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About this guide

Native forest on the impressive ignimbrite cliffs above Lake Taupo's Western Bay.

The central volcanic plateau ecological region is a dramatic part of the Waikato region's landscape. Home to New Zealand's largest lake, the head of its longest river, and edged by snow-dusted ranges, it attracts local and international visitors year round. However, with just 20 per cent of its land area now in native vegetation cover there is plenty of scope to improve the landscape and its ecology with native plantings.

This area is in need of restoration because:

- most of the remaining native forest is restricted to higher elevation, with little or no remaining natural areas on lower or gentler terrain for winter refuge or for lower altitude plant species to establish
- animal pests such as deer, goats, possums and even wallabies (in localised pockets) and an extensive array of plant pests such as wilding pines and Japanese honeysuckle are a significant threat to native forest regeneration
- the area contains two of the most significant fresh water bodies in the Waikato region; Lake Taupo and the upper Waikato River – protecting their water quality and aquatic life is a matter of national importance, and densely vegetated riparian zones are important to filter out nutrients and sediments
- the area is currently undergoing significant land use change with the conversion of exotic forestry to dairy pasture – this will further reduce habitat opportunities for native plants and birds such as the New Zealand falcon and North Island robin and place greater pressure on already declining water quality.

Planting natives can help overcome these problems. Native plants can be used to:

- replace exotic weeds and prevent other weeds establishing in cleared areas
- stabilise river banks and reduce erosion on bare land and newly created slips
- enhance waterways and provide seasonal food and habitat for native birds
- improve water quality through the restoration of wetland habitats
- provide shelter and amenity value for farming operations
- contribute to the aesthetic and landscape character of the central volcanic plateau ecological region.

Many agencies, community groups, farmers, forestry companies, and individuals are working hard to protect the natural values of the central volcanic plateau ecological region. They are removing weeds, controlling pests, and planting natives to recreate or enhance natural ecosystems.

This guide will help you select and plant local native plants for your gardens, re-vegetation areas, or as specimen or shelter trees for your property.

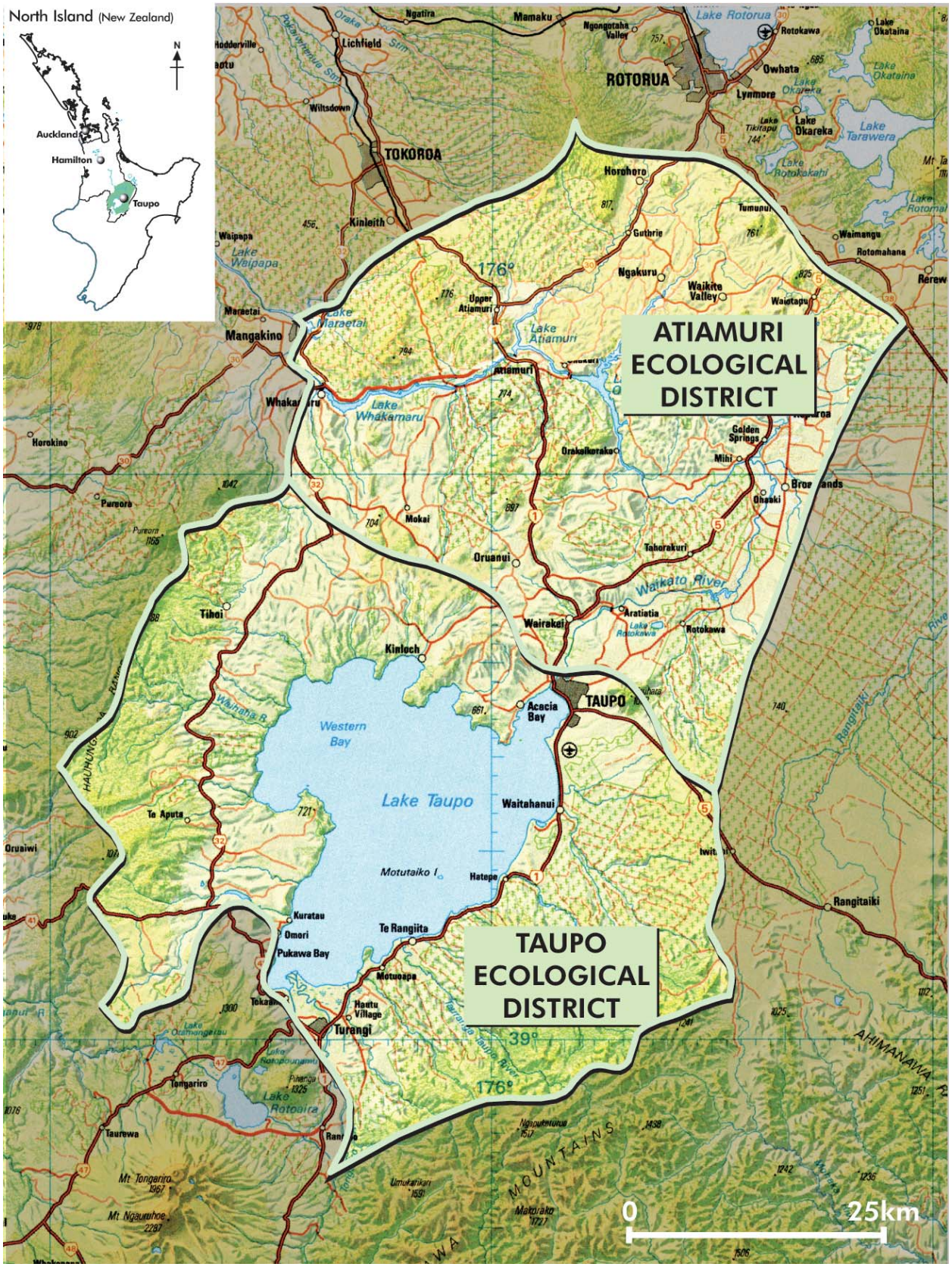
The focus of this planting guide is on native forest species. For ideas on what to plant in wetlands, contact Environment Waikato for a copy of the 'Wetland Management' factsheet series or visit www.ew.govt.nz/water.

