Forest Fragment Management Series

MANAGING FOREST FRAGMENTS

FACTSHEET 3

WHERE DO I START?

If you have more than one fragment on your land you may need to plan where to start.

If you're new to this, start with a small site close to the house so it is easy to visit and monitor the changes as you go.

Otherwise, prioritise your fragments on the basis of size, shape, location, condition, maturity, access and special features.

- **SIZE**: Larger sites can generally maintain more native species.
- **SHAPE:** Sites that are squarish or circular will be cheaper to fence than narrow sites of the same size, and they will be less affected by edge effects (see inside).
- **LOCATION**: Fragments close to other native areas will have a better chance of being colonised by birds and native seeds; fragments that cross your boundary may enable you to protect a larger area with your neighbour's help; fragments adjacent to streams or wetlands can help protect them from run-off.
- **CONDITION**: Fragments with the fewest problems (e.g. those with few weeds and pests, fenced or partly fenced) will generally provide the best return for effort.
- **MATURITY**: Consider protecting areas with larger, more mature trees first – they may be hundreds of years old, so they're irreplacable in our lifetime.
- **ACCESS**: You'll need good access for fencing, pest control and planting, and to share your fragment with visitors.
- **SPECIAL FEATURES**: Some fragments have rare or threatened species, culturally important species (such as rongoā Māori) or other special features that you may wish to maintain or enjoy.

We can increase the lifespan of existing trees, encourage natural regeneration and provide food and habitat for more native animals.

A FOREST FRAGMENT IS A SMALL PATCH OF NATIVE FOREST.

Many landowners in the Waikato have forest fragments on their land.

Unfenced and unmanaged forest fragments, especially smaller ones, are likely to slowly degrade as the canopy trees age and die. Some of the threats to forest fragments are:

- stock damage
- weeds and pests
- wind damage
- spray drift
- drainage or water shortage
- vehicle track construction
- dumping or fill
- slips
- fire (in drier areas).

Forest fragments, especially small ones, may never be able to sustain the full range of native plants and animals that were present before land clearance. However, with good management, we can increase the lifespan of existing trees, encourage natural regeneration and provide food and habitat for more native animals.

This factsheet tells you how to manage a fragment of native forest, particularly in rural areas[1].

1 For urban fragments, contact Hamilton City Council (07) 838 6699 for a copy of their Gully Management Guide – gullyguide.co.nz.

HOW CAN I MANAGE A FOREST FRAGMENT?

Follow the steps below to improve the health, diversity and longevity of your forest fragment.

WHAT HAVE YOU GOT?

What needs doing (see the list of threats on page 1)? Are there valued plants and animals, or unwanted weeds and animal pests? Check out similar forests nearby. Do they have weeds that may become a problem in your fragment, or native plants that are missing from your fragment?

WHAT ARE YOUR AIMS?

Consider what you want to achieve, and how much time and money you want to invest. Decide which fragments to focus on first (see page 1).

SEEK HELP IF NECESSARY

Any keen community groups able to assist with fencing or pest control, or school groups keen to help growing plants? Check out Factsheet 4 for funding options.

SEEK ADVICE

Talk to neighbours who manage their fragments. Talk to local DOC or council staff, plant pest officers, QEII officers, Forest & Bird members.

LOOK FOR OTHER NATURAL AREAS NEARBY

Can you connect them? Can you plant a woodlot between them, or plant natives along a waterway?

FENCE OFF YOUR FRAGMENT(S)

PLAN AND START WEED AND PEST CONTROL

ENHANCE THE FRAGMENT

Plant the fragment edge, or understorey, if necessary (see our planting guide).

PROTECT YOUR INVESTMENT

A covenant can be placed on the site (you still own and can sell the land, but the site remains protected on the land title).

MONITOR YOUR FRAGMENT

Take lots of photos. Keep an eye out for weeds. Record what birds you see at different times of the year. Look for fruit and flowers, and young birds – they are a good sign that pest numbers are down.

