NEW ZEALAND
FOREST OWNERS' ASSOCIATION INC.

New Zealand Environmental Code of Practice for Plantation Forestry

Parts One to Five

Version 1

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NZFOA E-CoP Version 1

The New Zealand Environmental Code of Practice for Plantation Forestry

The NZ Environmental Code of Practice for Plantation Forestry (E-CoP) is intended to replace the New Zealand Forestry Code of Practice (the LIRO Code) that was first published in 1990 and revised in 1993. The new code up-dates the information contained in the original LIRO Code; however, the focus has also been expanded to include a section setting out industry best environmental practices (BEPs).

The Code aims to be a key reference tool to a wide range of parties involved in managing forests by providing information on environmental values, how such values should be assimilated into operational planning, other references and resources as well as the beps. It may also serve as a useful framework for training purposes.

The BEP section is intended as a tool-kit; describing a range of management options that could be applied to a particular situation. It is up to the planner or operator to consider all the relevant factors, on a site by site basis, and decide which one (or more) of the options provided is most applicable. The provision and exercise of such discretion for the planner or operator means that it is not suitable or appropriate for any regulatory body to require blanket compliance with this code.

Appropriate web sites are quoted wherever possible and are recommended as the source of up-to-date information. This is particularly relevant in areas such as legislation, council plans and research.

When using this document in electronic format, text in blue marks live hyperlinks to websites or other sections within the code or to the meanings of terms compiled in the glossary. In the latter case, only the first such use of any term in each BEP is hyperlinked. Commonly used glossary terms are generally not hyperlinked in parts 2 through to 5 where more information gives better context to the terms used.

To order further copies of this publication please refer to the FITEC website www.fitec.org.nz

The NZ forest owner's association has always identified the important environmental values that well grown and managed plantation forests can provide – clean water, soil conservation and rehabilitation, biodiversity and more recently the values associated with carbon sequestration.

It is a matter of record that the forest growing industry is also one of the major contributors to the country's economy and is an important element in the pattern of rural landuse which largely drives that economy. Approximately 25,000 people, mostly living in regional centres and rural communities are directly employed in the forest growing and primary wood processing industry, while a further two to three times that number derive much of their income from directly supporting this activity.

At least part of the reason for the success of forestry in NZ has been the ability of the industry to adopt and even lead in the provision of new technologies, meeting the communities' wood fibre needs while operating in a manner which met wider expectations in terms of environmental conservation.

And over time, as environmental knowledge and understanding has developed these expectations have changed. The forest industry has played its part in this process as well, with the commitment to the forest accord, forest sustainability standards, the present effort to develop sustainability certification standards – all including a high level of consultation with community groups best able to address such matters.

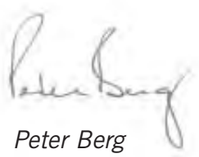
In 1992 the first Code of Practice for Forest Operations was produced by the logging industry research association setting out clear guidelines for forest operations, **designed to minimise environmental impacts and encourage best practice without exception.** Many local authorities further developed the lead these provided, requiring adherence to the environmental code of practice as a minimum standard for forest operations in their area.

Although much of the content of this code is still relevant there have been significant changes in the machinery, techniques and materials utilised in present day forestry practice; much of which has come about because of the desire to continue to provide the highest levels of environmental protection.

Accordingly, two to three years ago, it was determined that the Code of Practice for Forest Operations should be completely revised to include standards that will **continue to ensure the highest level of excellence in our forest operations.**

The new 2007 Environmental Code of practice achieves all of that – it is a more comprehensive, state of the art, yet practical guide to forest operations that will ensure a high level of protection of the environment throughout the life cycle of a forest crop.

The NZ forest owners association have made a strong commitment to the production of the revised code and believe it will ensure that **the highest level of excellence attach to our forest operations well into the future.** We strongly endorse the Environmental Code of Practice to all forest owners throughout New Zealand and recommend that all our members adhere to its principles and practice.



Peter Berg
Chairman, NZFOA

The NZ Farm Forestry Association not only applauds the commitment of the NZ Forest Owners Association in the development of this code, but also enthusiastically endorses it and will **firmly recommend that all its members adhere to its principles and practice.**

Pat Milne
President, NZFFA

FICA endorses the best environmental practices defined in this updated code and acknowledges their value for assuring compliance with the resource management act and other relevant legislation.

John Stulen
Chief Executive
FICA – Forest Industry Contractors Association

Aims of the code

To plan, manage, and carry out commercial forest operations in a way that avoids, remedies, or mitigates adverse effects on the environment.

The code is a practical means of helping forest planners, contractors and operators to consistently accomplish required levels of environmental performance consistent with good health and safety and financial performance and the community and regulatory expectations that they face.

The goals of environmentally sound management

Commercial values and sustainability
To ensure all forest operations are carried out in an efficient, economic and effective manner whilst meeting appropriate environmental standards and ensuring applicable environmental regulation is met or exceeded.

Ecological values & scientific values
To identify and protect areas of significant ecological and scientific value within managed forests.

Forest protection
To maintain healthy forests while avoiding, remedying, or mitigating adverse effects on the environment.

Historic and cultural heritage values
To identify and protect sites of traditional, historical, and archaeological value.

Neighbour and other off-site impacts
To avoid, remedy, or mitigate adverse effects of forest operations on neighbouring properties and off site values.

Recreational values
To recognise and provide for recreational values throughout the forest cycle.

Scenic and landscape values
To recognise and manage the potential adverse effects of forest operations on visual amenity values.

Soil and water values
To avoid, remedy, or mitigate adverse effects of forest operations on soil and water values.

Understanding the environmental benefits of plantation forestry
To assist community understanding of the environmental benefits of plantation forestry.

Training
To provide a resource that can be used as part of environmental training programmes.

The role of planted forests as sustainable and environmentally sound sources of renewable energy and industrial raw material should be recognized, enhanced and promoted. Their contribution to the maintenance of ecological processes, to offsetting pressure on primary and old-growth forest and to providing regional employment and development with the adequate involvement of local inhabitants should be recognised and enhanced (The Forest Principles, UNCED, 1992).

Planted forests, managed in a sound manner, contribute positively towards the provision of environmental services (soil and water protection, rehabilitation of degraded lands, restoration of landscapes and carbon sequestration) and provision of social services and livelihood support (income generation, employment and recreation). The productivity of planted forests for forest products supply is substantially greater than in natural forests. The added benefits of wood products over competing products, is that they are renewable, energy efficient and environmentally friendly (UN FAO 2006).

Well managed plantation forests provide a number of environmental benefits, particularly when compared with alternative construction products such as concrete and steel, and productive land uses such as pastoral farming. Plantation forestry compares very well with other commercial land management practices in the protection of soil and water values, (e.g. erosion control and stream habitat values). These benefits are seen to be increasingly important as public awareness of the environment increases (e.g. climate change and water quality). As the New Zealand population becomes more urbanised, demand for recreational opportunities increases and plantation forests can provide a wide range of recreational experiences and opportunities. These additional values (environmental services) are described in more detail in later sections of the Code.

Community expectations, expressed through legislation, council rules and voluntary commitments, encourage forest owners and managers to use sound environmental practices that maintain both forest productivity and profitability. To do this, forest practices must be safe, environmentally and socially acceptable, physically achievable and economically viable.

By selecting appropriate environmental and management practices as outlined in the Code, along with existing legislation and other technical information, forest owners and managers can achieve sustainable commercial goals whilst meeting sound and practical environmental standards.

The NZ Environmental Code of Practice for Plantation Forestry was developed in accordance with the UN Food and Agriculture Organisation (FAOs) Planted Forest Code. Both the UN Code and the NZ Code apply to planted forests grown to provide wood, fibre, and non-wood forest products and also fulfils a role in providing protective functions and the provision of environmental and/or social services. The Code covers all aspects of planted forests, from policy development and planning, down to technical considerations of plantation management and day-to-day operations.

How to use the code

The New Zealand Environmental Code of Practice for Plantation Forestry (the Code) is intended for use by private and public forest owners, planners, contractors, forestry consultants and council staff involved in the forest industry.

A planned approach to environmental management within the industry means that environmental values and risks are identified at the planning stage, or earlier. Once the values and risks have been identified, appropriate operational methods can be recommended to ensure that values are protected and potential adverse effects are avoided or mitigated.

Some forest owners will have formal environmental management systems (EMS) in place to manage operations within their specific estates. Whilst these contain procedures and processes that are likely to be similar to those in this code, there may also be slight differences.

The relationship between this code and its anticipated user audience is listed below. The Environmental Code is divided into five parts:

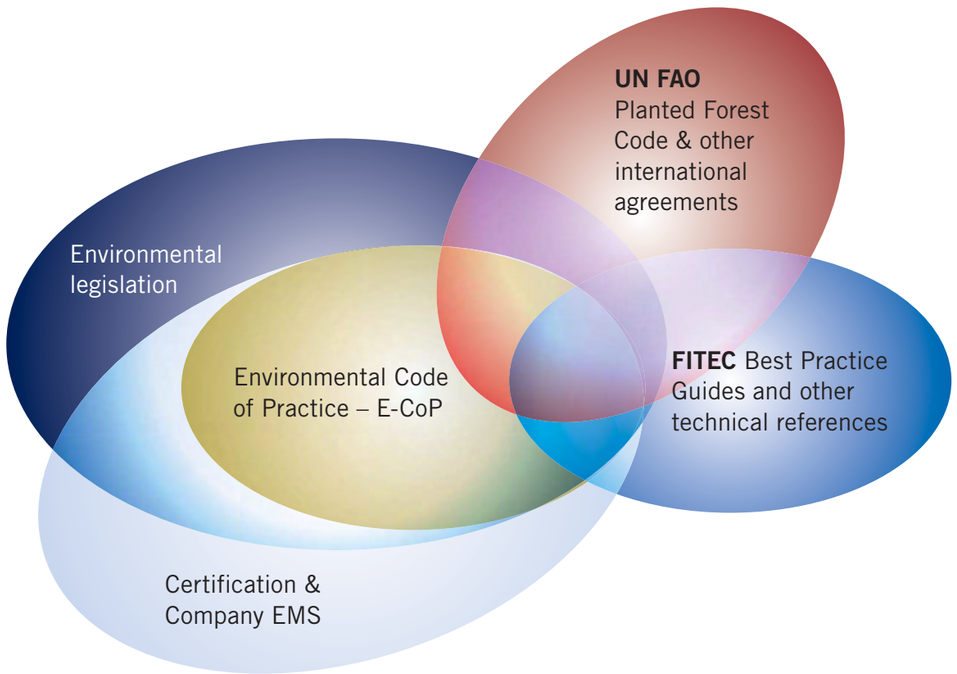
PART 1	**BEST ENVIRONMENTAL MANAGEMENT PRACTICES** Designed for operational practitioners *This section aims to provide ready access to recommended beps by forestry practitioners and contractors. The section is also designed to allow for stand-alone production of the beps for use and distribution in the field.*
PARTS 2 & 3	**RECOGNISING ENVIRONMENTAL VALUES & PLANNING FOR GOOD ENVIRONMENTAL OUTCOMES** Designed for forest planners, regulators and the general public *This section aims to provide broad guidance into the means and processes involved in planning forest operations to achieve good environmental outcomes particularly for those newly contemplating forest operations.*
PART 4	**RESOURCES AND REFERENCES** Designed as a reference section for all users *This section provides summary information and references to the legislative structure and relevant industry agreements, standards and protocols that influence the commercial forestry sector.*
PART 5	**TRAINING** Outlines training opportunities, requirements and courses relevant to environmental management in forestry operations. *Forest management staff have created a number of new zealand qualification authority (nzqa) recognised environmental unit standards for use by the industry. Training by experienced, qualified environmental trainers is making a major contribution to environmental understanding within the forest industry.*
GLOSSARY & APPENDICES	The appendices contain references to further information (including web sites).

The Code complements a range of other material readily available to the industry. This includes:

- Industry best practice guides such as those produced by FITEC and covering operational best practices within the industry
- Industry produced material, company environmental management systems (ems), and company policy and procedures.
- Environmental legislation including council plans and guides
- Forest certification standards

Furthermore, all forest management and in this case forest environmental management, must comply with the environmental laws of New Zealand. The Forestry Code is a subset of the wider framework of information designed to complement forward planning, operational conduct and appropriate training of all parties involved in forestry operations to ensure they can meet required legal and good practice standards.

The illustration below illustrates the relationship of the Forestry Code of Practice and associated BEPs with the wider forestry management arena. Careful attention to their implementation will ensure a balanced outcome is achieved – between the critical elements of safety, environment and economy.



Part 1
BEST ENVIRONMENTAL MANAGEMENT PRACTICES

NZFOA E-CoP Version 1

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Overview

Best Environmental Practices (BEPs), are primarily intended for use by those directly involved in undertaking or managing forestry operations. They have been developed for all key forest operations, such as harvesting and establishment, recognising that their implementation should not put the health and safety of operators and workers at risk. **The relevant legal and practical requirements of the health and safety in employment act should take precedence.**

As with safety, compliance with any environmental legal conditions is a necessity and is a key objective of any operation. Use of the BEPs does not replace or abdicate any responsibility for ensuring compliance but use of the BEPs will help to ensure that an operation complies with any associated environmental legal requirements. Such legal requirements include resource consents, historic places authorities and standards/conditions for permitted activities under a regional or district plan (refer to part 4 of the full E-CoP). The BEPs have also been designed to incorporate the requirements of voluntary industry agreements like the New Zealand forest accord.

Relationship of BEPs to the management environment

The BEPs should not be used in isolation. In some cases, a number of different BEPs may be applied to a particular operation. Some BEPs will also refer to parts of more technical guides such as the FITEC Best Practice Guides, or other documentation where appropriate.

This wider relationship is detailed in the section on use of the Environmental Code of Practice.

Using BEPs

For those familiar with forestry management, any particular BEP applicable to a proposed operation may be selected simply from the index table below.

Others less familiar with operational and planning requirements may wish to refer to the **Operations Based Table** for guidance on the BEPs that might be applicable to any operation they are considering.

Each BEP is split into 2 sections, **Rules** and **Guidelines**. Rules are compulsory and must be met. Guidelines list additional considerations to be acted upon where safe and practical to do so. Each BEP is followed by guidance notes that provide basic background information relating to the particular BEP.