This guide is for the central volcanic plateau, comprising two adjoining ecological districts.

The Taupo ecological district stretches from Taupo to Turangi, occupying the basin between the Hauhungaroa range and the foothills of the Kaimanawa ranges.

Atiamuri ecological district is centred on the southern Waikato hydro lakes, bordered by the towns of Whakamaru, Horohoro, Reporoa and Taupo.

Lake Rotorua and the mountains of the Tongariro National Park, Pureora and the Kaimanawa forest parks are outside these ecological districts.



Taupo and Atiamuri ecological districts

Central volcanic plateau ecological region and districts

What is an ecological district?

New Zealand has been divided into 268 ecological districts based on geological, topographical, climatic and biological features that together define a characteristic landscape. Similar districts combine to form 'ecological regions'.

Description of central volcanic plateau ecological region and districts

The central volcanic plateau ecological region, comprising Taupo and Atiamuri ecological districts, is located in the Taupo basin. It occupies a huge subsided area (caldera complex) formed during several catastrophic volcanic eruptions, the last being around 186 AD. These eruptions, along with the evolution of the Tongariro and Waikato river systems, have greatly influenced the formation of the land and vegetation.

Topographically the two ecological districts are very different. Taupo ecological district is a basin dominated by Lake Taupo, occupying one quarter of the district, and edged by high mountain ranges draining down to the lake. Atiamuri ecological district is a plateau, flat in the Reporoa Valley to the east, but blistered by a cluster of rounded lava domes to the south-east, and more dissected ranges to the north and west.

Major landforms generated during and after the Taupo eruptions include:

- high cliffs along the western and northern sides of the lake formed when the land collapsed creating the caldera
- a greatly enlarged Lake Taupo following the caldera formation
- gently sloping rhyolitic ignimbrite and pumice alluvium landscapes of the Hauhungaroa range, the Mamaku Plateau and the Ouaho hills with characteristic rilled (channelled) erosion on the hill slopes, and entrenched rivers and streams with high pumice cliffs
- small volcanic cones of andesite, dacite and basalt such as Rainbow Mountain
- clusters of lava domes including 897 metres Maroanui hill in the Kaingaroa Forest south and east of Atiamuri.

The lower reaches of the Tongariro River delta provide a slow infill of Lake Taupo in the south. The outflow at the north end of the lake is the source of the Waikato River which cuts its way through the north of the ecological region, bursting dramatically through a narrow gorge at the Huka Falls near Taupo. Geothermal areas are a significant feature of the area, with the rising steam visible from a long way away.