ENJOY YOUR FRAGMENT

Add seats and paths. Listen to the birds. Take a night walk. Invite visitors to share it, too.

FENCE OUT STOCK

The first priority for all forest fragments should be to permanently exclude all livestock.

Cattle, goats and (to a lesser extent) sheep with free access to a fragment will heavily graze edible native seedlings and saplings and open up the forest understorey. Livestock can also weaken and sometimes kill trees by rubbing against trunks and trampling roots.

Stock damage may increase the risk of fire by creating an open, breezy and dry understorey, and increasing the buildup of broken branches and dead trees.

Excluding stock may result in weed growth, but most non-invasive weeds will be shaded out by native plants within a few years (see tips on weed control).

Healthy, ungrazed forests (with a dense native understorey, deep litter layer and thick shrub, sedge or flax margins) can intercept rainwater and surface run off, filtering out its sediments and nutrients and reducing erosion during heavy rain. Fragments with little or no understorey, and a forest floor of bare earth, cannot function in this way and may, in fact, contribute to the loss of sediment.

FENCING TIPS

- Use eight wire post and batten fencing for effective sheep and goat control.
- A well-maintained two or three wire electric fence will exclude cattle.
- If the fragment is small, open underneath, and/or exposed to wind, place the fence five or more metres away from the bush edge and plant up a buffer zone of hardy shrubs and small trees (see the planting guide). If you can't, or don't want to plant a buffer zone, fence under the dripline close to the bush margin to minimise weed invasion.
- Shelter for stock is important, and tall trees can provide shade beside rather than inside the forest. You could leave a few trees outside the fence, at least until shelter trees in the paddock are big enough.

Maintain your fence well – in half an hour a beast could undo years of restoration growth. Put in a gate to quickly get trespassing stock out.

Dead logs will provide habitat for fungi and invertebrates, which are food for other animals

MANAGING DRAINAGE

Drainage of adjacent farmland can threaten some forest fragments. Swamp margin species such as pukatea and swamp maire require root contact with the water table throughout the year to survive. Drainage of swamps and farmland can lower the water table and may kill mature swamp trees. See Wetland Restoration: Factsheet 1 by Waikato Regional Council to find out more about restoring water levels.

MANAGING EDGE EFFECTS

Most forest fragments are surrounded by pasture. The first 50 metres into these fragments have higher light and wind levels, temperature extremes and lower humidity than the forest interior. These harsh 'edge effects' can reduce seedling survival, especially of some canopy tree species, and reduce the number and kinds of perching plants. They can also create an open or weedy forest understorey along the margin.

In more sheltered sites, natural regeneration of native seedlings (assisted by weed control) may be sufficient to create an effective buffer of shrubs and small trees.

However, in more exposed sites a buffer zone of hardy native trees and shrubs may need to be planted around the forest margins to reduce the impact of edge effects. See the planting guide to find out what plants to use for a buffer at the edge.

FRAGMENT BIODIVERSITY

Because of their small size and isolation, forest fragments are not able to sustain the diversity of plants and animals found in large areas of native forest. Some bird species can't live permanently in fragments because of insufficient year-round food supplies.

Encourage plants and animals by:

- Retaining or planting native vegetation along stream and river margins to link separate fragments and improve wildlife passage.
- Planting woodlots between fragments, and harvesting outside the breeding season.
- Increasing the size of your fragment by planting around it.
- Planting in the understorey if natural regeneration is not occurring.
- Planting 'winter food' plants like miro, karamū, kōhūhū, korokio, lemonwood, five finger and putaputawētā and, in warmer areas, kohekohe and pūriri.
- Retaining dead standing trees and fallen logs within the fragment as habitat for fungi and invertebrates, which are food for other animals. Dead standing trees can also act as perching sites for birds that may drop seeds of native plants into the fragment, and as nest holes for bats and some birds.
- Regularly controlling animal pests, particularly in late winter for the spring breeding season.

Encouraging birds to your fragment will increase plant diversity, too, thanks to the seeds carried in by birds.

