserve

Sampled 12 July 2012. EDGE PLOT: S 40° 11.284', E 175° 27.103', 95 m a.s.l. Vegetation: tītoki (*Alectryon excelsus*), pepper tree (*Macropiper excelsum*), rangiora (*Brachyglottis repanda*), kōwhai (*Sophora* sp.), *Agapanthus*, mānuka (*Leptospermum scoparium*), unidentified fern. CENTRE PLOT: S 40° 11.303', E 175° 26.983', 94 m a.s.l. Vegetation: pepper tree, kahikatea (*Dacrydium dacrydioides*), tītoki, tōtara (*Podocarpus totara*), māhoe (*Melicactus ramiflorus*), bamboo, *Agapanthus*, kōwhai seedlings, unidentified fern. Sampling took place in the 16-ha bush gully. The bush gully has been developed as a garden that contains some native remnant vegetation, including giant kahikatea, tōtara and pukatea (*Laurelia novae-zelandiae*) trees, as well as tawa (*Beilschmiedia tawa*), tōtara, mataī (*Prumnopitys taxifolia*), and a number of vines. The reserve is open to the public and has paved walkways throughout.

Kitchener Park

Sampled 24 April 2012. EDGE PLOT: S 40° 14.786', E 175° 32.380', 26 m a.s.l. Vegetation: karaka (*Corynocarpus laevigatus*), pepper tree, tītoki, mataī. CENTRE PLOT: S 40° 14.800', E 175° 32.333', 25 m a.s.l. Vegetation: pepper tree, māhoe, tītoki, mataī, karaka, kahikatea. Kitchener Park (7.11 ha) makes up part of a larger, c. 14-ha reserve. In 1991 an extensive restoration and weed eradication programme was undertaken by the Manawatu District Council and the community. The bush is open to the public and has walkways throughout.

McCraes Bush

Sampled 8 May 2012. EDGE PLOT: S 40° 17.005', E 175° 45.929', 52 m a.s.l. Vegetation: pepper tree, tītoki, māhoe, supplejack (*Ripogonum scandens*). CENTRE PLOT: S 40° 17.028', E 175° 45.867', 54 m a.s.l. Vegetation: supplejack, tītoki, pepper tree, tōtara. McCraes Bush (0.0046 ha) is owned by the Palmerston North City Council. This small urban remnant contains a walking track and is open to the public. High weed infestations are being managed.

Ashhurst Domain

Sampled 9 March 2012. EDGE PLOT: S 40° 18.138', E 175° 45.475', 45 m a.s.l. Vegetation: pepper tree, karaka, lemonwood (*Pittosporum eugenioides*), māhoe, tītoki. CENTRE PLOT: S 40° 18.210', E 175° 45.526', 26 m a.s.l. Vegetation: wineberry (*Aristotelia serrata*), pepper tree, māhoe, wandering Willie (*Tradescantia fluminensis*). The 27.4-ha domain, which is open for public use, contains an area of mature native forest. While very close to Ashhurst, the Ashhurst Domain's native forest area is considered a rural forest remnant of ecological significance.

Victoria Esplanade

Sampled 6 March 2012. EDGE PLOT: S 40° 22.316', E 175° 36.755', 14 m a.s.l. Vegetation: silver fern (*Cyathea dealbata*), wheki (*Dicksonia squarrosa*), māhoe, tawa. CENTRE PLOT: S 40° 22.330', E 175° 37.196', 14 m a.s.l. Vegetation: lemonwood,

māhoe, pepper tree, seven-finger (*Schefflera digitata*). Victoria Esplanade is an urban public park alongside the Manawatu River in Palmerston North. A 7.5-ha native forest remnant in the esplanade was sampled.

Bledisloe Park

Sampled 7 March 2012. EDGE PLOT: S 40° 23.000', E 175° 37.180', 44 m a.s.l. Vegetation: lemonwood, karaka, māhoe, pepper tree. CENTRE PLOT: S 40° 22.980', E 175° 37.180', 45 m a.s.l. Vegetation: broadleaf (*Griselinia littoralis*), lemonwood, puriri (*Vitex lucens*), seven-finger, soft tree fern (*Cyathea smithii*), māhoe, pepper tree, rangiora, gully fern (*Pneumatopteris pennigera*), common maidenhair fern (*Adiantum cunninghamii*). Bledisloe Park (86 127 m²) is an urban native forest remnant in Palmerston North. The area is open to the public, with walking tracks on both flat and steep terrain.