OPERATIONS BASED TABLE

Contemplating the following operation	In addition to these BEPs...	Page
All operations	1. Operational planning – BEP	3
	17. Environmental incident – BEP	50
	15. Waste management – BEP	46
	13. Historical & heritage site discovery – BEP	41
	16. Operational monitoring – BEP	48
	You may need the following BEPs	
Road or tracks or landings, quarries	2. Earthworks – BEP	6
	5. Waterway crossings – BEP	17
	4. Slash management – BEP	14
	12. Historical & heritage management – BEP	37
	14. Fuel and oil – BEP	43
Harvesting	3. Harvesting – BEP	10
	2. Earthworks – BEP	6
	5. Waterway crossings – BEP	17
	4. Slash management – BEP	14
	12. Historical & heritage management – BEP	37
	14. Fuel and oil – BEP	43
Mechanical land preparation	6. Mechanical land preparation – BEP	21
	12. Historical & heritage management – BEP	37
	14. Fuel and oil – BEP	43
Burning	8. Burning – BEP	27
	12. Historical & heritage management – BEP	37
	14. Fuel and oil – BEP	43
Planting	9. Planting – BEP	30
	12. Historical & heritage management – BEP	37
Pruning & waste thinning	10. Pruning & waste thinning – BEP	32
Fertiliser application	11. Fertiliser application – BEP	34
	14. Fuel and oil – BEP	43
Agrichemical application	7. Agrichemical application – BEP	24
	14. Fuel and oil – BEP	43
Forest protection	18. Forest protection – BEP	52

Applies to the development of forest operational plans. This BEP covers all forest operations including plans for forest establishment, silviculture, forest health, earthworks and logging.	
Objective	• To scope, identify and evaluate all relevant issues and associated environmental and compliance risks. • To prescribe methods and techniques that accomplishes full legal compliance and an effective balance of economic, safety and environmental performance outcomes.
BEP	
Rules (Compulsory)	**General rules** • Develop a robust planning process to ensure planning completeness and consistency. • Plan forestry operations to avoid remedy or mitigate adverse environmental effects. • Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements. • Review the effectiveness of plans and the planning process and incorporate relevant changes or improvements e.g. updated council standards or resource consents conditions. • Ensure the planning process is flexible enough to address possible plan changes e.g. changes in available harvesting equipment can affect harvest boundaries.
	Planning process • Scope the intended operation by identifying and reviewing relevant information. • Identify important environmental values for each site. • Consider plan alternatives and assess the potential impact of the proposed operations upon the identified values (An Assessment of Environmental Effects). • Consult with potentially adversely affected parties. • Select the best alternative. Tradeoffs between competing factors is inevitable e.g. the balance between safety and health, productivity and quality, environmental and social factors. • Select cost effective, low environmental impact operational techniques. • Finalise the plan and document operational specifications e.g. prescribe and document methods, techniques and constraints required to manage the impacts of the operation upon the identified values.
	The plan • Develop operational maps and plan notes that clearly incorporate the identified environmental issues and specified controls. • Ensure the plan is clearly understood, agreed and signed off by operational personnel.

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Guidelines (Where safe & applicable)	**General** • Plan holistically. Aim for sustainability through balancing economic, social and environmental factors. • Consider cumulative effects of plans, e.g. the altered hydrological response to storms of a river where the catchment has been subject to consecutive harvesting operations over a large proportion of its area. • Define and document restricted areas where activities must be excluded or subject to tight controls • Use planning as a tool to improve environmental management. • Consider the strategic implications of an operation e.g. planting boundaries should make acceptable harvesting boundaries.
	Community • Identify and communicate with local authorities, communities, individuals and other stakeholders that have an interest in or are likely to be directly adversely impacted by proposed forest operations.

	Visual landscape
	• Consider incorporating landscape planning principles when planning in visually sensitive areas including:
	  ○ Minimise visual impact of infrastructure e.g. roads, landings, firebreaks
	  ○ Establish planting boundaries where they follow landform boundaries e.g. ridges, gullies.
	  ○ Consider amenity planting along major public thoroughfares.
	  ○ Consider additional site rehabilitation activities.

	Monitor • Monitor performance of the plan to check its operational effectiveness with a view to improve e.g. the plan has been followed, desired outcomes achieved, and the planning was appropriate.
Related BEPs	Any applicable BEP that has been used in the operation and or in the planning phase of the operation

NOTE

Many forest owners or management companies have their own best environmental practices and/or have an environmental management system (EMS) in place. These systems should be followed when operating in specific forests or company managed areas. Although they are likely to be very similar to the BEPs in these guidelines, they are likely to be specific to the forests and/or conditions. Within an EMS, a company may have specific procedures and documentation that should also be used in preference to those listed below.

INTRODUCTION

An important aspect of robust operational planning is the process to recognise potential environmental impacts arising from operations. Planning assesses the risk of adverse outcomes in terms of the probability, severity and longevity of those effects and then adopting a methodical approach to prescribing and implementing appropriate methods and controls including the relevant guidance provided by the following BEPs to avoid remedy or mitigate the identified risks.

Undertaking an assessment of environmental effects

The process of assessing risk due to operations is known as an Assessment of Environmental Effects. The matrix below assists in matching key environmental values/issues that are potentially adversely affected by given forestry operations activities. The assessment of effects form (Appendix H) and Part 3 – 2.3 Assessment of Environmental Effects in the full E-CoP provides recommended guidance, in conjunction with this matrix for assessing the degree of risk an operation might pose. In combination, these tools can assist in identifying which BEPs and which components of selected BEPs should be adopted to manage identified potential impacts. Practitioners are advised to adopt processes similar to those below when planning their operations.

Some operational situations will have minimal risk while others may have significant and complex risks. Operational planning requires technical input and a solid understanding of the operational requirements. The necessary skills are normally gained through tertiary level qualifications additional to operational experience.

	ENVIRONMENTAL VALUES/ISSUES											
Forestry operational Activities	Erosion & sediment control	Water quality	Soil conservation & quality	Air quality	Aquatic life	Native wildlife	Native vegetation	Historical & cultural values	Landscape & visual values	Neighbours	Public utilities	Recreation values
Harvesting	•	•	•	•	•	•	•	•	•	•	•	•
Earthworks	•	•	•	•	•	•	•	•	•	•	•	•
Slash management	•	•	•	•	•	•	•	•	•	•	•	•
Stream crossings	•	•	•		•	•	•	•	•	•	•	•
Mechanical land preparation	•	•	•	•	•	•	•	•	•	•	•	•
Burning	•	•	•	•	•	•	•	•	•	•	•	•
Planting							•	•	•	•	•	•
Tending		•			•					•	•	•
Fertiliser application		•	•	•	•					•	•	•
Agrichemical use	•	•	•	•	•	•	•	•	•	•	•	•
Oil & fuel management		•	•		•	•	•	•		•	•	•
Waste management		•	•		•	•		•	•	•		•
Forest protection	•	•			•	•	•	•		•		•

Applies to forestry earthworks. This includes the construction and maintenance of roads, waterway crossings, processing areas, landings, tracks, firebreaks, dams and water control structures, quarries, metal stockpiles and other engineering works.

Objective	• Compliance with the law. • To avoid, remedy or mitigate the adverse or potentially adverse effects upon on-site and off-site environmental values. e.g.: Water quality · Catchment hydrology · Ecological Archaeological/cultural · Landscape · Community
BEP	
Rules (Compulsory)	**General rules** • Earthworks must be planned, designed, supervised and constructed by appropriately trained personnel. • Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements, including mining regulations for quarries and the building code for structures. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operation starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols. • Design all earthworks appropriate to the soil type, topography, climatic conditions and anticipated traffic usage. • Employ engineering expertise, to design or project manage, when prudent to do so e.g. large earthworks projects, quarries or operations in high-risk areas. **Operational** • Communicate operational requirements verbally and in writing before an operation starts to ensure personnel are aware of their environmental obligations. • Comply with operational specifications. • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Do not damage, modify or destroy archaeological sites without approval. • Place debris where it will not affect sensitive features, zones or destabilise the site. • Keep machinery out of waterways and riparian margins unless authorised. • No earthworks within 5m of permanent waterways except at designated crossings or water access points or where topographical constraints leave no alternative.

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Rules *(cont'd)*	• Earthworks should be stable or stabilised using recognised engineering and vegetative techniques. • Do not incorporate slash or other organic material into steep fill batters. • Install correctly designed waterway crossing structures, sediment traps and cut-off spacing according to local soil, rainfall and topographic conditions and as work progresses. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. • Monitor the effects of the activity during an operation, on completion, and where necessary on a routine basis thereafter to ensure operational and compliance specifications have been met. • Wash machinery where weed transfer is an identified risk.
Guidelines (Where safe & applicable)	• Programme earthworks to enable best use of seasonal conditions and allow stabilisation before use. • Undertake work in suitable weather for the site conditions. • Locate earthworks to avoid sensitive features, unnecessary disturbance and to minimise exposure to unstable areas. • Consider enlarged riparian areas where appropriate. • Consider alternative construction or screening methods to mitigate impact in visually sensitive areas. • Apply surfacing materials where appropriate, to new formations as soon as practicable. • Use water control techniques including • Direct water to stable areas and away from sensitive areas and waterways, e.g. using fluming, socks, cut-offs, culverts. • Control and filter runoff e.g. through vegetation or slash, sediment traps, water tables and berming. • Place topsoil where it is stable and recoverable for reuse where required. • Instigate maintenance programmes appropriate to the nature of the earthworks and structures and their environmental risk.
Related BEPs	**1.** Operational planning **2.** Waterway crossings **3.** Harvesting **4.** Fuel and oil **5.** Waste management **6.** Historical & heritage management **7.** Operational monitoring **8.** Environmental incident **9.** Historical & heritage site discovery
Key associated reference	Best Practise Guidelines for Road and Landing Construction – FITEC 2005 Forest roading manual – LIRO Relevant Regulatory Authority Guidelines

INTRODUCTION

Apart from the tree crop, roading infrastructure is the most important physical asset within a plantation forest. Roads enable access at all stages of the forest cycle, from establishment through to tending and protection, to eventual harvesting. Earthworks increasingly involve operations on steeper, more erosion prone terrain, because of marginal land planted in the past. This creates numerous challenges and, often, significant environmental risks.

The planning, construction and maintenance stages of earthworks are equally important. In regard to the protection of environmental values, the key factors that must always be considered when carrying out earthworks are:

- Location
- Timing
- Stabilisation
- Appropriate erosion and sediment controls
- Maintenance

Potential adverse effects

Earthworks operations can produce two main adverse effects:

1. Accelerated erosion arising from increased soil exposure and instability e.g. collapse of slopes around cuts.
2. Excessive sediment discharge to waterways though erosion of water control structures, fill-slope failure and soil disturbance.

Earthworks can activate or accelerate erosion by disturbing high risk areas, e.g. the toe of an earth flow, gully heads or old landslide scarps (slips), or by concentrating surface flows into those areas.

Sediment discharges to a water body can affect water quality and subsequently impact spawning fish, aquatic life, in-stream structures and downstream values such as recreation and customary food gathering. In addition to effects on water resources, excessive sediment discharges and earth flows can have an impact on land, e.g. native reserves and neighbouring properties. These effects can be minimised by keeping earthworks away from restricted areas and riparian areas. Where appropriate riparian setback widths could be increased to provide more buffering to protect stream values.

Earthworks could damage sensitive features such as archaeological sites, public utilities, and protected vegetation. Other potential harmful effects include unnecessary soil displacement and unacceptable visual impacts. The visual impacts of poorly planned earthworks can give the public a poor impression of forest operations.

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The shifting of machinery between areas can provide ideal conditions for the spread of invasive weeds unless machinery is washed down to remove soil and seeds on the equipment.

Earthworks and harvesting operations use large volumes of fuel and oils compared to other forest operations. Consequently, there is a greater risk of spills and contamination of soil and water associated with these operations (refer to fuel and oil management BEP).

A good example of excavator construction of a mid slope road using balanced cut and fill.

Drainage cut out, excavated to full width of track, discharging into logging slash.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage engineering operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Harvesting includes clear felling, road line salvage & production thinning operations. It applies to the felling, extraction, processing of trees into products, stockpiling, loading and product cartage. Processing may occur on or off site.

Objective	• Compliance with the law. • To avoid, remedy or mitigate the adverse or potentially adverse effects upon on-site and off-site environmental values. e.g.: Water quality — Catchment hydrology Soil stability or loss — Soil compaction & fertility Ecological — Archaeological and cultural Landscape — Community
BEP	
Rules (Compulsory)	**General rules** • Harvesting must be planned, supervised and undertaken by appropriately trained personnel. • Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operation starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols. • Communicate operational requirements verbally and in writing, before an operation starts, to ensure personnel are aware of their environmental obligations.

	Operational
	• Comply with operational specifications.
	• Do not destroy, damage or modify archaeological sites without approval.
	• Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas.
	• Do not use waterways as extraction corridors or routes.
	• Install appropriate water and sediment controls and prevent runoff flowing directly into waterways. Appropriate water control can be achieved through
	  ○ Water bars & cut-offs
	  ○ Sediment traps
	  ○ Slash redistribution
	  ○ Track and soft point corduroying.
	• Maintain water and sediment control structures in effective operating condition until site decommissioned.
	• Keep machinery out of water bodies and riparian margins, unless authorised.

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Rules *(cont'd)*	• Use appropriate felling and extraction techniques to minimise impact in sensitive areas. If unacceptable effects are unavoidable then consider:
	  ○ Leaving trees standing
	  ○ Fell to waste
	• Use appropriate options to minimise tracking to reduce soil disturbance, compaction and erosion.
	• Monitor the effects of the activity during an operation, on completion, and where necessary, on a routine basis thereafter to ensure operational or compliance specifications have been met.
	• Close or control operational areas to prevent inadvertent unauthorised access.
	• Wash machinery where weed transfer is an identified risk.

	Post harvest decommissioning • Decommission the site to appropriate standard. • Ensure water and sediment controls are in place and maintained in effective operating condition until site is revegetated, rehabilitated or otherwise stable. • Haul tracks are properly decommissioned. • Slash and "birds nests" stabilised. • Remove all rubbish from site and dispose in a safe and legally acceptable way.