Yellow-brown soils formed from volcanic ash have developed on Taupo pumice over most of the area. The soil depth varies with topography, with soils often shallow particularly on steeper slopes. Thick deposits of pumice (up to 6–8 metres) in depth occur on the eastern side of Lake Taupo. Leaching effects range from moderate (in areas of lower rainfall) to severe (in higher rainfall areas), with podzolised soils (strongly leached acidic soil) in areas previously vegetated in rimu-dominated forests. Soils are generally well-drained, though some areas of poor drainage occur in the fomer lakebed of the Reporoa basin.

The climate is the most continental-like in the North Island, with warm, often dry summers and cool winters. Heavy rain, hail and thunderstorms are frequent events particularly on higher altitude areas. Snowfalls are infrequent but ground frosts and fog are relatively common, with 60 or more frosts per year. Droughts occur most years.

The central volcanic plateau ecological region is divided into two ecological districts which are the focus of this planting guide. Each of these ecological districts has a particular combination of landform, soil, vegetation and climate which brands it differently from the rest of the country.

1. **Taupo ecological district**
   Taupo ecological district comprises of the water catchment area surrounding Lake Taupo. The Hauhungaroa and Kaimanawa ranges form the catchment boundaries on the west and southeast respectively. The lower slopes rising up from Lake Taupo are a fan of volcanic breccia, eroded off the surrounding caldera walls. The topography is rolling to locally broken, mostly within the altitude range of 300 to 600 metres, with high points of Mt Tauhara (1091 metres) near Taupo township, and the north-west faces of the Kaimanawa Ranges (1300 to 1500 metres). The current land cover is mostly native forest on the steep ranges to the east and west, with the lower slopes in farmland to the north-west and plantation forestry to the south-east.

2. **Atiamuri ecological district**
   Atiamuri ecological district comprises most of the upper Waikato river catchment. The eastern boundary extends to the Kaingaroa escarpment and, in the west, to Lake Maraetai. The terrain in this district is mostly rolling to rugged hill country with low lying floodplains, and includes a group of rhyolitic domes up to 800 metres elevation and the Paeroa Range (900 metres). A large amount of geothermal activity is centred in this ecological district. The current land cover is dominated by pine plantations and farmland, with very little native vegetation remaining. Much of the plantation is currently being converted to dairy farms.

Vegetation in the Taupo and Atiamuri ecological districts

The Taupo eruption of 186 AD blasted a column of superheated rocks, pumice and ash some 50 kilometres into the air from its vent, the Horomatangi reef east of the middle of Lake Taupo. When the column collapsed it surged sideways at speeds of up to 1000 kilometres per hour, largely incinerating all pre-existing forest over a distance of about 80 kilometres in all directions.

Successful regeneration occurred, and prior to human settlement the land was again almost entirely re-covered in forest vegetation, mainly dense podocarp[1] forest on the lower slopes, with pockets of black, silver and red beech on the more broken country on the eastern side of the lake. Reasonably extensive wetlands existed on plains and in valley floors, many of which still remain.

Repeated wildfires during the 600 years or so of Maori occupation, combined with harsh temperatures, resulted in a landscape dominated by tussockland, bracken fern and scrub, with forest generally being restricted to inaccessible steeper places and damp gullies.

By 1840, much of the forest cover had been burnt and the remaining forest vegetation consisted of four main types.

- Rimu and matai over kamahi forest on well-drained, flat to rolling hill country.
- Dense podocarp (totara, matai and kahikatea) forest on deep, well-drained volcanic soils and on the ignimbrite geology west of Lake Taupo.
- Beech (red and silver) forest on steep slopes at high altitudes, and in gorges where cold air accumulates, particularly on the eastern ranges in the Taupo ecological district north of the Tauranga-Taupo River. South of the river mosaics of red beech and podocarp-dominated forest rose to mountain beech forest above 800 metres.
- Hall's totara over kamahi forest at higher altitude in places such as Mt Tauhara and Oruanui where beech forest was absent.