Large native remnants

Totara Reserve

Sampled 2 September 2012. EDGE PLOT: S 40° 09.102', E 175° 50.598', 139 m a.s.l. Vegetation: mapau (*Myrsine australis*), supplejack, hen and chicken fern (*Asplenium bulbiferum*), tawa, pepper tree, lancewood (*Pseudopanax crassifolius*), hanging spleenwort (*Asplenium flaccidum*), kahikatea, cabbage tree (*Cordyline australis*), juvenile karaka. CENTRE PLOT: S 40° 08.824', E 175° 50.638', 164 m a.s.l. Vegetation: pepper tree, supplejack, tawa, kahikatea, unidentified tree fern, pigeonwood (*Hedycarya arborea*), hen and chicken fern. Totara Reserve (c. 338 ha) is in the Pohangina Valley and covers land ranging from river flats to hills up to 600 m high. Sampling was done in the Fern Walk area, which contains mature native podocarp forest of tawa, tōtara, rimu (*Dacrydium cupressinum*), pukatea, and rātā (*Metrosideros robusta*). Totara Reserve is considered to be the finest native forest remnant in the Manawatu Ecological District, but has a number of pests and weeds. The reserve is open to the public and provides for various recreational activities.

Manawatu Gorge

Sampled 12 July 2012. EDGE PLOT: S 40° 20.392', E 175° 49.068', 86 m a.s.l. Vegetation: pepper tree, tawa, juvenile lancewood, hanging spleenwort, giant maiden hair fern (*Adiantum formosum*), supplejack. CENTRE PLOT: S 40° 20.203', E 175° 48.740', 118 m a.s.l. Vegetation: pepper tree, tawa, hanging spleenwort, supplejack, nikau palm (*Rhopalostylis sapida*), *Pittosporum* spp., hen and chicken fern, filmy fern (*Hymenophyllum*). The Manawatu Gorge Scenic Reserve (1000+ ha) is c. 12 km from Palmerston North, running between Ashhurst and Woodville. The forest remnant covers steep hilly terrain, but a 10-km walking track has been developed to encourage public use of the area.

Kahuterawa Reserve

Sampled 30 September 2012. EDGE PLOT: S 40° 28.247', E 175° 36.801', 97 m a.s.l. Vegetation: black tree fern (*Cyathea medullaris*), parataniwha (*Elatostema rugosum*), pepper tree, five-finger (*Pseudopanax arboreus*). CENTRE PLOT: S 40° 28.458', E 175° 36.259', 92 m a.s.l. Vegetation: hen and chicken fern, rangiora, supplejack, five-finger, rewarewa (*Knightia excelsa*), wheki, paritaniwha, pepper tree. Part of the Kahuterawa outdoor recreation area is 63 ha of naturally

regenerating native forest found on steeper slopes and margins of the stream; there are walking tracks through the native forest area.

Shannon Forest

Sampled 11 October 2012. EDGE PLOT: S 40° 35.088', E 175° 25.781', 140 m a.s.l. Vegetation: macrocapa (*Cupressus macrocarpa*), *Digitalis*, māhoe, gorse (*Ulex europaeus*), palm leaf fern (*Blechnum novae-zelandiae*), creek fern (*B. fluviatile*), wheki, seven-finger. CENTRE PLOT: S 40° 36.299', E 175° 25.640', 433 m a.s.l. Vegetation: bush lawyer (*Rubus cissoides*), supplejack, hen and chicken fern, tawa, rangiora, seven-finger, rewarewa, wheki, filmy fern.

Pine forests

Whanganui Forest

Sampled 19 October 2012. Coordinates: S 39° 48.803', E 175° 1.972'. EDGE PLOT: Vegetation: radiata pine (*Pinus radiata*), blackberry (*Rubus fruticosus* agg.). CENTRE PLOT: Vegetation: radiata pine, gorse, blackberry. The pine forest in Whanganui is 1400 ha of hilly and flat terrain; the sampled area was flat. The sampling plot was 1.8 ha and the trees there were 8 years old, the land having been harvested once previously (R. Brown, pers. comm., 19 October 2012). There are wild fallow deer in the area and, while the forest is fenced from bordering farmland, the occasional escaped sheep is found. The land is privately owned but permission is granted for some recreational use. Due to problems with the GPS, the Whanganui pine forest coordinates were gained from Google Earth after sampling took place. The coordinates therefore reflect the location of the forest but not the exact sampling locations, and elevation was not recorded.