Guidelines (Where safe & applicable)	**Operational**
	• Avoid deviations to prepared harvest plans without approval, where relevant e.g. from an operational supervisor.
	• Undertake work in suitable weather for the site conditions.
	• Avoid damage to standing crop during production thinning operations.
	• Select harvesting machinery that best suits the constraints of the harvest plan:
	  ○ Increased tower height of haulers to gain greater lift and suspension of logs
	  ○ Employ mechanical carriages capable of fully suspending logs above sensitive areas such as waterways
	• Swing yarders that can operate in confined areas decreasing the requirements for large landings, or enabling roadside landings.
	• Ground based systems suited to soil type e.g. tracked skidders or excavators with low ground pressure for easily compacted soils such as clays.
	• Aim for extraction using techniques that achieve suspension of the butt end of the log.
	• Follow landscape mitigation principles, where documented as part of operational plan (refer to Operational Planning BEP).
	• Consider the benefits of wider riparian setbacks.
	• Avoid trimming stems in water channels or flood ways or riparian areas.
	• Consider use of debris traps where in-stream slash removal is unachievable.

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Guidelines *(cont'd)*	• Instigate monitoring and maintenance programmes appropriate to the nature of the logging and its environmental risk. • Decompact (rip) landings after use if not required for future.
	Cartage • Consider the community. • Schedule trucking to minimise early morning trips through local communities. • Avoid school bus routes prior to 9.00am and after 3.00pm on difficult and narrow rural roads, install radio communications with bus or instigate other safety management strategies. • Consider sealing or lime cement stabilisation where prolonged heavy usage is anticipated. • Consider road surface damping or enforce reduced speed to manage dust on short term operations past dwellings. • Notify local authority of road upgrade requirements well in advance of need. • Consider using central tyre inflation to reduce impact upon roads. • Install appropriate warning signage along trucking routes. • Ensure trucking activity monitored for safety, load security, deposition of extraneous material on public roads and that any public complaints are relayed on to cartage managers.
Related BEPs	**1.** Operational planning **2.** Waterway crossings **3.** Harvesting **4.** Slash management **5.** Fuel and oil **6.** Waste management **7.** Historical & heritage management **8.** Historical & heritage site discovery **9.** Operational monitoring **10.** Environmental incident
Key associated reference	Best Practice Guidelines for Cable Logging – FITEC 2005. Best Practice Guidelines for Ground Based Logging – FITEC 2005 Best Practice Guidelines for Tree Felling – FITEC 2005 Relevant Regulatory Authority Guidelines

INTRODUCTION

Harvesting is the end-point of a plantation forest cycle and comprises logging, felling, trimming, extraction, sorting, stacking and log transportation. It is at this point the financial return on 25 or more years of investment is realised. Harvesting is the single most intensive forestry operation – employing relatively large amounts of machinery and labour.

Harvesting conforms to two broad types:

1. Clear felling.
2. Production thinning.

Clearfell operations are increasingly moving into hill country that sometimes presents steep, more difficult terrain that has numerous challenges and, typically, increased environmental risk. The majority of these areas will be harvested using cable hauler systems. Production thinning is carried out within stands mid-way through their rotation, depending on economics. In most cases production thinning is on easy slopes and utilises ground-based systems where any associated environmental effects are generally minor.

Potential adverse effects

A poorly planned or executed operation can have unnecessary and extensive environmental impacts. There is the potential for: • Sediment discharges to water bodies • Effects on off-site values, e.g. aquatic ecosystems and neighbouring properties • Activation or acceleration of erosion by physical disturbance or water flow runoff. • Damage to archaeological sites, public utilities, and native reserves • Other potentially harmful effects include soil compaction and soil displacement. • In publicly visible areas a harvesting operation can be visually intrusive • Relatively large volumes of fuels and oils are stored on site during engineering and harvesting, increasing risks of spills and soil & water contamination.

However, a well managed harvesting operation giving appropriate attention to the protection of identified restricted areas, riparian areas and riparian widths and other aspects (refer to part 2 of the full E-CoP) will minimise adverse effects upon the environment.

Well managed harvesting operations should minimise adverse effects

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage harvesting operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Slash and wood debris is generated from harvesting operations. It comprises of off-cuts from log making and debris from felling and extraction to the landing.	
Objective	• To manage slash and wood debris to avoid adverse environmental effects, especially surrounding landings e.g. 'birds nests' and material deposited in waterways.
BEP	
Rules (Compulsory)	**General rules** • Comply with applicable Council requirements, Resource Consent conditions, Historic Places Trust Authority and any other legal requirements. • Ensure slash management requirements have been identified and clearly mapped or documented before the operations starts e.g. slash storage sites. • If there is insufficient space for onsite slash disposal, plan for temporary slash storage that will allow slash to be accumulated and then taken off site, e.g. transported to another landing site.
	Operational • Communicate operational requirements verbally and in writing before an operation starts to ensure personnel are aware of their obligations e.g. location and requirements for the designated slash disposal areas. • Comply with operational specifications. • Maintain water and sediment control structures in effective operating condition until decommissioned to prevent water building up in slash piles and adjoining landing, leading to operational difficulties and possible landing collapse. • Monitor slash piles to ensure that they are always stable and fully utilise the available space. This may require benching, and/or shifting and reworking of the piles. • If available slash storage space is likely to be exceeded, then identify an alternative disposal site • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Instigate monitoring and maintenance programmes appropriate to the nature of the earthworks and structures and their environmental risk.
Guidelines (Where safe & applicable)	• Plan the operation/layout of the landing/processing area to ensure that there is unrestricted access to the slash disposal sites. • Where economic, hog residues (slash, slovens and arisings) and consign to a biofuel plant. • Pull back or burn landing slash where 'birds nests' are on unstable or potentially unstable ground.

Guidelines *(cont'd)*	**Slash and debris in streams**
	• Use directional felling or other appropriate measures where possible to minimise the amount of woody debris that is deposited in the stream.
	• Remove as much slash and wood debris as practicable from intermittent streams where flood flows have the potential to mobilise the debris and cause
	  ○ The blocking or damming of stream flow.
	  ○ The diversion of flow into stream banks likely to cause erosion.
	  ○ A risk to downstream structures and neighbouring property e.g. culverts and bridges
	• Consider the use of debris traps at strategic locations downstream where slash removal is not possible. These structures will generally require expert consultation and a resource consent.
	• Where possible, ensure that slash left adjacent to streams is not in a position where it could be picked up by flood flows.

INTRODUCTION

Some operations, particularly harvesting, can generate large quantities of slash and wood debris. In harvesting, this material is mainly a product of breakages during felling and extraction and from trimming and processing operations.

Impacts from slash and wood debris often contribute to adverse environmental impacts. But they can create benefits when managed appropriately. Material left on a harvested area provides a surface cover that helps protect against soil erosion and sediment discharges. As that material decays, it returns nutrients to the soil and hosts a range of biota from fungi to invertebrates. These contribute to processes of soil formation and nutrient redistribution, thereby assisting the growth of the following crop.

Some slash left in streams can also be beneficial, by providing cover and shade for native fish and young trout, assisting in keeping water temperature low and constant (through shading), increasing stream flow turbulence and providing food and substrate for macro-invertebrates; helpful in situations where there is no permanent streamside vegetation.

Potential adverse effects

Poorly managed wood debris also has the potential to cause significant adverse effects on the environment. The risks increase in cable-logging operations that involve steep, unstable terrain, and where landing sites are often small and have limited space available for slash storage.

A collapsed slash pile can trigger a mass movement of soil and debris causing significant damage. Such failures are not always immediate and can occur a considerable time after the completion of harvesting. Slash in streams can form a debris dam that can move downstream, a potentially dangerous situation that can degrade the bed and banks of a stream and potentially damaging infrastructure. Extensive slash build-up can also obstruct fish passage and restrict fish habitat/breeding – adult trout are mostly affected. Decomposition of organic material in streams removes oxygen from water as it decays. Large amounts of material left in a waterway can harm aquatic life, especially streams with slow or low flows.

Slash stored in a stable location

Water build up behind a 'birds nest' which could lead to collapse

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure for slash management. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Waterway crossings include permanent and temporary structures that cross waterways and include bridges, culverts, fords, battery culverts, drift decks and log crossings.	
Objective	• Compliance with the law. • To ensure waterway crossings are suitably planned, designed, and installed to minimise impacts on the waterway values.
BEP	

Rules
(Compulsory)
	General rules
	• Crossings must be planned, designed, supervised and constructed by appropriately trained personnel.
	• Comply with applicable council requirements, resource consent conditions, freshwater fisheries regulations and any other legal requirements e.g.:
	  ○ Building consents are required for any bridge where fall height exceeds 1m (including collapse).
	  ○ A civil/structural engineer (C.P.Eng) must approve structural designs where appropriate and perform inspection for recertification of existing bridges.
	  ○ Fish passage must not be impeded by structures.
	• Selection and design of crossings must consider:
	  ○ Waterway environmental values e.g. water quality, fauna
	  ○ Waterway physical attributes e.g. size of waterway, catchment area and characteristics like topography and geology, bed and bank stability, and peak flows
	  ○ Intended crossing use e.g. traffic volumes and type
	• Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before the operations starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies.
	• Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols.
	• Design all crossings appropriate to the soil type, topography, climatic conditions and anticipated traffic usage.
	• Employ engineering expertise to design, verify, inspect, certify or project manage, where legally required or otherwise prudent to do so e.g. large structures.
	
	Operational
	• Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their environmental obligations.
	• Comply with operational specifications.

Continued next page

Rules *(cont'd)*	• Close or control access to operational areas to prevent inadvertent unauthorised access. • Undertake work in suitable weather for the site conditions. • Ensure no contaminants enter waterways. • Avoid in-channel work during fish spawning season. • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Do not damage, modify or destroy archaeological sites without approval. Minimise machinery operating in the bed of the waterway. • Decommission temporary crossings after use. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. • Monitor the effects of the activity during an operation, on completion, and where necessary on a routine basis thereafter. Monitoring is to ensure the operational specifications or compliance requirements have been met. • Undertake a post-operational audit upon completion of job. • Instigate maintenance programmes appropriate to the nature of the structures and their environmental risk
Guidelines (Where safe & applicable)	• Programme earthworks to enable best use of seasonal conditions and stabilisation before use. • Confine disturbance to the immediate work site. • Use existing structures, where they are present, as a tool to assist in determining effective new structure requirements. • Wherever possible, crossings should be located perpendicular to waterway, with abutments on solid level ground on each bank. • Earthworks should be stable or stabilised using recognised engineering and vegetative techniques. • Locate earthworks to avoid unstable areas, sensitive features or unnecessary disturbance. • Avoid steep approaches to and from crossings. • Cross where waterway banks are solid and beds stable. • Consider use of slash racks to protect culverts where slash build up is expected. • Divert road/track runoff away from crossings using berms, cutouts, culverts or flumes. • Consider using bridges or low level crossings on larger waterways. • Construct fords for infrequent vehicle use, and to cross waterways that have hard streambeds, low flows and low in-stream values.

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Related BEPs	**1.** Operational planning **2.** Earthworks **3.** Operational monitoring **4.** Fuel and oil **5.** Waste management **6.** Historical & heritage management **7.** Historical & heritage site discovery **8.** Environmental incidents
Key associated	Landing Construction – FITEC 2005 Forest Roading Manual – LIRO Relevant Regulatory Authority Guidelines Keller G & Shearer J 2003 Low Volume Road Engineering BMP Field Guide. USAID/USFS www.blm.gov/bmp/field%20guide.htm Culvert Guidelines Ministry for the Environment – www.mfe.govt.nz/publications/land/culvert-bridge-oct04/html/page2.html

INTRODUCTION

Waterway crossings are commonly required in most New Zealand plantation forests to provide access. They are a valuable asset that should be planned, constructed and maintained carefully. Crossings include bridges, culverts and fords. Stream crossings will require a resource consent under the resource management act (RMA) unless a regional plan specifically provides for them as a permitted activity. Therefore, it is critical to find out and understand the relevant legislative and regulatory requirements when planning a crossing.

Potential adverse effects

In-stream structures like culverts, by their very nature, will have some unavoidable effect on environmental values. During construction, there is a high risk of short term sediment discharges to the stream. These discharges can harm aquatic life and effect downstream values including recreation, customary food-gathering, potable water supplies. If not constructed/installed appropriately, they can also activate or accelerate stream bed erosion by concentrating stream flows and velocities. In addition, a poorly constructed crossing can direct flows into the stream banks causing or aggravating bank erosion. Poorly designed, installed or maintained in-stream structures can restrict or even prevent fish passage by increasing stream velocities and forming physical barriers, such as drop-offs. Accumulation of debris around culvert openings and bridge abutments can block stream flow resulting in flooding (with subsequent sediment deposition) and potential structural failure.

On-going monitoring and maintenance is essential to ensure that crossings continue to function capably and with minimum environmental impact.

Typical battery ford (vented ford)

Single pipe culvert, with mitred outlet

NOTE:
Forestry companies who have an environmental management system in place are likely to have a procedure to manage waterway crossing operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Applies to the preparation of land for planting using machinery including spot mounding/ cultivation, line-raking, wind rowing, root and slash raking, v-blading, ripping and mounding, roller crushing, mulching and conversion from plantations.	
Objective	• Compliance with the law. • The management of mechanical land preparation to avoid remedy or mitigate adverse effects, particularly accelerated erosion and sediment generation.
BEP	
Rules (Compulsory)	**General rules** • Mechanical land preparation must be planned, supervised and undertaken by appropriately trained personnel. • Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operation starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols.
	Operational • Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their environmental obligations. • Comply with operational specifications. • Minimise soil disturbance except where v-blading, ripping and mounding are being carried out to ameliorate specific adverse soil properties. These operations must recognise site and topographical constraints. • Undertake work in suitable weather for the site conditions. • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Do not damage, modify or destroy archaeological sites without approval. • Ensure water and sediment controls are in place and maintained in effective operating condition until sites revegetated, rehabilitated or otherwise stable. • Ensure sediment runoff is contained within the work site and do not direct runoff into restricted areas or water bodies. • Monitor the effects of the activity during an operation, on completion, and where necessary on a routine basis thereafter. Monitoring is to ensure the operational specifications or compliance requirements have been met. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. • Undertake a post-operational audit upon completion of job.