LONG TERM PROTECTION

There are several legal protection measures available to landowners to ensure that a forest fragment is well managed by future owners. These include the Queen Elizabeth II National Trust Open Space covenants and Ngā Whenua Rāhui kawenata (for Maori land). Some district councils also offer protective covenants, often in return for extra subdivision rights. See Factsheet 4 for contact details.

What to plant in Waikato forest fragments

BEFORE YOU LIFT A SPADE ... PREPARE A PLANTING PLAN

- Decide if you need to do any planting. It's probably better to focus on planting the edge and under large canopy gaps than in the understorey of a dense canopy.
- Make a list of the species you will use with the help of a planting guide developed for your area, or use the list in this factsheet as a starting point. Use the planting zones and plant tolerances to select plants suitable for your site and location. Not all species in the guide will be suitable for your area or situation. Coastal and upland areas, in particular, will have their own species associations. Discuss your list with local experts like native plant growers, botanical societies or your local council or DOC office.
- Determine the size of the area and the number of plants to be planted each year on the basis of the number of plants you can comfortably water and weed around.
- Draw a rough plan of your site, showing damp, dry, steep, flat, sheltered, windy, sunny, shady areas, etc. Decide where you want walkways and other features. Note which species you should plant and where, based on wind, drainage and light, for example. Don't waste time and money putting plants where they won't survive. Let nature 'tell' you what type of site each plant prefers by examining nearby native forests.
- Waikato Regional Council has several local planting guides, a detailed guide to *Planting Natives in the Waikato Region* with many helpful tips.

TIMING

Plant hardy, frost tolerant species in autumn, and frost sensitive species in spring. Plants requiring shelter or shade can be planted three to five years later, once cover has developed.

Supplementary planting under the canopy can be safely carried out any time from autumn to spring because the forest floor under a healthy canopy will generally be frost-free.

GET YOUR PLANTS

- Buy plants from nurseries that source plants from your district to ensure they are suited to your area's climate and soils. You may be able to grow some of your plants from seeds or cuttings taken from neighbouring fragments – always seek landowner permission before taking any plant material. Cuttings will be clones (genetically identical), so keep use of these to a minimum. Don't collect seed from or near gardens.
- For a higher chance of survival, use larger potted plants. These are also less likely to be uprooted by pūkeko or bitten off by hares.
- Some species have separate male and female plants – if you are planting a small area make sure you have at least four to five plants (not cuttings!) to ensure fruit production.

PLANTING AND MAINTENANCE

Remember that most native plants have virtually no tolerance of being grazed by stock. Fence prior to planting to protect your investment. Remove weeds from within and adjacent to forest fragments prior to planting (see the tips on weed control). Make sure you know which plants are weeds and which are native plants that typically occur in your forest type.

1. Set plants out in sites suitable to their growing requirements. Plant shrubs and small trees 1.5-2 metres part to avoid competition that may kill some plants. Large, spreading canopy trees like pūriri or tawa may eventually reach 10 metres or so across. Place these (often more expensive) plants further apart, but put smaller plants in between to avoid weed invasion.
2. Plant in groups. The plants will soon shelter each other and begin to shade out surrounding weeds making your job easier. More plants can be added to the edge of each group as time and resources permit.
3. Dig a hole twice the size of the plant container, leaving some soft soil at the bottom. Set the plant in the hole. Gradually fill in the soil and compact it to remove air gaps. If a post hole borer is used, rough up the sides to allow the roots to penetrate.
4. Form a hollow around the base of the plant to trap rainfall on dry sites. If practical give the plants and surrounding soil a good watering. Water young plants over dry spells.
5. Staking the plants at this stage will make them easier to locate later. Tall thin bamboo stakes highlighted with spray paint are ideal.
6. In sandy or clay soils, organic matter like well-rotted manure or compost can be added to improve soil structure.
7. Smothering by tall grass is the most common cause of planting failure. Control weeds for the first few years. Once native plants have grown tall enough they will begin to shade out grasses and weeds, and no longer require intensive weed control.
8. Mulch, such as untreated wood chips, compost, newspaper, old non-synthetic carpet, underlay or rotted hay, can be used to help conserve water, keep weeds down and add nutrients. Don't let the mulch touch the stem or it may rot the plant.
9. Pests such as rabbits and possums will need to be controlled, particularly before planting and during the seedling stage. See Tips on Pest Control.