Tawa forest, with associated mangeo and pukatea, is currently rare in this area, mainly confined to the northern parts of the Atiamuri ecological district and the Hauhungaroa Range of the Taupo ecological district. While these species tend to prefer warmer temperature, their absence may be a result of the

[1] Podocarps are a group of plants that produce pollen in cones but their seeds are either enclosed in a fleshy cover or sit atop a fleshy 'foot', both of which are designed to attract birds that distribute their seeds. New Zealand podocarps include rimu, totara, kahikatea, matai and miro.

relatively recent volcanic disturbance that has favoured the more light tolerant conifer and beech species. Tawa may eventually re-establish as a later successional species in this area under mature podocarp forest.

Secondary vegetation resulting from fire was extensive and consisted of mainly two types.

- Silver tussock on flat plateau country exposed to persistent burning, and gradually colonised by manuka and monoao shrubs.
- Broadleaved scrub (five-finger, kohuhu, kamahi, mahoe, rewarewa) regenerating through bracken on steeper topography less prone to fire and frost.

The vegetation cover of these ecological districts assisted in protecting and building the soil resource, playing a vital role in reducing erosion and the resultant effects of sedimentation and flooding. They helped to maintain a clean, healthy water resource and provide habitat for native animals including blue duck, koaro (a native fish), kiwi and the small-scaled skink.

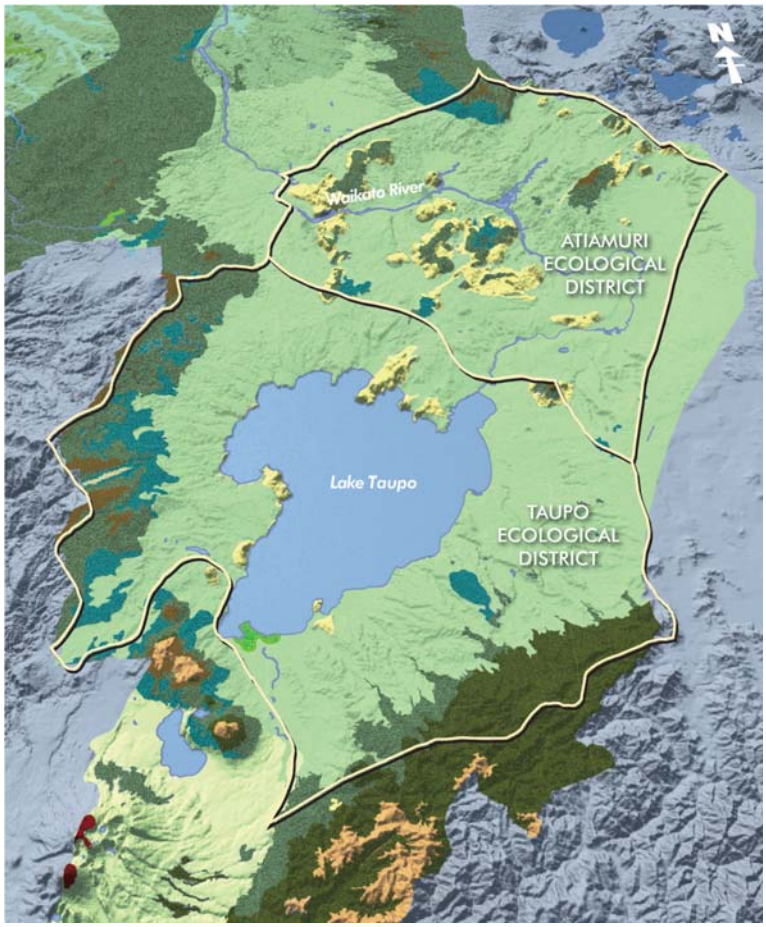
Over the past 150 years, clearance of land for forestry and agriculture further reduced the original forest cover. Only scattered original forest remnants remain today, mostly on higher altitude or steep inaccessible areas with most having been cut over for timber. As a result of efforts to protect Lake Taupo's water quality, approximately 11,000 hectares have been set aside as lakeside reserves and riparian corridors. These areas are now in regenerating scrub and young forest. However, in the Atiamuri ecological district very little indigenous vegetation remains, and the remnants are often small and degraded.

	Total land area (ha)	Portion of land area in native forest (%)	Portion of land area in all types of indigenous vegetation (%)
Taupo ecological district	203,520[2]	29	36
Atiamuri ecological district	222,420	4	7
Total central volcanic plateau	425,940	16	21

Taupo and Atiamuri ecological districts have some special plant communities.