Continued next page

Guidelines (Where safe & applicable)	**Operational** • Leave an undisturbed buffer zone around identified protected areas and at least 5m adjacent to permanently flowing streams. • Consider enlarged riparian areas where appropriate. • Cultivate or rip landing sites across the slope and ensure that water does not accumulate in fill areas. • Operate along the contour, to minimise runoff being concentrated down cultivated lines. Where unavoidable, limit downhill runs to a maximum continuous length of 50 metres. • Where soil properties and rainfall predispose, align slash windrows along the contour of sloping land and within broad valley floors, to help trap and filter sediment. • Blade or rake at least one line on the contour along the lower boundary of operations to help contain sediment within the work site and prevent runoff concentration at low points or gullies. • Wash machinery where weed transfer is an identified risk.
Related BEPs	**1.** Operational planning **2.** Waterway crossings **3.** Earthworks **4.** Fuel and oil management **5.** Waste management **6.** Historical & heritage management **7.** Environmental incidents **8.** Historical & heritage site discovery

INTRODUCTION

Mechanical land preparation comprises a range of operations that are often necessary for the successful establishment/re-establishment of production forests. Operations are normally carried out by either tractor or excavator and involve the removal/movement of vegetation, stumps and slash and soil disturbance so that planting can readily occur and initial seedling survival and growth is improved.

Apart from roller-crushing, an operation to crush standing vegetation, all other land preparation operations are typically confined to easier terrain and involve only minor soil disturbance.

Potential adverse effects

Poorly-executed mechanical land preparation can result in adverse environmental effects. In particular, operations can result in sediment discharges to water bodies. They can also activate or accelerate erosion by disturbing erosion prone areas, e.g. gully heads, or by directing runoff into these areas. In addition, operations can damage archaeological sites, public utilities, riparian (streamside) vegetation and areas of native vegetation. Other potential harmful effects include visual impacts, soil compaction and soil displacement.

Machine land preparation also often defines the boundaries for reestablishment of forest. It is important that prepared area boundaries make appropriate provision for riparian setbacks and especially enlarged setbacks around wetlands and larger water bodies. Often these can be suitably aligned with natural landforms.

Ripping across the contour retains sediment in situ.

A spot mounder. Spot mounding concentrates the land preparation to the immediate place required.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage mechanical land preparation operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Agrichemicals include herbicides, insecticides and fungicides. Herbicides are the most commonly used to suppress invasive woody weeds and grasses during and after establishment. Fungicidal applications are almost exclusively used to control dothistroma infection and insecticides only in occasional and very limited situations.	
Objective	• Compliance with the law. • To manage agrichemical storage, use and application to avoid adverse environmental effects, particularly on water quality, protected vegetation areas, and neighbouring properties.
BEP	
Rules (Compulsory)	**General rules** • Agrichemical applications must be planned, supervised, and undertaken by appropriately trained personnel e.g. hold an approved handler certificate along with a current GROSAFE certificate for application or have advanced agrichemical management training and experience. (Refer to Part 4, section 6 of the full E-CoP) • Comply with applicable Council requirements, Resource Consent conditions and any other legal requirements. Check rules applying to discharges to air, and sometimes land, or specifically fertiliser application. • Follow recommendations and guidelines of the Agrichemicals Standard NZS8409:2004. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operation starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols. • Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their environmental obligations.
	Operational • Comply with operational specifications. • Ensure that all operators/workers have required protective equipment. • Ensure ground-based equipment and/or aircraft loading and mixing areas are well away from any streams or water supplies and that the site is suitably located or sufficiently bunded to contain spills to the immediate site area. • Close or control access to operational areas to prevent inadvertent unauthorised access. • Ensure manufacturers label recommendations are followed.

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Rules *(cont'd)*	• Ensure that material safety data sheets (MSDS) sheets for all agrichemicals being applied are readily available. • Notify potentially affected people and neighbours immediately prior to spraying to ensure there is no risk to people, water supplies, livestock, and adjoining crops. • Calculate agrichemical application requirements carefully to ensure safe and efficient outcomes e.g. quantity, method and formulation. • Undertake work in suitable weather for the site conditions e.g. to prevent spray drift. • Monitor the effects of the activity during an operation, on completion, and where necessary on a routine basis thereafter, e.g. assess weather conditions at half hour intervals for aerial application. This should include wind direction, wind speed, temperature and relative humidity. Monitoring is to ensure the operational specifications or compliance requirements have been met. • Disperse any residual chemical mixture over the target area at or below standard concentrations – not dumped in a concentrated quantity over a small area. • Remove both full and empty spray containers from work sites daily – do not leave unattended. • Triple-rinse all empty agrichemical containers. Use wash water as part of the spray operation – do not dip containers into water bodies. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. Return container to agrecovery or similar depot for recycling where service exists. • Undertake a post-operational audit upon completion of job.
Guidelines (Where safe & applicable)	• Programme agrichemical application to maximise product effectiveness. • Use GPS navigation equipped aircraft and ensure gps coordinates are provided and checked and/or the boundary is flown with the operation's supervisor as part of the pre-operational briefing. • Utilise smoke bombs or similar to test for inversion and inappropriate wind conditions where weather indicators suggest potential problems. • Apply agrichemicals manually where there is a risk of spray drift into environmentally important areas or neighbouring properties.
Related BEPs	**1.** Operational planning **2.** Environmental incident **3.** Fuel & oil management **4.** Waste management
Key associated reference	Agrichemicals Standard NZS8409:2004

INTRODUCTION

Agrichemicals include herbicides, insecticides and fungicides. Herbicides are the most commonly used agrichemicals in forestry – primarily for suppression of invasive woody weeds and grasses during and after establishment.

Aerial application of agrichemicals is common; it is an effective and efficient method. Most agrichemical applications are permitted under council plans, subject to rigorous and specific conditions, e.g. the requirement to notify neighbours. Failure to comply with these conditions can result in prosecution. Careful planning and execution of any agrichemical application is therefore essential.

Clear wind indicator helicopter spraying

Over-spray damage in a plantation forest

Potential adverse effects

There can be significant environmental effects from poorly planned or executed applications. These include: • Impact upon water quality, aquatic life & potable water. • Chemical residues in soil. • Damage to non-target species and areas. • Chemical trespass.

Agrichemicals have the potential to degrade surface and ground water through overspray and leaching. The risk of drift outside the target area can be relatively high in aerial applications. Poorly controlled applications of agrichemicals can drift onto adjacent areas of protected vegetation, water bodies where some eco-toxic agrichemicals could harm or even kill fish and aquatic life or harm neighbouring properties. In the case of neighbouring properties, agrichemicals can damage pasture and crops, some of which can be especially sensitive to some formulations. Drift may also pose a risk to stock and people particularly if toxic chemicals are discharged into potable (drinking) water supplies. Drift is also a potentially high hazard for neighbouring organically certified farms.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage agrichemical applications. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Objective	• Compliance with the law. • The management of burning to mitigate the adverse environmental effects of air pollution and avoid damage to non-target areas or values.
BEP	
Rules (Compulsory)	**General rules** • Burning must be planned, supervised and undertaken by appropriately trained personnel. • Comply with applicable council requirements, resource consent conditions and any other legal requirements, e.g. council rules applying to discharges to air. • Obtain fire permits from the appropriate rural fire authority, and meet any requirements of the permit. • Develop a burn prescription, containing explicit requirements that are clearly mapped and documented. Include • Important environmental values requiring protection e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Neighbouring properties and other non-target area boundaries • Buffer zones and required firebreaks. • Burn conditions, light up patterns and fire control resources and locations. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols and notify adjacent households downwind.

	Operational
	• Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their environmental obligations.
	• Comply with operational specifications.
	• Carry out burns only when local and long range weather conditions are suitable.
	• Ensure that there are sufficient resources to control the burn, i.e. staff and equipment.
	• Close or control access to operational areas to prevent inadvertent unauthorised access.
	• When using accelerants ensure:
	  ○ Manufacturers label recommendations are followed.
	  ○ Material safety data sheets (MSDS) sheets are readily available.
	• Ground-based equipment and/or aircraft loading and mixing areas are well away from any streams or water supplies and are suitably located or sufficiently bunded.

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Rules *(cont'd)*	• Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Monitor the site after burning and mop up any hot spots and potential re-ignition sources if necessary. • Wash machinery where weed transfer is an identified risk.
Guidelines (Where safe & applicable)	• Undertake a post-operational audit upon completion of job. • Consider burning only if alternative methods are not practical or cost effective, or for training purposes where risks are low. • Avoid burning areas with important recreational values. • Consider post burn over sowing of areas that are prone to erosion and/or are visible from significant public viewpoints.
Related BEPs	**1.** Historical & heritage management **2.** Operational planning **3.** Environmental incidents

INTRODUCTION

Burning was once a common land preparation tool but is now practised much less frequently. Modern establishment methods have eliminated the need for burning except for occasional situations such as in minor-species cutover or after a significant windthrow event creating large amounts of slash and woody debris. Burning is now mainly used for slash management around landings, and activity which provides valuable fire-fighting training.

Burning is often used as a way to remove slash accumulated around the edge of landings ('birds nest'), particularly hauler landings. This can have many positive effects such as:

- Removing the safety hazard for silviculture workers operating below a 'birds nest'.
- Removing the risk of a 'birds nest' collapsing off the edge of a landing.
- Increasing the replantable area.

Although the above benefits are important, the potential adverse effects listed below also apply to 'birds nest' burning.

Potential adverse effects

Smoke produced by burn-offs can be a significant source of air pollution through the discharge of large quantities of ash and fine particulates. The adverse effects of these discharges include impacts on human health; nuisances e.g. damage to painted surfaces and soiling of drying washing; contamination of roof-water supplies and devaluing certain horticultural crops such as kiwifruit through skin blemishes. Large volumes of smoke can also be visually obtrusive.

Burning has the potential to accelerate erosion by removing vegetation cover and exposing soil. Burning can also affect ecological values by destroying habitat. In addition, burns including birds' nests can get out-of control, causing damage to adjacent areas of plantation or native vegetation, public utilities, and neighbouring properties. Burning 'birds nest' is particularly risky as they can reignite days or weeks after the initial burn.

Controlled burn – Kinleith Forest

Bird's nest burn to remove accumulated slash from the edge of the landing – Tairua Forest

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage burning operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Objective	• Compliance with the law. • Appropriately located plantation forests. Consideration has been given to the short and long term implications of their establishment.
BEP	
Rules (Compulsory)	• Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements e.g. governing planting location and setbacks. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before planting starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols. • Communicate operational requirements verbally and in writing before planting starts to ensure personnel are aware of their environmental obligations. • Comply with operational specifications. • Meet set back requirements around restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Leave a horizontal setback of at least a 5m each side of all permanently flowing streams. • Do not plant where harvesting will not be possible without serious adverse effects. • Do not plant spread-prone species on sites where there is a high risk of uncontrollable wilding spread beyond the boundaries of the plantation. Use Wilding Risk Calculator (refer Appendix I). • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way e.g. empty planter boxes and plastic liners should be removed from the site and recycled where possible. Untreated cardboard may be buried in the forest. • Undertake a post-operational audit upon completion of job.
Guidelines (Where safe & applicable)	• Consider conducting a social and environmental impact assessment when planting new areas outside existing forest boundaries. • Consider appropriate species, patterns and layout when planting areas with high visual values and/or with important recreational values. • Increase riparian setbacks where topographical, reserve features, stream size or sensitive boundaries and identifiable future harvesting complications indicate greater margins are needed.
Related BEPs	**1.** Historical & heritage management **2.** Historical & heritage site discovery **3.** Operational planning **4.** Waste management
Key associated reference	Wilding Risk Calculator (refer to Appendix I) or (www.fore.canterbury.ac.nz/euan/wildings/wrisk.htm) (www.wildingconifers.org.nz)

INTRODUCTION

Planting is mainly carried out by hand. There are often regional or district rules and standards regulating the planting of trees. In general, existing forests that have been harvested can be re-planted although some restrictions on setback distances may apply. Most district council rules relate to the establishment of new forests, e.g. planting next to property boundaries, roads, streams, and on certain landscape/visually sensitive sites. Some regional councils also have rules for planting near water bodies and in specific catchments for water yield purposes. In addition, archaeological sites require protection – refer to Historical and Heritage Management BEP.

Potential adverse effects

Planting by itself generally has very minor environmental effects. However, mature trees can create adverse effects – particularly at harvesting time if they were planted in poorly planned locations e.g. planted on steep terrain particularly next to streams, protected vegetation, neighbouring properties, archaeological sites and public resources. Infrastructure and utilities can also be adversely affected because of planting close to neighbouring properties and roads or power routes. Such effects include shading, safety (e.g. wind-throw onto roads), and damage to structures (e.g. fence/power lines) through breakage and wind-throw.

Hand planting

When planting new areas or replanting following harvest, it is important to properly consider the future implications of today's planting decision. Adequate riparian setback provisions around streams and wetlands should be determined and integrated with natural landform and native vegetation where possible for best environmental effect. In areas with low annual rainfall planting may affect total water yield, and reduce summer low flows once canopy closure has occurred, while unsuitable species planted on inappropriate sites may also cause the spread of wildings (self-set seed) onto adjacent land and into protected areas. Research on wildings has been undertaken, resulting in the production of a "Wilding Prevention" booklet, and "Wilding Risk Calculator" (refer to Appendix I).

For some, plantation forests may have negative visual impacts, in terms of size, scale and shape within the natural landscape. These effects are covered in more detail in the Landscape section, Part 2 of the full E-CoP.