PLANTING A BUFFER OR LINKAGE

This is probably the best area to focus on to protect a fragment. If you are fencing, leave 3-5 metres between the fence and the fragment to plant a buffer.

If the planting area is currently in pasture or weeds, clear a 1 metre circle around each plant with a spade or herbicide to ensure they get enough light and nutrients. Fast growing plants such as mānuka or kānuka can be used as nurse plants to provide shade for seedlings underneath. Plants like flax will attract native birds that will hopefully bring you native seeds to help with natural regeneration. Perching posts may also attract birds. Birds may also bring in weed seeds like privet and blackberry, so its important to check for and control them.

PLANTING UNDER AN EXISTING FRAGMENT

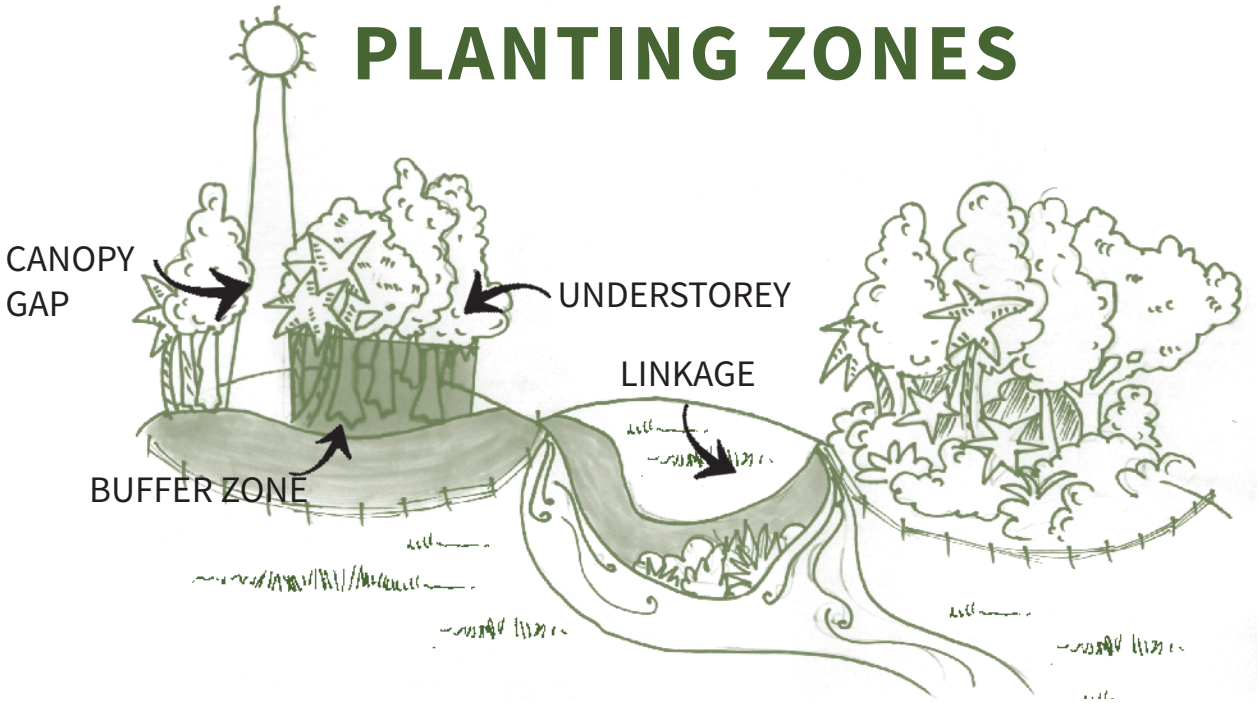
You will only need to do this if:

- your fragment has been heavily grazed and has very little understorey
- there is a high chance of weeds coming in
- the canopy is broken up leaving many 'gaps' that can become weedy
- there are no nearby natural areas to naturally reseed your fragment
- there are few saplings of future canopy species.