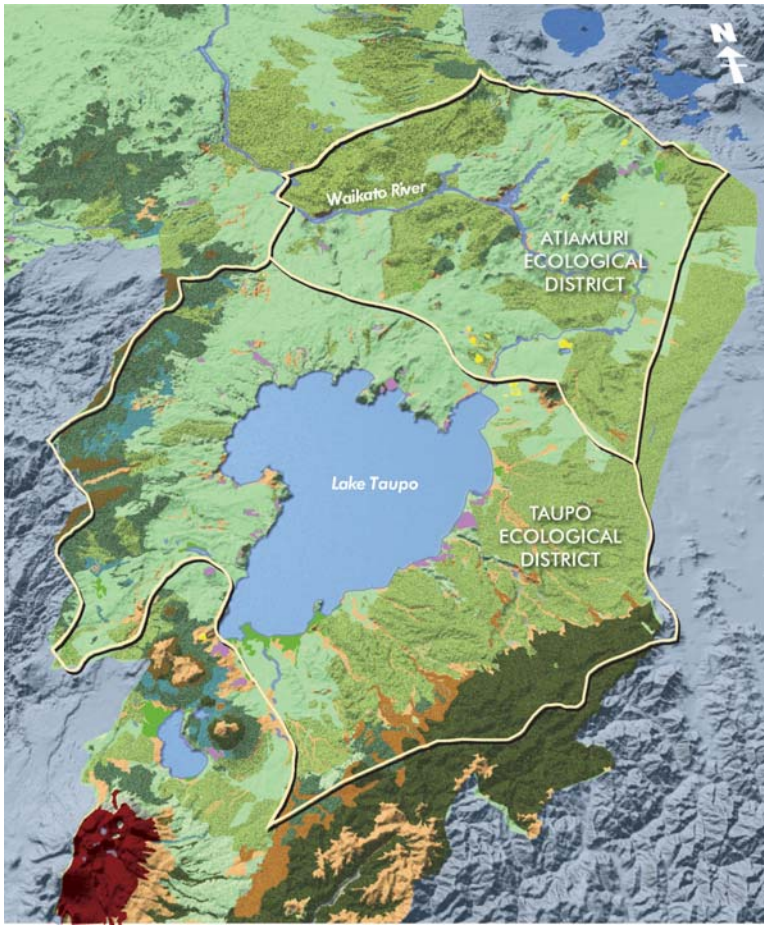
- The expanse of water in Lake Taupo creates a micro-climate enabling many 'coastal' species (about 20) to occur in a harsh inland situation. Species such as pohutukawa grow on or in close proximity (100 or so metres) to the lake shore where temperatures are milder and frosts rare.
- Black beech occurs in several small isolated stands on cliffs and steep ridges around Lake Taupo, on dry, infertile sites. It is thought that, along with red and silver beech, black beech may have rapidly colonised the raw pumice and ash soils after the catastrophic 186 AD eruption destroyed the existing forest cover, but the possibility exists that at least one of these stands, near Te Tawai Point, may be a remnant that remarkably survived the eruption. The rarity of black beech today is attributed to human-induced fires.
- Geothermal vegetation occurs as small steamy patches in a line from Turangi to White Island. Plants here are adapted to tolerate extremely high temperatures and unusual water and soil chemistry.

[2] Area excludes Lake Taupo (61,200 hectares).



Central Volcanic Plateau vegetation cover in 1840

- Beech forest
- Conifer forest
- Conifer - broadleaved forest
- Freshwater wetland
- Lava and debris flows
- Montane conifer - broadleaved forest
- Scrub / shrubland above treeline
- Secondary vegetation on domes
- Secondary vegetation on hill country (Lower Waikato)
- Secondary vegetation on plateaux
- Tongariro ringplain



Central Volcanic Plateau vegetation cover today

- Beech forest
- Conifer forest
- Conifer - broadleaved forest
- Conifer - broadleaved beech forest
- Exotic plantation
- Fernland
- Freshwater wetland
- Geothermal areas
- Lava and debris flows
- Montane conifer - broadleaved forest
- Pasture and general landuse

What is special about these ecological districts?

Special community projects

Lake Taupo at 61,300 hectares is the largest lake in New Zealand and a national treasure, renowned for its excellent water quality and clarity. However concerns have been raised recently about threats to this status.