Be aware that in some circumstances where trees have been poorly placed, the costs involved in meeting environmental requirements have made them uneconomic to harvest.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage planting operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Objective	• Compliance with the law. • To minimize adverse environmental effects of pruning and waste thinning operations e.g. slash management, fire risk and access.
BEP	
Rules (Compulsory)	• Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operation starts e.g. protected vegetation areas, public recreation areas, neighbouring properties and water bodies. • Communicate operational requirements verbally and in writing before the operation starts, to ensure personnel are aware of their environmental obligations. • Comply with operational specifications. • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Keep roads, tracks and access routes clear of slash. • Do not leave slash where it could divert or block a permanent waterway, water table or water control structure. • Remove slash from boundary fences, neighbouring properties, utilities etc. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. • Undertake a post-operational audit upon completion of job.
Guidelines (Where safe & applicable)	• Place thinning and pruning slash behind the first row of trees within the stand boundary. • Fell trees away from sensitive features. • Remove slash and debris where required to comply with the operational specifications progressively rather than leaving it to when the operation is finished.
Related BEPs	**1.** Environmental incident. **2.** Historical and heritage management.

INTRODUCTION

Tending (silviculture) is an important management tool for manipulating product and quality characteristics in plantation forests. The two core tending operations are pruning and waste-thinning operations. Generally, there are low environmental risks associated with these two operations. Both pruning and thinning operations are undertaken manually and cause only minor or no soil disturbance. Tending can provide several benefits, a pruned and thinned stand encourages the growth of under storey vegetation, which can provide better erosion/soil control, sediment trapping and greater biodiversity.

Potential adverse effects

The key environmental issues associated with tending operations relate to slash, fire risk, and access obstruction.

Slash can affect waterways, protected vegetation areas, archaeological sites, neighbouring properties/fence-lines, public utilities and roads. Slash left in waterways can cause damming, flooding and might pose short term effects on aquatic life if organic decomposition reduces oxygen levels. Poorly placed slash can also affect forest roads and tracks by blocking road drains, culverts and flumes as well as obstructing access.

Areas of extensive pruning and thinning slash can be a source of ignition in dry conditions. A small fire extinguisher should be on hand. Chainsaws used in thinning operations can also be a fire risk in dry conditions.

Felled stems can affect recreational values by blocking or impeding public access.

Thinning slash should not be deposited in a water channel.

A more open canopy under thinned stands can allow a diverse under storey to develop.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage tending operations. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Objective	• Compliance with the law. • To manage fertiliser application to avoid adverse effects on water quality and neighbouring properties.
BEP	
Rules (Compulsory)	**General rules** • Fertiliser applications must be planned, supervised and undertaken by appropriately trained personnel. • Comply with applicable council requirements, resource consent conditions and any other legal requirements. Check rules applying to discharges to air, and sometimes land, or specifically fertiliser application. • Ensure important environmental values and restricted areas have been identified and clearly mapped or documented before an operations starts e.g. protected vegetation areas, neighbouring properties and water bodies. • Consult with parties who are likely to be directly adversely impacted by operations – observe any established protocols. • Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their environmental obligations.
	Operational • Comply with operational specifications. • Ensure that all operators/workers have required protective equipment. • Store fertiliser in suitably located sites e.g. well away from waterways and neighbouring properties. Any spills should be contained and cleaned up. • Close or control access to operational areas to prevent inadvertent unauthorised access. • Ensure manufacturers label recommendations are followed. • Calculate fertiliser application requirements carefully to ensure safe and efficient outcomes e.g. quantity, method and formulation. • Undertake work in suitable weather for the site conditions. • Make every reasonable effort to avoid damage to restricted areas e.g. native vegetation, protected riparian strips, historic and heritage sites, research areas. • Remove all rubbish from the forest and dispose in a legally and environmentally acceptable way. • Undertake a post-operational audit upon completion of job. • Monitor the effects of the activity during an operation, on completion, and where necessary on a routine basis thereafter. Monitoring is to ensure the operational specifications or compliance requirements have been met.

Continued next page

Guidelines (Where safe & applicable)	• Programme fertiliser application to maximise product effectiveness. • Consider use of granulated slow-release fertiliser formulations where available and cost effective unless there is an urgent need to correct a deficiency. • Use aircraft with GPS navigation and control systems to ensure accurate application and acquisition of digital coverage data and supply operator with GPS coordinates prior to the operation. • Consider the use of helicopters with controlled spread hoppers in preference to fixed wing craft and gravity feed spreaders to achieve greater accuracy of application and evenness of spread. Leave buffer zones around water bodies and adjacent properties. • Apply fertiliser in patterns that utilise a positive wind direction blowing away from buffer zones and protected water bodies. • Apply fertilisers manually where there is a risk of fertiliser drift into water bodies or neighbouring properties.
Related BEPs	**1.** Operational planning **2.** Environmental incident **3.** Waste management
Key associated reference	New Zealand Fertiliser Code of Practice at – www.fertresearch.org.nz/attachments/document/updatadedcodefullcodeofpractice&cover.pdf

INTRODUCTION

Compared to other agricultural producers, forestry uses relatively low amounts of fertiliser. Ministry of agriculture and forestry statistics provide the following information on fertiliser applied:

Land use	Fertiliser applied (tonnes)	Land area	Tonnes/ha
Forestry	20,700	2,126,000	0.01
Grain growing	55,600	74,000	0.75
Beef cattle farming	500,700	2,143,500	0.23
Sheep farming	1,315,200	7,182,800	0.18
Dairy cattle farming	1,662,700	2,048,200	0.81

(Year ending 30 june 2002).

Fertiliser use may be restricted to hand applications at the time of establishment where small quantities are manually applied close to the seedling during planting or to correct specific forest nutritional problems on harsh sites where soils are deficient of nutrients. Aerial applications of nitrogen, phosphorus or boron based fertilisers occasionally occur on specific soil types in early or mid rotation stages when the crop nutrient demand is greatest.

Potential adverse effects

Generally, there is a low environmental risk associated with forest fertiliser applications. This is because application is often by GPS guided aircraft (or by hand) and the quantities applied are low and very intermittent by agricultural standards. However, excessive quantities of fertiliser have the potential to degrade the quality of both surface and ground water resources in coarse soils such as ash and pumice that enable relatively rapid leaching to ground water or on relatively impermeable soils if heavy rainfall occurs soon after application.

In forestry use, any sudden pulse of nutrients into a water body following over flight during aerial applications or heavy post application rainfall may damage or alter aquatic based ecosystems. Some fertiliser components such as boron are toxic to fish and animals (including humans) and require careful application and in correct quantities.

In addition to affecting water quality, aerially applied fertiliser can drift onto neighbouring properties. Particular care needs to be taken if a farm-based neighbour has organic certification.

Fertiliser applied by helicopter. A spinner on the bottom of the bucket and GPS navigation for the helicopter enables even, controlled distribution.

NOTE:

Forestry companies who have an environmental management system in place are likely to have a procedure to manage fertiliser applications. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Historic and heritage sites are generally associated with human activity prior to 1900. This includes Maori sites, e.g. pa, terraces, storage pits, middens, burial sites (urupa) and artefacts such as adzes, pigeon troughs and palisade posts. In some cases the only evidence may be simple earthen structures e.g. tracks, mounds or depressions. In some parts of the country, there are also remnants of early European sites such as old farm homesteads, timber milling and kauri gum digging and European and Chinese gold mining.

Objective	• Compliance with the law. • To avoid, or mitigate the impact to historical and heritage sites. • To allow sufficient time to obtain an "archaeological authority" when an archaeological site may be modified, damaged or destroyed by forest operations.
BEP	
Rules (Compulsory)	**General rules** • Comply with applicable Council rules, Resource Consent conditions, Historic Places Trust Authorities and requirements. • Comply with the requirements of the antiquities act in respect of artefacts discovered. • Establish the location and significance of known/suspected sites. • Check existing heritage inventories held by the N.Z. Archaeological association, N.Z. Historic Places Trust (NZHPT) and Councils. • Undertake archaeological field surveys where there is a high probability of sites being present. • Consult the appropriate iwi/hapu to identify specific concerns and protection requirements. • Do not damage, modify or destroy archaeological sites without approval. Obtain an archaeological authority (consent) from NZHPT when a site will be impacted, before any work commences. Any application will require a qualified archaeologist's assessment and a site management plan. • Sites must be recorded, accurately shown on maps and clearly marked in the field, before an operation starts. • Undertake a post-operational audit upon completion of job.
	Operational • Comply with operational specifications. • Communicate operational requirements verbally and in writing before an operation starts, to ensure personnel are aware of their obligations. • No machinery on historic and heritage sites without approval and, usually, supervision of a qualified archaeologist. • Do not plant historic and heritage sites or surrounding buffer zones. • Actively look for undiscovered historic and heritage sites especially where they could likely be present.

Continued next page

Guidelines (Where safe & applicable)	• Use qualified and experienced people preferably recognised by the NZHPT to carry out surveys and prepare assessments. • Archaeologist should demarcate the site boundary. • Minimise ground disturbance in approved operations using appropriate machinery and felling and extraction techniques. • Consider establishing a buffer zone around the site. • Mark sites permanently with marker posts. If possible, capture GPS co-ordinates to facilitate relocation of the site.
Related BEPs	**1.** Environmental incident **2.** Historic and heritage site discovery
Key associated reference	NZ Historic Places Trust. 2004. Heritage Management Guidelines for Resource Management Practitioners. NZ Historic Places Trust, Wellington. www.historic.org.nz/publications/hm_guidelines.html Walton, A.J. (Ed.) 1999. Archaeological site recording in New Zealand. NZ Archaeological Association Monograph 23. The NZ Archaeological Site Recording Scheme and archaeological issues refer to www.nzarchaeology.org/recording.htm

INTRODUCTION

Plantation forests can contain a range and wealth of historic and heritage places. These may relate to pre-European Maori land use and occupation, e.g. pa sites, terraces, storage pits, artefacts such as adzes, pigeon troughs and palisade posts, middens, and burial sites (urupa). Remnants of early European sites such as old farm homesteads, timber milling and kauri gum digging and European and Chinese gold mining.

The majority, but not all, of these places are archaeological sites through association with human activity occurring before 1900. Such sites are subject to the provisions of the **Historic Places Act 1993**, as are post-1900 archaeological sites that have been gazetted by the trust as archaeological sites. Archaeological sites that post-date 1900 may still be considered historic and heritage places and require specific management under the relevant district or regional plan. Sites of maori origin will have both archaeological and cultural values that will need to be taken into account during planning and operations.

Historic and heritage places are a non-renewable resource, once destroyed they are lost. Consequently, the options for protecting those places are limited to avoidance or mitigation. Note that previously unknown sites are often discovered during forest operations.

Potential adverse effects

Not all forestry operations involve disturbance, e.g. pruning and spraying. However, key operations such as planting, harvesting and earthworks have the potential to have a major impact on archaeological sites. Planting of plantation species can cause damage as the trees grow on archaeological sites. Sites constructed in the soil such as terraces, pits, pa, and house-sites are particularly vulnerable from root disruption and wind-throw. Historic sites are also particularly vulnerable to ground disturbance, being usually situated on or just below the ground surface. Poorly managed earthworks in particular, can cause significant damage and even total destruction. Damaging a heritage place can seriously offend the tangata whenua and cause irreparable harm to relationships that may have taken considerable time and effort to establish.

A decision to modify, damage or destroy a site should be carefully considered and only contemplated if there is no practical alternative. Where it may be necessary for a forest operation to modify, damage or destroy a known archaeological site, (such as where it is necessary to harvest the crop trees that have been planted on a pa site), an archaeological authority (consent) from the N.Z. Historic Places Trust is required, regardless of the land ownership or who is doing the work and before the start of any works that could affect the site. Note that the act allows the N.Z. Historic Places Trust three months from the date of lodgement to process any authority application. Refer to www.historic.org.nz/publications/hm_guidelines.html

Example of good practice of operating on an archaeological site

Storage pits pre clearance (Belmont Forest)

Storage pits post clearance (Belmont Forest)

NOTE:
Forestry companies who have an environmental management system in place are likely to have a procedure to manage historic and heritage sites. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Historic and heritage sites are generally associated with human activity prior to 1900. This includes Maori sites, e.g. pa, terraces, storage pits, middens, burial sites (urupa) and artefacts such as adzes, pigeon troughs and palisade posts. In some cases the only evidence may be simple earthen structures e.g. tracks, mounds or depressions. In some areas, remnants of early European sites such as old farm homesteads, timber milling and kauri gum digging and European and Chinese gold mining.

Objective	• To comply with the requirements of the historic places act. • To manage the discovery of an historical and heritage site during forest operations.
BEP	
Rules (Compulsory)	**General rules** • Comply with applicable council requirements, resource consent conditions, historic places trust authority and any other legal requirements after a site has been discovered. • Notify an archaeologist, the historic places trust, and organise a qualified archaeologist's assessment and a site management plan. • Notify appropriate iwi/hapu representatives, if the place is of maori origin, to determine what further actions are appropriate to safeguard the cultural values. • Obtain an "archaeological authority" (consent) from NZHPT if the site will be impacted by operations. • Notify the police if human remains are uncovered. • Ensure newly discovered sites are protected from future forest operations by accurate recording details in forest records.
	Operational • Stop work immediately at the location, if it is safe to do so. • Notify the site's location to all members in the crew, and any other people working in the vicinity. • Mark a 20 metre perimeter buffer zone around the area with warning tape and/or paint. • The contractor must contact the land owner/land manager. • Do not damage, modify or destroy sites without approval. • No machinery on historic and heritage sites without approval and, usually, supervision of a qualified archaeologist. • Actively look for additional undiscovered historic and heritage sites.