Natural generation is likely to happen if your site is near a natural area and you keep stock out and weeds under control. Native plants may germinate from the seed bank or be brought in by birds or wind. Wait for a year after fencing to see if natural regeneration occurs.

Tree species like rimu or pūriri will grow much faster when planted in light wells. These are areas where the forest floor has higher light levels, e.g. where a large tree has come down leaving a canopy gap. Shrubs and more shade-tolerant species like kohekohe, kawakawa, large-leaved coprosmas and patē can be planted in darker areas if natural regeneration is not occurring. Avoid planting too close to the roots of existing trees.

PLANTING ZONES



Key

1 - tolerates or needs
2 - tolerant of some
3 - poor or no tolerance

SPECIES FOR PLANTING IN CANOPY GAPS

(tolerant of moderate shade, and will grow best with overhead sunlight)

PLANT	LIGHT FROST	HEAVY FROST	WATER-LOGGING	DROUGHT	ATTRACTIVE TO BIRDS	GROWTH RATE	PLANT TYPE	NATURAL OCCURRENCE IN THE WAIKATO REGION
TARAIRE *Beilschmiedia tarairi*	2-3	3	2-3	3	Y	slow	tree	north of Huntly
TAWA *Beilschmiedia tawa*	2	3	2-3	3	Y	slow	tree	throughout
KARAKA *Corynocarpus laevigatus*	2	3	3	2	Y	fast	tree	coastal and lowland areas
RIMU *Dacrydium cupressinum*	1	3	2-3	2-3	Y	slow	tree	throughout

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SPECIES FOR PLANTING IN CANOPY GAPS

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PLANT	LIGHT FROST	HEAVY FROST	WATER-LOGGING	DROUGHT	ATTRACTIVE TO BIRDS	GROWTH RATE	PLANT TYPE	NATURAL OCCURRENCE IN THE WAIKATO REGION
HĪNAU *Elaeocarpus dentatus*	1	3	3	3		slow	tree	throughout
TREE FUCHSIA *Fuchsia excorticata*	1	2	3	3	Y	mod	tree	throughout, riversides
REWAREWA *Knightea excelsa*	2	2	2-3	2	Y	mod	tree	throughout
PUKATEA *Laurelia novae-zelandiae*	1	3	1	3		mod	tree	throughout, damper areas
MANGEAO *Litsea calicaris*	1	3	3	3		mod	tree	often on volcanic soils
TŌTARA *Podocarpus totara*	1	2	3	2	Y	mod	tree	throughout, lowland areas
MIRO *Prumnopitys ferruginea*	1	2	3	3	Y	slow	tree	throughout
MATAĪ *Prumnopitys taxifolia*	1	2	2	3	Y	slow	tree	throughout
PŪRIRI *Vitex lucens*	2	3	3	2	Y	fast	tree	coastal areas
KĀMAHI *Weinmannia racemosa*	1	2	2	2-3		mod	tree	throughout, upland areas
TŌWAI *Weinmannia silvicola*	1-2	2-3	2	2-3		mod	tree	Coromandel and north Waikato, uplands

Many of these species will also grow in full sun and may grow faster in sun than shade.

Key

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SPECIES FOR PLANTING IN THE UNDERSTOREY

(tolerant of moderate to full shade, and will also grow well in canopy gaps)