Santoft Forest

Sampled 21 September 2012. EDGE PLOT: S 40° 06.849', E 175° 11.809', 10 m a.s.l. Vegetation: radiata pine, grass, blackberry, dandelion (*Taraxacum officinale*), *Muehlenbeckia* sp. CENTRE PLOT: S 40° 06.799', E 175° 11.806', 38 m a.s.l. Vegetation: radiata pine, grass, blackberry, dandelion. Santoft Forest (owner: Ernslaw One; 4478 ha in total; 3832 ha stocked with radiata pine) is planted on flat to rolling sandy terrain, on former overgrazed farmland with large sandy areas; sampling took place in the area planted in 1994 (P. McCarthy, pers. comm., 30 October 2012). Santoft pine forest is a popular recreational hunting area (sambar deer), close to both Palmerston North and Whanganui.

Hawkey's Forest

Sampled 7 May 2012. EDGE PLOT: S 40° 13.415', E 175° 49.131', 215 m a.s.l. Vegetation: radiata pine. CENTRE PLOT: S 40° 13.424', E 175° 49.177', 232 m a.s.l. Vegetation: radiata pine, a few small ground ferns. This small (c. 15 ha) privately owned pine forest is surrounded by farmland. The forest was planted on sloping farmland in 1990. The forest is fenced, and there is no public access, but sheep and deer are let in to graze (T. Hawkey, pers. comm., 7 June 2012).

Kahuterawa: Woodpecker Forest

Sampled 14 June 2012. EDGE PLOT: S 40° 28.264', E 175° 36.712', 173 m a.s.l. Vegetation: radiata pine, unidentified tree fern with skirt, seven-finger, māhoe. CENTRE PLOT: S 40°

28.434', E 175° 36.644', 278 m a.s.l. Vegetation: radiata pine, rangiora, unidentified tree ferns. The Kahuterawa outdoor recreation area is located a short distance from Palmerston North. Part of this recreation area is a c. 130-ha plot of mature radiata pine known as Woodpecker Forest, which includes both steep terrain and flat areas. The forest was planted between 1975 and 1978 (Palmerston North City Council, n.d., p. 23). A distinctive feature of the Kahuterawa pine forest is its diverse native understorey. A number of walking and mountain bike tracks run through the forest.

Waitarere Forest

Sampled 25 June 2012. EDGE PLOT: S 40° 31.279', E 175° 13.247', 15 m a.s.l. Vegetation: radiata pine, occasional ground ferns (including bracken *Pteridium esculentum*). CENTRE PLOT: S 40° 31.209', E 175° 13.169', 9 m a.s.l. Vegetation: radiata pine, occasional ground ferns. Waitarere Forest (2500 ha, owned by Rayonier/Matariki) is a coastal pine forest on flat terrain. Sampling took place in the area planted in 1997 (P. Wright, pers. comm., September 2012). Waitarere Forest is intensively used by the public; pedestrians and cyclists are permitted in the forest, but vehicles must have a permit to enter (P. Wright, pers. comm., September 2012).

Shannon Forest

Sampled 25 August 2012. EDGE PLOT: S 40° 35.224', E 175° 25.774', 162 m a.s.l. Vegetation: radiata pine, *Digitalis*, bracken, gorse, mānuka, grass. CENTRE PLOT: S 40° 35.309', E 175° 25.932', 184 m a.s.l. Vegetation: radiata pine, *Digitalis*, gorse, mānuka, grass, bush lawyer. The forest is owned by Ernslaw One and lies 5 km south-east of Shannon. There are 366 ha of stocked pine forest in the area (P. McCarthy, pers. comm., 30 October 2012). The remainder of the Shannon forest has been left as native forest, the majority being on very steep terrain. The pine is planted on moderate to steep ex-pasture or reverting farmland; the majority of the forest was established in 1974–1981 and the sampled areas contained 7-year-old trees (P. McCarthy, pers. comm., 30 October 2012). The forest is used by the public.