Continued next page

Guidelines (Where safe & applicable)	• Undertake historic and heritage surveys prior to forest operations to reduce the likelihood of operational site discoveries. • Use qualified and experienced people preferably recognised by the NZHPT to carry out surveys and prepare assessments. • An archaeologist should demarcate the site boundary. • Mark sites permanently e.g. with marker posts. • Record any discoveries in environmental incident registers.
Related BEPs	**1.** Environmental incident **2.** Historic and heritage management
Key associated reference	Heritage Management Guidelines: www.historic.org.nz/publications/hm_guidelines.html The NZ Archaeological Site Recording Scheme and archaeological issues refer to www.nzarchaeology.org/recording.htm

Most forestry operations use fuel and oil. This may include diesel and petrol, and oils such as hydraulic, gearbox, and chainsaw bar lubricant.	
Objective	• To comply with the law. • To manage oil and fuel use and storage to avoid or minimise adverse environmental effects in the event of a spill.
BEP	

Rules (Compulsory)	• Fuel storage systems must conform to the Hazardous Substances and New Organisms (HSNO) Regulations and associated Codes of Practice.
	• No smoking, open flames or other spark sources in the vicinity of fuel storage or refuelling areas.
	• Have an emergency response plan for fuel and oil incidents.
	• Storage of fuel and oil should be in a location where an accidental spill cannot enter a waterway and collision damage from passing machinery or logs is avoided.
	• Storage areas should be stable, located outside the main working area and take into consideration likely servicing and refuelling requirements.
	• Stationary tanks (tanks without wheels) should have secondary containment (bunding) where storage capacity >1000L.
	  ○ Earth bunds are acceptable for tanks manufactured prior to april 2004. Construct perimeter drainage to prevent storm water entry.
	  ○ Impermeable secondary containment is required for all other stationary tanks.
	• Where open to the weather a drainage system shall be established.
	• Note that trailer tanks are not required to have secondary containment.
	• Contents of tanks/containers should be clearly labelled with common fuel name, nature of hazard and emergency contact.
	• Pipes, seals and fittings should be in good condition, leak free and regularly inspected.
	• Machinery should be regularly checked for fuel and oil leaks. Where leaks are present and not able to be fixed immediately machinery should be parked up and containers/drip trays used to collect leakage.
	• Spill kits, appropriate to the nature and scale of operation, should be available on site to respond to an emergency spill.
	• Waste oil should never be deliberately released onto soil.
	• Waste oil should be collected and removed off-site to an authorised disposal/recycling facility.

Continued next page

Guidelines (Where safe & applicable)	• Clean up spills promptly. In the event of a spill, dispose of contaminated material in a legally and environmentally acceptable way. • Drip trays should be used when and where appropriate. • Secure storage of fuel and oil containers at the end of each day's work is recommended. • Only use recognised chain bar lubricants. • Waste oil should not be reused as chain bar lubricant or for treating winch or hauler ropes or guys due the presence of contaminants and toxic substances within waste oil. • When operating in community water supply catchments, consider use of vegetable-base lubricants especially if they become cost effective.
Key associated reference	ERMA's Code of Practice for the Management of Existing Stationary Container Systems up to 60,000 litre capacity. www.ermanz.govt.nz/consultations/cop9draft2.pdf Appendix F

INTRODUCTION

Forestry operations can use large quantities of fuel and oil, especially in harvesting operations. This may include diesel, petrol, hydraulic, gearbox and other oils. It is often necessary to store fuel and oil on-site during operations. For larger forest operations, fuel may be delivered by mini tanker on a daily basis, which minimises the need for on-site storage.

Potential adverse effects

As well as their fire risk, fuel & oil have the potential to contaminate water and soil and to seriously harm or kill aquatic life/wildlife. Leaks and spills can be a major source of contamination; for example, a small oil leak at the rate of 1 drop per minute equates to more than 4 litres per day or 30 litres per week. Consequently, it is important that all fuel /oil is stored and used carefully at all times.

Self bunded fuel tank

Fuels and oils are classed as 'Hazardous Substances' and are subject to the provisions of the Hazardous Substances and New Organisms Act (HSNO Act). This act includes specific regulations relating to the transportation and storage of fuel (diesel and petrol) introduced in november 2004. A brochure has been prepared that covers the specific details for tank trailers, sled tanks, slip on units and individual containers (drums and smaller tanks). – Refer to Appendix F of the full E-CoP.

Where fuel and oil leaks or leaches into waterways, it may also effect downstream recreation or neighbours who take water. In situations involving a discharge to a waterway or where the hydrocarbon contaminant is on surface waters (e.g. wheel ruts and water tables), use absorbent materials to mop up spilt material (e.g. a spill kit socks, pillows or pads). In an emergency a surface dam created from a small stem, punga etc. May help to prevent contaminants moving downstream.

Use of an absorbent 'sausage' to prevent diesel from a spill entering a stream

Prompt action by the crew prevented this incident turning into an emergency

NOTE:
Forestry companies who have an environmental management system in place are likely to have a procedure to manage fuel & oil. Whilst it is likely to be similar to the above, there may be differences. Where a company procedure exists, it should be followed.

Waste material includes wire rope, paint cans; fuel/lubricant containers, machinery parts, used grease cartridges, used fuel and oil filters, agrichemical containers, food wrappings and containers, waxed or plastic lined paper or cardboard and plastics.	
Objective	• The management of waste material to avoid contamination of the environment.
BEP	
Rules (Compulsory)	• Place waste material into a secure skip or container. • Remove all waste from the forest and dispose in a legally and environmentally acceptable way. • Dumping of non-biodegradable waste in the forest is prohibited. This includes those items listed above. • Dumping of household waste including gardening waste is prohibited. It has led to the introduction of forest invasive weeds. • Human waste must be buried and located away from waterways and roads/tracks. • Bury only biodegradable waste such as food scraps.
Guidelines (Where safe & applicable)	• Progressively dispose of waste during an operation and not just on its completion. • Utilise recycling options where available. Examples of items that could be recycled include, but are not limited to: ○ Used oils and hydraulic fluids ○ Plastic oil and hydraulic fluid containers ○ Plastic planting box liners ○ Fertiliser bag and bag liners ○ Plastic agrichemical containers www.agrecovery.org.nz ○ Wire rope ○ Aerosol paint cans
Related BEPs	All Forestry Operations and Operational Processes

INTRODUCTION

Forestry operations generate a variety of waste material including: wire/steel rope; paint cans; fuel/lubricant containers; machinery parts; used fuel and oil filters; agrichemical containers; used grease cartridges; food wrappings & containers; paper; cardboard and plastics.

Potential adverse effects

Waste material has the potential to contaminate water and soil and harm wildlife. Abandoned agrichemical and fuel/oil containers can be a source of soil and water pollution for many years. Used oils contain a variety of contaminants including heavy metals. Discarded waste is also an 'eyesore' and safety hazard that can affect visual and recreation values and encourages attitudes disrespectful to the land and environment in general.

Human wastes also need to be managed properly, especially near streams where there is a risk of giardia transfer to waterways.

It is important that all waste be managed properly at all times.

Good waste management on a super skid (landing)

To be avoided – old wire rope and accumulated rubbish left in forest

NOTE:
Most forestry companies have their own environmental waste management procedures that all their staff and contractors must follow. This BEP is primarily intended for use in situations where there are no such existing procedures.

Applies to the monitoring of operations in progress, operations post completion and ongoing routine monitoring of at risk sites.	
Objective	• Compliance with law • To ensure the impact of operations are within the standards identified in the relevant beps being utilised for the operation undertaken
BEP	
Rules (Compulsory)	• Comply with applicable regional and district council standards, resource consent conditions, memoranda of understand or other agreements entered into with iwi or other parties and applicable beps. • Comply with operational specifications (e.g. Harvest Plan). • Ensure all existing water controls are maintained and follow up on maintenance monitoring. • Ensure the site has been decommissioned to an appropriate standard (e.g. water controls, slash management) • Remove all rubbish from site (e.g. oil containers, paint cans, wire rope) and dispose in a legally and environmentally acceptable way.
Guidelines (Where safe & applicable)	• Implement a systematic and robust monitoring programme for key potentially high impact operations such as harvesting. • Monitor the effects of the activity regularly during the operation. • Check the activity on completion (before machinery has left site) to ensure all environmental mitigation and remedial steps have been implemented. • Monitor the activity on a routine ongoing post-operational basis if the site is deemed to pose a significant ongoing risk. (e.g. water control structure failure after heavy rainfall events) • Over-sow or stabilise areas at risk of failure • Check to ensure waste has been minimised • Document monitoring (use or develop operational audit forms and protocols) and retain audit results as part of operational record keeping. • Develop means to record and analyse operational auditing results to assist environmental performance improvement.
Related BEPs	Any applicable BEP that has been used in the operation and or in the planning phase of the operation

INTRODUCTION

Many companies implement formal operational monitoring processes to ensure their operations are meeting or exceeding prescribed operational outcomes and legal requirements.

Monitoring programmes are a recommended practise for all scales of operation even though the complexity and rigour of monitoring will alter according to the nature and scale of the particular operations.

Key features of most operational monitoring systems are:

- A formal checklist or form is used to ensure a consistent identification of the key issues associated with particular types of operation.
- Auditing is carried out regularly and periodically during long running potentially high impact operations. Any deficiencies in operational practise or outcomes are recorded and corrective actions initiated to rectify the deficiencies. Audit systems may use formal scoring or "check-box" confirmation procedures.
- Auditing is undertaken at the end of operations before machinery removal to ensure site compliance with operational environmental objectives and or remediation of any deficiencies.
- Post-operational audits often require formal sign-off by contractor principals and operational supervisors ***before*** the operation is deemed completed and mutual contractual obligations fulfilled.
- Some situations such as water controls on earthworks, especially temporary tracks and landing sites may require periodic ongoing audits either on a regular basis or following trigger events such as significant storms where there is a risk that damage will have occurred to environmental mitigation structures.
- Monitoring audit records are retained along with other records pertaining to a given operation.

More advanced monitoring systems can incorporate audit results into long term data systems to enable:

- Analysis of operational performance over time,
- Identification of key contributors to poor environmental outcomes
- Development of new and improved approaches to identified problem areas.

NOTE:

Most forestry companies have their own environmental monitoring procedures that all their staff and contractors must follow. This BEP is primarily intended for use in situations where there are no such existing procedures.

Environmental incidents cover a wide range of unexpected events like fuel and oil, chemical, or other hazardous substance spills, damage to restricted areas like protected vegetation areas or archaeological sites, and damage caused by major erosion events.	
Objective	• To provide action and follow-up steps in the event of an environmental accident to minimise affects and prevent recurrence.
BEP	
Rules (Compulsory)	**General** • Never endanger yourself or others. If someone is hurt, follow safety and health procedures. • Take immediate, safe action, to limit any damage that has or could occur. • Notify the site's location to all members in the crew, and any other people working in the vicinity. • Report the incident as soon as possible to the forest/landowner and if necessary, to the appropriate authorities – refer to guidance notes. • Undertake follow-up actions to assure security and safety of the site. • Record the details of the incident, including time & place, type of emergency, people involved, actions taken and to whom it was reported. • Investigate all incidents. • Provide recommendations, which may include a review of processes and procedures to minimise the likelihood of recurrence.

	Hazardous substances
	• In the event of a spill, leak, or fire involving a hazardous substance take the following immediate action:
	  ○ Ensure safety of personnel.
	  ○ Stop the operation and secure the site where the incident occurred.
	  ○ Treat all spills, leaks or fires as dangerous until proven otherwise.
	  ○ Do not smoke and avoid sparks from ignition/exhaust systems if the hazardous substance is combustible
	  ○ Stop, contain or limit any damage or further damage that could occur. For example:
	  ○ Shutting down equipment, closing off valves, extinguishing any ignition source
	  ○ Cordon off the area if necessary with warning tape or signage. Keep all unauthorised people clear of the affected area
	  ○ Isolating spills or leaks by using spill-absorbent material (if available), earth, sawdust, or bark to prevent liquid flowing into any waterway or being mixed with another chemical substance.
	  ○ If necessary, use a machine to contain spills e.g. bunding and perimeter drainage.

Guidelines	• Seek assistance from internal and external resources to control or stop the emergency • Decontaminate clothing, equipment or land if required.
Related BEPs	All Forestry Operations and Operational Processes

INTRODUCTION

An environmental incident is an unexpected event, which has a serious actual or potential adverse effect on the environment or people. It includes environmental non-compliance with operational specifications. Normally, environmental incidents are relatively minor and can be resolved or contained through appropriate corrective actions at an operational level. However, where simple corrective actions are not feasible and there are potentially serious effects, then an incident should be treated as an environmental emergency.

An environmental emergency is an incident that will or may have immediate or imminent serious actual or potential effects on people, property or the natural environment and may not be able to be satisfactorily controlled or avoided, due to the speed of developing events or the extent of immediately available resources. It needs immediate action.

A forest owner may become aware of an incident or emergency from staff or forest workers, or from a neighbour or member of the public.

Most incidents can be handled 'in-house' and do not require involvement of external agencies. Emergencies may require the involvement of agencies such as regional councils, the fire service, department of conservation and historic places trust. It is important that forest operational procedures specify channels of communication especially when it concerns external communication.

The following are examples of environmental incidents:

- Concentrated hydrocarbon spills to land that cannot be adequately contained by available skill kits or are not absorbed immediately into earth, well clear of water tables or streams, rivers and wetlands.
- Spills of concentrated agrichemical of any volume.
- Significant erosion events or earthworks failures.
- Damage to significant natural features, habitats or rare and endangered species (e.g. wetlands, areas of forest accord vegetation, bat colonies, kiwi nesting areas etc).
- The accidental discharge of any hazardous substance to a watercourse will be an environmental emergency.

Some incidents may require notification to external parties with legal jurisdiction over such matters. These may include:

- **Hazardous substances – regional/district council and Fire Service** (note: minor spills of fuels in quantities of less than 20 litres (as defined in the examples above) that are well away from water bodies or any means of entry to water bodies, areas of conservation value or neighbouring properties should not normally require reporting to the regional council or fire service);
- **Major erosion event,** large-scale culvert, roading landing or 'birds nest' failure – **regional council;**
- **Conservation land** (damage on) or rare/threatened species – **Department of Conservation;**
- **Historic and heritage sites** (damage to) – Historic Places Trust

All environmental incidents should be reported, recorded, and alternatives to current practise and procedures evaluated in order to eliminate risky or unsafe practice.

NOTE:

Most forestry companies have their own environmental incident/emergency procedures that all their staff and contractors must follow. This BEP is primarily intended for use in situations where there are no such existing procedures.