Prior to deforestation, the densely forested catchment provided a natural filtration system as the water moved across the land flowing through the various wetlands, streams and waterways, eventually reaching Lake Taupo and moving on into the Waikato River as cool, clear water. Following forest clearance, land drainage, land use intensification and the spread of pest species, the natural filter has been disrupted.

The local community, concerned about the impacts of weed invasion, high nutrient levels and increased sedimentation on water quality, is taking action. There are currently over 14 environmental community groups active in the Taupo catchment, involved in voluntary activities such as education and advocacy, animal and plant pest control, fencing and planting, and recovery of threatened species. Local landcare, lakecare, wildlife management and other restoration groups all operate with a common theme of people working together to protect our environment.

Community projects

Taupo Lake Care

Taupo lake Care was formed in 2000 – to represent the farming community in restoration of water quality in the Lake Taupo catchment. Their focus is finding practical, sustainable management solutions to ensure the long-term water quality of Lake Taupo and the economic viability of land management and farming businesses.

Community work in progress.
More than12 environmental community groups are active in the Taupo and Atimauri districts.

Key activities:

- kamahi forest education about the economic, social and environmental impacts associated with non point source water discharges
- funding and facilitating research into sustainable arming practices and the economic impact of a 'nitrogen cap' on farming businesses
- developing workable solutions, such as 'cap and trade' regime, for managing nitrogen inputs in Lake Taupo
- maintenance of riparian waterway planting – over 80 per cent of the catchment's waterways are already retired and planted.

For more information, visit www.landcare.org.nz/action/groups and search on in the key word 'Taupo'.

Waimarino Wetland Restoration

Formed to restore a representative example of the variety of wetland types and associated species that occur within the South Taupo wetland.

Key activities:

- willow control through aerial spraying and hand control
- monitoring bird life
- some replanting including kahikatea.

Pukawa Wildlife Management Group
Formed to restore birdlife to the forests of Pukawa Bay on the south-western shores of Lake Taupo. This group recently received an award for their pest control initiative.

Key activities:
- animal pest control, with the guidance and support of DOC
- bird counts from December to February
- kamahi forest monitoring pest plants such as German ivy and cotoneaster for removal by pest plant contractors
- threatened plant restoration – placing white mistletoe (*Tupeia antarctica*) seedlings on trees.

For more information, visit www.landcare.org.nz/action/groups and type in key word 'Pukawa'.

Torepatutahi Landcare Group
Formed to assist DOC to manage the Torepatutahi Canyon in Reporoa – the headwaters of the Torepatutahi Stream, and an important landscape feature highly used by various outdoors groups.

If you are interested in getting involved with a community group contact Biodiversity Advice Waikato on 0800 BIODIV (0800 246 348) for a list of groups in your area or interest.

Key activities:
- re-vegetating the area for soil conservation
- enhancing access to the canyon
- restoring vegetation by planting local species such as koromiko, flax (*Phormium tenax*) and kohuhu.

For more information, visit www.landcare.org.nz/action/groups and search on the in key word 'Torepatutahi'.

Special native wildlife
Despite the paucity of native forest, particularly in Atiamuri ecological district, most forest remnants contain indigenous birds species which are generally rare or absent from similar sized remnants in the Waikato lowlands, including toutouwai (North Island robin), bellbird, whitehead, tomtit and karearea (New Zealand falcon). This is probably due to the large area of exotic forest surrounding the forest remnants, and forming linkages between native forests such as Pureora and Kaimanawa forest parks and the Paeroa range. Long-tailed bats are present and use both exotic and native forest areas. Reptiles include the common forest and Auckland green gecko and locally the rare speckled skink (*Oligosoma infrapunctatum*).

Lake Taupo, the Waikato River and its hydrolakes have numerous wetlands that adjoin them, and waterfowl and wetland birds are numerous, including nationally threatened and rare bird species such as dabchick, matuku (bittern), and matata (fernbird). Lake Taupo is the stronghold for waterfowl and contains large populations of grey teal, scaup and black swans. A small resident population of black billed gulls is present at geothermal Lake Rotokawa. Large numbers of four species of shags are present, with a nationally significant rookery on Motutaiko Island in Lake Taupo. The same island hosts a distinctive population of the common skink (*Leiolopisma nigriplantare*) and the nationally endangered land snail (*Wainuia clarkia*). The diversity of indigenous fish species is low with koaro, smelt, koura, bullies and native mussels probably being introduced by Maori and Europeans above Huka Falls. Tributaries to Lake Taupo provide habitat for the nationally endangered blue duck (whio).