PLANT	LIGHT FROST	HEAVY FROST	WATER-LOGGING	DROUGHT	ATTRACTIVE TO BIRDS	GROWTH RATE	PLANT TYPE	NATURAL OCCURRENCE IN THE WAIKATO REGION
TĪTOKI *Alectryon excelsus*	2	3	2-3	2-3	Y	mod	tree	lowland and coastal areas
RANGIORA *Brachyglottis repanda*	2	3	3	2		mod	small tree	throughout
KANONO *Coprosma grandifolia*	1	3	3	3	Y	mod	small tree	throughout
KARAMŪ *Coprosma robusta/ C. lucida*	1	2	3	2	Y	fast	small tree/shrub	throughout
TREE FERNS *Cyathea species*	1-3	2-3	2-3	2-3		slow	tree ferns	throughout
KOHEKOHE *Dysoxylum spectabile*	2	3	3	3	Y	mod	tree	lowland and coastal areas
HANGEHANGE *Geniostoma rupestre*	2	3	2-3	3		slow	shrub	throughout
PIGEONWOOD *Hedycarya arborea*	1	3	3	3	Y	mod	tree	throughout
MĀHOE *Melicytus ramiflorus*	1	3	3	3	Y	mod	tree	throughout
MĀPOU *Myrsine australis*	1	3	2	2	Y	fast	small tree	throughout
HEKETARA *Olearia rani*	1	3	3	2		mod	small tree	throughout
KAWAKAWA *Piper excelsum*	2-3	3	3	2	Y	fast	small tree/shrub	throughout, lower elevations
FIVE FINGER/ WHAUWHAUPAKU *Pseudopanax arboreus*	1	2-3	3	2	Y	fast	small tree	throughout

Key

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2 - tolerant of some
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SPECIES FOR PLANTING IN THE UNDERSTOREY

(tolerant of moderate to full shade, and will also grow well in canopy gaps)

PLANT	LIGHT FROST	HEAVY FROST	WATER-LOGGING	DROUGHT	ATTRACTIVE TO BIRDS	GROWTH RATE	PLANT TYPE	NATURAL OCCURRENCE IN THE WAIKATO REGION
NĪKAU *Rhopalostylis sapida*	2	3	2-3	2-3	Y	slow	tree	lowland and coastal areas
PATĒ *Schefflera digitata*	2	3	2-3	3	Y	mod	small tree	throughout

NOTE: *Tolerances of a given species may vary with location and genetic variability among plants. Seek local advice. Fern spores are widely dispersed so ferns may turn up on their own.*

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SPECIES FOR FRAGMENT BUFFERS AND LINKAGES

(tolerant of full sun and light frost, some tolerant of heavy frost)

PLANT	LIGHT FROST	HEAVY FROST	WATER-LOGGING	DROUGHT	ATTRACTIVE TO BIRDS	GROWTH RATE	PLANT TYPE	NATURAL OCCURRENCE IN THE WAIKATO REGION
KAURI *Agathis australis*	1	3	3	2		mod	tree	north of Raglan and Hamilton
WINEBERRY *Aristotelia serrata*	1	2-3	3	2-3	Y	fast	small tree	throughout
KARAMŪ *Coprosma robusta*	1	1-2	2	2	Y	fast	small tree	throughout
TĪ KŌUKA, CABBAGE TREE *Cordyline australis*	1	1	1-2	1-2	Y	fast	tree	throughout
KAHIKATEA *Dacrycarpus dacrydioides*	1	3	1	3	Y	slow	tree	throughout
HOUHERE, LACEBARK *Hoheria populnea/ Hoheria sexstylosa*	1	1-2	2	1-2	Y	fast	tree	*H. populnea* north of Putaruru, *H. sexstylosa* throughout
KĀNUKA *Kunzea ericoides*	1	1	3	1		mod	tree	throughout
MĀNUKA *Leptospermum scoparium*	1	1-2	1	1		fast	small tree	throughout
MĀHOE *Melicytus ramiflorus*	1	2-3	3	3	Y	mod	tree	throughout
MĀPOU *Myrsine australis*	1	2-3	3	2	Y	fast	small tree	throughout, esp. drier sites
AKEPIRO *Olearia furfuracea*	1	2-3	3	1-2		mod	small tree	throughout
TĀNEKAHA *Phyllocladus trichomanoides*	1	2	3	2-3		mod	tree	throughout
LEMONWOOD, TARATA *Pittosporum eugenioides*	1	1-2	3	2		mod	tree	throughout
KŌHŪHŪ *Pittosporum tenuifolium*	1	1-2	3	2		mod	tree	throughout
TŌTARA *Podocarpus totara*	1	2-3	3	2-3	Y	mod	tree	throughout
FIVE FINGER *Pseudopanax arboreus*	1	2-3	3	2	Y	fast	small tree	throughout
LANCEWOOD *Pseudopanax crassifolius*	1	2-3	3	2	Y	mod	tree	throughout
KŌWHAI *Sophora microphylla*	1	1-2	2	1-2	Y	mod	tree	throughout
KOROMIKO *Veronica stricta*	1	1-2	2	2		fast	shrub	throughout