Forest protection covers a wide range of factors that can damage forest and infrastructure assets. These including fire, disease, plant and animal pests, storm events, grazing, nutrient deficiencies, and illegal activities such as property damage, theft and marijuana growing.	
Objective	• Compliance with law • To manage forest protection processes to control, reduce, minimise or eliminate potential adverse environmental impacts, or to control trespass or illegal activity.
BEP	

Rules (Compulsory)	• Comply with applicable council requirements, resource consent conditions and any other legal requirements. This may include rules on noxious plant and animal pest control.
	• Develop a comprehensive fire preparedness plan and lodge a copy with the appropriate rural fire authority.
	• Manage grazing
	• No grazing within restricted areas and waterways or wetlands.
	• Ensure fences are not nailed to production forest trees
	• Monitor and maintain existing infrastructure especially:
	  ○ Forest access, waterway crossings & signage
	  ○ Permanent water control structures
	• Monitor and control as appropriate, designated weed and animal pests under regional pest management strategies.
	• Use agrichemicals and vertebrate toxins in accordance with Agrichemicals BEP

Guidelines (Where safe & applicable)	• Consider forest, fire and public liability insurance • Consider forest security measures to reduce illegal activities and manage recreational user safety. • Monitor forest health. • Consider developing an integrated pest management plan • Identify existing pests and diseases. • Include protected areas where appropriate. • Identify risks for the introduction of new pests and diseases. • Develop a plan to manage them in coordination with neighbours and pest management agencies. • Monitor the effectiveness of the plan. • Develop, with the police, appropriate protocols for managing illegal activities.
Related BEPs	**1.** Operational planning **2.** Earthworks **3.** Waterway crossings **4.** Agrichemical application **5.** Burning **6.** Waste management **7.** Environmental incident **8.** Historical & heritage management **9.** Historical & heritage site discovery
Key associated reference	Relevant Regional Pest Control Strategy Agrichemical Standard NZS8409:2004

INTRODUCTION

As a long term financial asset, management of a forest does not end with the planting of trees or the completion of tending. There are a number of aspects that should be monitored to ensure the ongoing health and productivity of the forest.

Fire

Windy dry summers in many parts of the country can create high fire hazard conditions. For this reason, it is considered good management to plan for the protection of the forest asset from fire by developing an emergency response fire plan and maintaining some degree of control over public recreation to reduce the risk and ensure public safety. A fire plan should include details on:

- Access and forest/land ownership
- Insurance
- Forest details including water supplies and access
- Contacts including neighbours and other stakeholders
- Potential hazards and risks

Disease

Plantation forests are a part of a much larger landscape into which new pests and diseases might be introduced from any variety of potential sources. A forest might be subject to the transfer of unwanted diseases from neighbouring areas or it could be the initial establishment point for a new disease that needs to be identified and understood as soon as possible before it spreads. In some cases, there is little that can be practically achieved to control a disease but other common diseases such as dothistroma are easily controlled. Forest managers should monitor or have monitored their estates by competent specialists who can establish the health of a plantation and identify and initiate the response to any newly identified threats.

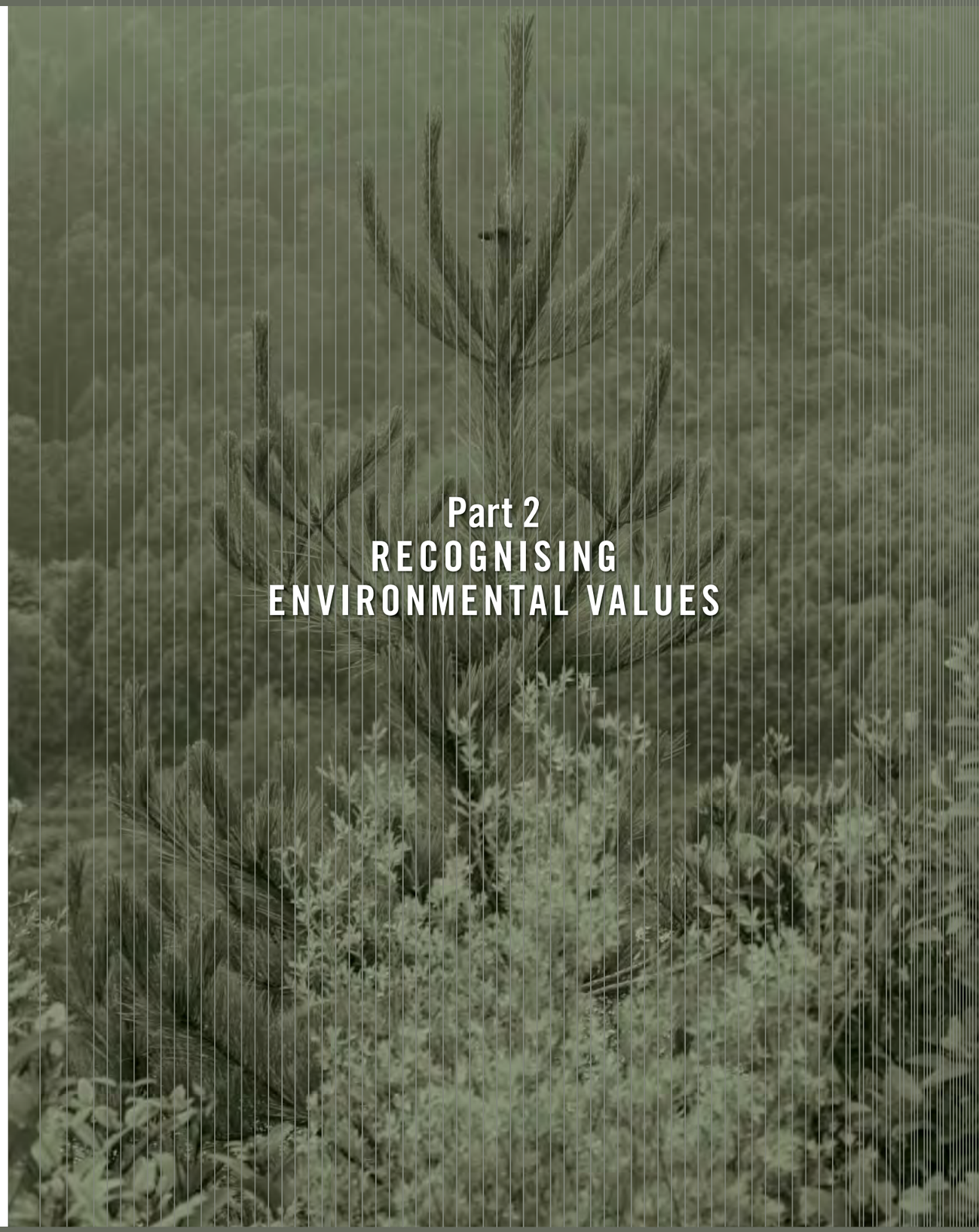
Pest plants and animals

By their very nature, forests provide a greater variety of habitat niches for biodiversity than agricultural land. Their position in the wider landscape means that they can act both as attractants to unwanted pest plants and animals and as refuges from which such pests can spread. Forest managers need to be aware of the pest species identified as locally relevant in regional pest management strategies and seek to control or eradicate such species in accordance with these plans to prevent spread and nuisance to neighbours or new areas of infestation developing within their own boundaries. Very often, the most cost effective long term control can only be achieved with cross boundary cooperation with neighbours and pest control agencies. Forest managers should look to opportunities to achieve such cooperation.

Infrastructure

Roads, tracks and waterway crossings should be monitored periodically especially until canopy closure after new or replanting at which point the erosion potential of storm events becomes much reduced. Debris blockages in culverts, waterway crossings and in water tables can all lead to scouring and sometimes earth and debris flows that can have a significant adverse environmental effect. Manage earthworks associated with firepond and firebreak maintenance for sediment discharges. The positive benefits to natural water quality from forest cover and the protection of native vegetation should not be undermined by poor control of grazing stock with in forest boundaries. Signage, particularly for safety purposes, should be maintained in areas subject to public usage and access should be controlled where possible.

NOTE:
Most forestry companies have their own forest protection procedures that all their staff and contractors must follow. This bep is primarily intended for use in situations where there are no such existing procedures.



Part 2
RECOGNISING ENVIRONMENTAL VALUES

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INTRODUCTION

There are 1.8 million hectares of plantation forests, spread throughout New Zealand. Plantation forests are a significant component of New Zealand's environment. As well as providing obvious socio economic benefits, forests generate a number of positive environmental effects including conserving soils, maintaining water quality, stabilising water flows, providing wildlife habitat, carbon storage, oxygen exchange, and providing an environment for people to experience and enjoy. In addition, many forests have historical and cultural dimensions that are important to all groups, especially for Maori.

The benefits or values below are discussed in more detail in the accompanying sections that also cover issues to be considered if these values are to be maintained and protected during forest operations:

- Soil and Water
- Scenic and Landscape
- Historic and Heritage
- Scientific Values
- Ecological
- Recreational

The planning process outlined in Part 3 covers the sustained management of these values.

1.1 INTRODUCTION

Soil and water are interrelated with a number of other components of our forest land resource, including surface and underlying geology, geomorphology, topography, climate, flora and fauna. Forestry has had and continues to have an important role to play in maintaining soil & water quality in New Zealand. Significant areas of plantation forest were originally planted for catchment and soil protection purposes in some regions to address problems created by pastoral land use. Cyclone Bola (March 1988) and subsequent storm events over erosion prone lands in the lower North Island have continued to highlight this value.

Long term land use studies such as the Pakuratahi Land Use Study (which has applicability to over 700,000ha of North Island hill country) have concluded that forestry is a sustainable land use.

1.1.1 Beneficial Effects of Forested Catchments

Typical benefits of forestry for soil and water values include:

- **Reduction in soil erosion.** Planting forests on erosion prone slopes can help stabilise geologically unstable land, while providing sustainable land use option, especially when compared to intensive pastoral land uses. Tree roots increase the soil shear strength reducing the probability of shallow land sliding (slips) and retarding other forms of mass movement e.g. earth flows. Because saturated soils are prone to mass failure, rainfall interception in the tree canopy can be beneficial as it reduces the total amount of water reaching the soil. Furthermore, forest soils are generally less compacted than similar soils under grazed pasture and have more macro-pores – effects that combine to give forest soils higher infiltration capacity and hence lower susceptibility to rilling and gullying. Litter on the forest floor and canopy cover helps to reduce rain splash erosion while tree root networks help bind soils and reinforce slopes.

Landsliding following storm events in unconsolidated sandstone country near Wanganui illustrates that value of plantation forest cover in reducing soil erosion. Researchers established that the ratio of landslides on pasture versus forest land is 10:1.
Photo taken by Lorrie Cairns.

- **Reduction in nutrient losses.** Nitrogen and phosphorus is stored in relatively stable organic forms in forest soils. Nutrients that are bound to soil particles are less prone to erosion under a forest cover. Nitrate pollution is avoided under both indigenous and exotic plantation forest cover, unless cattle are grazed as a part of an agro-forestry operation.

- **Reduction in flood peaks.** Soils under forest are drier and can store more water in small to moderate rainfall events. Closed canopy forest cover intercepts rain, giving less effective rainfall, thus forests act to reduce flood peaks in small to medium sized storm events. By reducing the supply of coarse sediment to streams, the channel capacity of streams flowing from forest areas is maintained or enhanced, so that greater flood peaks can be passed without over-topping banks (out of channel flow across floodplains).

- **Improved water quality for in stream and downstream users.** The root networks of trees growing in riparian areas helps to maintain water quality by reinforcing stream banks and reducing stream bank erosion. Overland flow seldom occurs under closed canopy forest. Delivery of fine sediment to streams is generally very low. At harvest, logging slash left at the foot of slopes and low shrubs and grasses, growing in riparian areas, help filter sediment derived on upper slopes Good management of the forest road drainage network is generally the key to minimising sediment delivery to streams in plantation forests, as roads and landings are the main sources of sediment.

- **Enhanced riparian and aquatic habitat.** Many in-stream values benefit from improved riparian habitat. Streamside shade reduces both the average and range of diurnal water temperatures, while leafy material provides a source of litter for in-stream fauna. Trees provide an ongoing supply of large woody debris (LWD) for channel form and structure, in stream habitat, and refuge for in stream fauna.

1.1.2 Adverse Effects of Forest Operations

Soil and water values are most at risk from forest operations that involve or create effects outlined below. This Code's primary purpose, through BEPs, is to avoid remedy or mitigate the effects of forest operations. Soil and water values form a component of most BEPs but particularly those covering earthworks, harvesting and agrichemical usage. Adverse effects can be substantially mitigated or avoided by using appropriate management practices and considering potential problems early in the planning stage.

- **Exposure of bare ground.** After mechanical site preparation, road and landing construction (earthworks) and burning operations, areas of bare soil increase, raising the risk of erosion. This can result in a reduction in water quality during heavy rain. While the ecology of NZ stream systems are adapted to inputs of sediment in intense storms, large slugs of coarser material entering streams can affect fish spawning habitat and increase the likelihood of local flooding as channel depth is reduced. Fine sediment remains in suspension and discolours water well beyond the operation.

  The adverse effect of earthmoving and harvesting operations can be minimized by choosing appropriate techniques, having appropriate operational supervision and maintenance, which avoids concentration of runoff thereby keeping soil and suspended sediment out of waterways.

- **Reduction or removal of vegetation.** If more than half of the forest in a large catchment is removed at any one time during land preparation and harvesting, there can be significant changes in runoff characteristics because of reduced rainfall interception and tree transpiration. (Paired catchment studies have repeatedly shown that removal of less than 20% of the forest cover is generally not detectable in the stream flow hydrograph).

  The effects of vegetation removal and soil disturbance during earthworks and harvesting can be minimised by ensuring that the minimum amount of vegetation and soil is disturbed during operations, particularly when operating close to watercourses. Establishment of a riparian buffer zone provides physical protection of the channel. Stream bank disturbance is reduced with beneficial effects on water quality and aquatic ecology.

- **Rate of runoff.** Dense roading networks in steep hill country (typically where more than 5km of road is built per 100 hectares of land) can cause a small catchment to be more responsive ('flashy') under intense rainfall, compared to unroaded catchments.

- **Compaction of soils.** Repeated use of heavy machinery on wet soils usually results in soil compaction, particularly of susceptible soils. The main extraction tracks are heavily compacted after logging with ground-based systems. Unless it is deep ripped, roots cannot penetrate the compacted soil and water cannot infiltrate, increasing surface runoff.

- **Chemical use.** Application of desiccant sprays, other agrichemicals, or fertiliser where the products that can enter the stream system. This can adversely affect in stream ecosystems.