White heron and royal spoonbill are occasional visitors and are most commonly seen at the Tongariro delta. North Island kaka (more commonly known as kereru) are present closer to larger forest parks. Small remnant North Island brown kiwi populations are known at a few sites though this species will likely become locally extinct in the near future unless protected from predators such as stoats.

Pest mammals, especially ship rats, are major predators of our native birds and are a real threat. Pest control is the best thing everyone can do to assist in providing a safe habitat for native birds.

Special plants

About 130 plant species native to the Waikato region are at risk of extinction. Planting threatened species will help ensure their survival. There are also a number of species of plants in the central volcanic plateau that are uncommon in the wider Waikato region.

The following table lists some threatened species or species which are not abundant that you may like to try establishing:

Maori/common names	Botanical name	Ecological district*	Plant type	Habitat	Status
Mountain wineberry	*Aristotelia fruticosa*	A	Shrub	Montane and frostflat scrub and shrubland.	
Leatherwood	*Brachyglottis elaeagnifolia*	T	Shrub	Montane scrub and forest margins.	
Kohurangi/ Kirk's daisy	*Brachyglottis kirkii var. kirkii*	A	Shrub	An epiphyte on trees in lowland and lower montane forest. Plant in areas free of deer, goats and possums.	Threatened species
Small-leaved tutu	*Coriaria kingiana*	T	Shrub	Montane scrub, stream sides.	
Mountain tutu	*Coriaria pteridoides*	T	Shrub	Montane scrub, stream sides.	
Nehenehe	*Epacris alpina*	A, T	Shrub	Frost flat shrubland.	
Prostrate snowberry	*Gaultheria macrostigma*	T	Shrub	Dry open grass/tussockland.	
	Helichrysum filicaule	A, T	Shrub	Dry open grass/tussockland.	
Niniao	*Helichrysum lanceolatum*	T	Shrub	Dry open scrub, shrubland and forest margins.	
Dwarf mistletoe	*Korthalsella salicornioides*	A, T	Shrub/ hemiparasite	Parasitic plant, locally common on manuka and kanuka.	Threatened species
Mida/willow leaved maire	*Mida salicifolia*	A, T	Small tree	Lowland forest.	Threatened species
Weeping mapou	*Myrsine divaricata*	T	Small tree	Lowland and montane forest, shrub and scrubland.	
Mountain beech	*Nothofagus solandri var. cliffortioides*	T	Tree	Montane forest.	
Black beech	*Nothofagus solandri var.solandri*	T	Tree	Lowland and montane dry ridges and spurs; river terraces.	
Hakeke/ mountain holly	*Olearia ilicifolia*	T	Shrub	Montane scrub and forest margins.	
Shrub daisy	*Olearia nummulariifolia*	T	Shrub	Montane scrub and shrubland.	
	Parahebe catarractae subsp. catarractae	T	Shrub	Damp, open streamsides.	
Turner's kohuhu	*Pittosporum turneri*	T	Small tree	Montane forest margins, streamsides and frost flats.	Threatened species
Manatu/ ribbonwood	*Plagianthus regius*	A	Small tree	Lowland forest – valleys and lower hillslopes.	Regionally uncommon
Raukawa	*Raukaua edgerleyi*	A, T	Small tree	Sub-montane/montane cloud forest/lowland forest.	Threatened species
Poroporo	*Solanum laciniatum*	A, T	Shrub	Lowland forest margins.	
Kowhai	*Sophora tetraptera*	A, T	Tree	Lowland and montane forest margins and streamsides.	Distinctive
White mistletoe	*Tupeia antarctica*	T	Shrub/ hemiparasite	Locally common around Lake Taupo.	Threatened species

*A = Atiamuri, T = Taupo

Threatened species have been identified with a symbol in the plant list on page 25. Some of these plants may be difficult to source, but nurseries may be able to provide them if given prior notice. It is important that these species are eco-sourced (seed collected from naturally occurring plants) from the local district. Some of these plants require specialist techniques for establishment, and some of them will only thrive in montane environments.

Do not remove threatened plants from the wild.

Black billed gull.
Photo: Department of Conservation.

Poroporo, *Solanum laciniatum*.