WILY WEEDS

Removing livestock can lead to a rapid increase in seedlings on the forest floor. However, in fragments that had been heavily grazed, these seedlings may be of invasive weed species[2]. Unless they are controlled:

- weeds like blackberry, pampas, gorse, broom, and woolly nightshade can occupy ungrazed forest margins more rapidly than native plants
- weeds tolerant of low light levels, such as wandering willie, wild ginger, ivy and periwinkle, will quickly cover the forest floor, smothering native seedlings and preventing regeneration
- introduced climbers like old man's beard, Japanese honeysuckle and climbing asparagus will smother and kill trees in fragments damaged by grazing.

Early and repeated control of invasive weeds may be necessary in areas where weeds are common, and in forest fragments just retired from grazing. If troublesome weeds are left to establish, a more substantial effort will be needed to remove or control them later.

2 Note that in addition to the listed regional plant pests, many other weed species threaten fragments.

ANIMAL PESTS

Forest fragments have a large boundary for their size, and are therefore prone to constant reinvasion by pests. The impact of animal pests on forest fragments can be staggering.

- Possums mostly browse on leaves, but also eat young native birds and eggs, fungi and invertebrates.
- Rabbits and hares are most common on open pasture land, but will graze seedlings in small fragments and forest margins if the vegetation is not too dense.
- In larger fragments, especially near large areas of forest, goats and deer can cause considerable damage to seedlings, saplings and the bark of trees within the 'browsing zone' (0.25 to 2 metres above the forest floor).
- Rats and mice feed on seeds falling to the forest floor and rats can eat surprisingly large amounts of seedling and shrub foliage as well as bird eggs and invertebrates.
- Stoats, ferrets, weasels, ship rats, possums and feral (and domestic) cats kill many native animals in forest fragments.

TIPS ON WEED CONTROL

- When working with spades and machinery in weedy areas, wash them down before using them elsewhere on the farm so you don't spread weeds. Fencing out stock will also reduce the spread of weeds.
- In small areas, control weeds by hand pulling, digging and cutting. However, in larger areas, and where weed invasion is substantial, herbicides may be the only practical means of control.
- Ask your local plant pest officers, qualified contractors, the QEII National Trust, or DOC, about herbicides before you buy.
- Use chemicals that are proven against your target weed, and always apply them at the recommended rates.
- Native plants are sensitive to most herbicides. Avoid spray drift by spraying only when there is little or no wind and placing a spray cone over the nozzle.
- Don't use chemicals that remain active in the soil for long periods near native plants, or where natives are in the path of surface run-off. Follow the label's stand-down period between spraying and planting.
- If natural regeneration does not readily occur, plant native trees and shrubs in the understorey, especially at the edges, to increase shade and deter weeds. See the planting guide for suitable species.

TIPS ON PEST CONTROL

- For pest control to be effective it needs to be undertaken at regular intervals.
- Extend control to surrounding farmland to create a buffer zone of low pest numbers and reduce reinvasion rates.
- Animal pests can be controlled with traps and poisons, but make sure they don't harm non-target animals.
- The Department of Conservation and Waikato Regional Council can assist you with advice on appropriate control methods. Always get permission from the Department of Conservation before using traps or poison on conservation land.

Photo: Nga Manu

For more information call 0800 800 401 or visit waikatoregion.govt.nz.

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Waikato REGIONAL COUNCIL
Te Kaunihera ā Rohe o Waikato