  The application of pesticides by aerial or mechanical ground-based operation must comply with the 'Code of Practice for Management of Agrichemicals (NZS8409:2004)'. Fertiliser application should be in accordance with the Code of Practice for Fertiliser Use (FertResearch). The use of GPS systems in aircraft fitted with integral flow control systems represent current best industry practice and should be employed, where appropriate, in forest operations.

  The chemical desiccation of deep rooting vegetation also may allow increased opportunities for surface erosion and land slipping if not followed rapidly by planting or other forms of protective cover. It is important to consider timing of operations to avoid prolonged land exposure.

2.1 INTRODUCTION

Although only a relatively small proportion (c. 7%) of New Zealand's land area, plantation forestry is widespread and a highly visual component of the working rural landscape that is continually changing with the seasons and crop cycle.

While rarely part of formally recognised "outstanding" landscapes forestry operates on a long cycle with potential for periodic major landscape changes. Landscape and scenic values are inherently subjective, and societal and individual perception and appreciation of landscape will change with knowledge, time and circumstance.

Research has been undertaken to determine perceptions and attitudes towards exotic forestry in New Zealand. Exotic plantation forests are generally seen by most New Zealanders as a harvestable tree crop or tree farm, but can be viewed differently by overseas visitors, particularly those from North America, Europe and Japan, who often see them more as a natural and scenic resource, due to differences in cultural perceptions. Landscape values, including scenic, are now commonly addressed in regional and district plans and are often considered in international certification evaluations.

Perception of the forestry environment is primarily visual. Visual indicators also convey information about other values, for example, how natural areas are being protected or how well tended a forestry operation is. Forests are usually viewed from road corridors or along the edges of plantations. For many viewers, a well managed forest edge can create a positive impression of how the less visible areas of the forest are being managed. Operations with high visual impact can be used to inform and educate the public about the forest management process.

Understanding and, where possible, managing the visual effects of forest operations can reduce the visual impact of those operations. If members of the public have a better understanding of the different phases in the plantation cycle and an awareness of the benefits of well managed plantation forests, they are more likely to be supportive of plantation forestry as a sustainable land use.

Plantation forestry can create interest within an overall land use pattern.

Well selected compartment boundaries can create strong, logical patterns within the landscape.

2.2 Landscape Planning Principles

Abrupt changes in the landscape appear to be more severe, whereas gradual changes, such as trees growing year by year, are accepted as part of a slowly changing landscape. In forestry, the establishment and harvesting phases are the most dramatic in terms of visual change and are discussed further below.

2.2.1 Establishment and/or Replanting Phase

Changing land use has environmental, economic and social impacts. Forest establishment creates significant visual and sometimes physical change to the land. Herbicide application, burning, access road formation, and firebreak construction and maintenance can all have significant effects on the way that a landscape is perceived from a particular location, especially if the previous land use was not plantation forestry.

Poor planning during establishment has implications throughout the forestry cycle. If not well planned and implemented, land preparation, forest access and planting all have the potential to create conspicuous, unnatural lines within a landscape and can severely constrain options for landscape effect mitigation in subsequent plantation cycles.

When planning new forests or re-establishment consider landscape sensitivities and possible methods of reducing the visual impact of forestry management during establishment. These might include:

- Minimising the visual impact of infrastructure such as access roads and firebreaks, by careful selection of location, screening or construction practices, to ensure they are not visible from main roads and viewing locations such as lay-bys and lookouts.
- Where practicable, avoid roading on prominent faces
- Keep roads as low as possible on visible faces, or establish ridge top roads that, although visible, minimise cut batter faces.
- Within safety constraints, construct narrow roads for planting access. Upgrade works for harvesting will then be screened by the established crop.
- Revegetate or place mulch on significant visible cut/fill surfaces
- When a site can be seen from a main road or viewing location, consider locating compartment boundaries at logical junctions between landforms, such as those created by a toe slope, terrace, ridge, gully, fan, basin, or beyond the brow of a hill. The scale and pattern of forest establishment should reflect natural landform systems.
- Where possible, avoid or minimise the number of compartment boundaries running in vertical lines up hill slopes, especially where age classes differ significantly.
- Where major routes pass through large forests, it may sometimes be worth considering planting occasional groves of long term or permanent vegetation to break up the plantation boundary and create partial screening for the eventual harvesting of a forest.
- Replanting boundaries are often re-evaluated prior to the re-establishment phase for a number of reasons, including the economics of harvesting, land stability and water quality. The retirement of marginal areas may also provide visual benefits in some locations.

The District Plan will usually identify significant landscape areas and restrict the activities that can occur (without consent) in those areas, including the establishment of plantation forests and the amount of earthworks able to be undertaken. While these rules will not necessarily restrict the ability to re-establish an existing forest, they may limit the ability to establish new forests without consideration of the landscape implications.

2.2.2 Harvesting Phase

The most dramatic visual change occurs during harvesting. Strong edges are created between compartments and previously screened earthworks are often exposed. Additional earthworks, such as new landing sites, or tracking from ground based extraction methods may be very noticeable. On sloping terrain, exposed ground and remaining under storey is highly visible, following clear felling, while the visual characteristics of hauler logging is often accumulation of slash (birds nests) around landings and obvious haul lines leading to each landing.

Vertical compartment boundaries can create unnatural lines in the landscape.

Small areas of remnant vegetation will provide some relief during the harvesting phase.

Methods of reducing the visual impact of forestry management during the harvesting phase are often very constrained by engineering, safety and the implications of past historical afforestation decisions. However where practical, considerations might include:

- Harvest compartments in a logical sequence, when viewed from a main road or viewing location, leaving the foreground vegetation for removal as the last stage of an operation.
- Harvest all trees within a compartment to ensure that small groups or singular trees do not highlight an incomplete operation.
- Use of Best Management Practices (BEPs) to avoid or minimise damage to remnant indigenous vegetation within or on the boundaries of harvested areas.
- Create landing sites and landings in locations where they are not visible from main roads or viewing locations.

Other than on plains, geometric-shaped harvest patterns introduce unnatural forms and lines into a landscape. Harvest operations need not follow geometric lines and if possible should follow landform boundaries. To avoid leaving small groups of unstable trees, or leaving an image on an ‘incomplete operation’, as described above.

In visually sensitive areas, cable hauler harvesting systems may be considered, where the terrain allows, especially where slopes are to be protected from unnecessary earthworks.

In visually sensitive areas, with gentler slopes, ground based systems which create minimal soil disturbance should be considered.

Ground based extraction systems can create highly visible earthworks on prominent slopes

Harvesting in a logical sequence, and removing all plantation trees from a slope, creates a tidy impression. Gaps left on the ridgeline (as above) are often considered objectionable.

3.1 INTRODUCTION

Many cultures have settled in New Zealand. Historic and heritage places are the remnants of those earlier ways of life. Historic and heritage places have lasting value in their own right and provide evidence of the origins of New Zealand's distinct society.

Archaeological sites, as defined in legislation (Historic Places Act [HPA], refer to Part 4 Environmental Legislation), are defined as sites that show evidence of human activity before 1900. An archaeological site is a physical site able to be investigated using archaeological techniques. Cultural values are concerned with traditional values, waahi tapu or significant Maori sites. Such sites may not be archaeological sites if there is no physical presence.

Cumulatively there are a large number of Archaeological Sites spread over many forests throughout New Zealand.

Historic and heritage is defined in the Resource Management Act (s2) as meaning:
those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, deriving from any of the following qualities:

- *(i) Archaeological*
- *(ii) Architectural*
- *(iii) Cultural*
- *(iv) Historic*
- *(v) Scientific*
- *(vi) Technological*

and includes:

- *(i) Historic sites, structures, places, and areas; and*
- *(ii) Archaeological sites; and*
- *(iii) Sites of significance to Maori, including wahi tapu; and*
- *(iv) Surroundings associated with the natural and physical resources*

The main types of historic and heritage places likely to be found in forests are from pre-European Maori land use and occupation and, in some parts of the country, remnants of early European and Chinese extractive industries such as gold mining, timber milling and kauri gum digging (refer to Glossary of Archaeological Site Types). The majority of these places are archaeological sites. Archaeological sites that post-date 1900 may still be historic and heritage places, as defined by the RMA and need to be managed appropriately. Often sites of Maori origin will have archaeological and Maori cultural values, which both need to be taken into account during planning and operations.

3.2 Historic and Heritage Inventory

A key tool for management of historic and heritage places in forests is a comprehensive historic and heritage inventory. The inventory can be included as a layer in GIS applications to enable integrated planning and where appropriate included on hard copy maps.

In addition to containing information about historic and heritage places in forests, the inventory should also note if places meet the HPA archaeological sites definition and, consequently, are subject to the HPA authority provisions and, if places are listed in District Plans, are subject to consent requirements.

The primary sources of information for a heritage inventory are discussed in the following paragraphs.

3.2.1 NZ Archaeological Site Recording Scheme

The New Zealand Archaeological Association (NZAA) Site Recording Scheme is endorsed by the New Zealand Historic Places Trust and the Department of Conservation as the national system for recording archaeological site information. It is a paper-based record system that may contain plans, section drawings, photographs, artefact drawings and field notes. It is organised on a regional basis with each district file administered by a volunteer file keeper, with a duplicate central file held in Wellington. There are currently over 57,000 sites recorded across the country. However, not all archaeological sites are recorded in the Site Recording Scheme. Information on the types of archaeological sites likely to be encountered in forests is listed in the glossary at the end of this section.

Archaeological sites are usually recorded either as part of a systematic survey or intermittently because of opportunistic sightings or finds. Systematic surveys of a specific area may be carried out by individuals for research purposes or commissioned by organisations for resource management purposes, for example, the New Zealand Forest Service undertook site surveys in many of its forests in the 1970s, so knowledge of sites in some forests is of a good standard. In other areas, recording has not been undertaken systematically or not been undertaken at all. The absence of recorded sites in a particular area should not necessarily be taken to mean that no sites are present.

NZAA is currently undertaking a project to review and upgrade information about recorded sites and to develop an electronic information management system to hold and distribute the upgraded information. This project should be completed in 2007. NZAA also maintains an electronic inventory of archaeological sites, suitable for use in GIS systems.

For information about the Site Recording Scheme phone: (0508) 272 423 or check www.nzarchaeology.org.

3.2.2 NZHPT Register

The Register is the national schedule of New Zealand's historic places. It is established under the Historic Places Act 1993 and compiled by the New Zealand Historic Places Trust. The Historic Places Trust register is divided into Category I and II historic places, historic areas, wahi tapu, and wahi tapu areas. Registration is for information purposes only, however, some local and regional councils protect registered places in their district and regional plans.

Some parts of the register are on-line at www.historic.org.nz/register/register.html. Or contact the Historic Places Trust.

3 Cultural and Historic and Heritage *(continued)*

3.2.3 Local and Regional Authorities

Local and regional councils often include heritage places in their plans. These lists are often derived from NZAA and HPT lists; however, it is important to know if places are scheduled in plans as they may be subject to rules and consent requirements.

Some councils have their heritage inventories available on line. An index of council web sites is at www.rma.co.nz/councils.cfm

3.2.4 Existing Forest Records

The previous NZ Forest Service commissioned archaeological surveys of many of its forests in the 1970s. Information on these surveys and more recent archaeological surveys may be held on file. Some pre-establishment surveys were undertaken by the larger forest companies in the late 70's and early 80's. However, these were relatively rare and not extensive.

3.2.5 New Surveys

Surveys may be carried out to build up a picture of the resources in a forest or required where operations are planned that could have an effect on known heritage places. A pre-harvest survey, especially in areas where the archaeological record is scant or non existent, may be advisable especially where there is a likelihood of pre-European occupation. Such surveys are now being undertaken by many forest companies.

Historic and heritage surveys and the development of management plans for such sites should be undertaken by qualified, suitably experienced people. For a list of contract archaeologists, refer to the NZAA website www.nzarchaeology.org. Check for archaeologists with experience of working in plantation forest areas.

3.2.6 Existing Forest Records

The importance of knowing the location of any significant sites should not be understated. Many sites have been damaged or destroyed because their location was not known before work had begun. Wherever possible sites should be accurately recorded in forest records and marked in the field.

In some circumstances, the tangata whenua of an area may provide information about Maori heritage places to assist with their management, but may also be reluctant to have detailed knowledge about a site recorded in external records. In such cases, this does not need to be a barrier to ensuring the existence of the site is recognised in the planning process. Instead, what needs to be recorded in the forest's records is that there is a site in a specific location, and who to contact regarding that site. If tangata whenua do not wish to have heritage places permanently identified within inventory systems it will be necessary to consult with the appropriate people in advance of forest operations to ensure that the sensitive areas can be identified on the ground. This restriction and requirement should be recorded within the inventory.

If the tangata whenua do provide any information about a site, their approval should be sought before information about these places is included in an inventory and any restrictions on the distribution of information should be abided by.

A summary of current best practice for consultation with Maori about environmental issues can be found at MfE's Quality Planning web site: www.qualityplanning.org.nz/qp-library/index.php?

3.3 Management of Historic and Heritage Places

Heritage places are a non-renewable resource, so once they are altered or disturbed it is not possible to remedy adverse effects.

Historic and heritage places are particularly vulnerable to ground disturbance. Most archaeological sites are situated on or just below the ground surface. Not all forestry operations involve ground disturbance, e.g. pruning and spraying. However, key operations such as planting, harvesting and road construction have the potential to have a major impact on heritage places.

Avoidance should be (where possible) the primary management goal during forestry operations. Avoidance, not only protects the heritage places, it can be more cost effective, rather than going through the delays and potential costs of the consent/approval process. Where it is not possible to avoid heritage places, techniques should be adopted that minimise ground disturbance and/or restrict the disturbance to a small area.

3.3.1 Consent Processes for Historic and Heritage Places

The Resource Management Act 1991 (RMA) requires councils to manage natural and physical resources, including historic and heritage places, in a sustainable manner. The primary method of meeting this objective is through district and regional plans. Many councils include schedules of heritage items in their plans and work affecting these places may be controlled through rules.

Under the recent amendment to the RMA, the recognition and protection of historic and heritage became a matter of national importance (section 6f). Historic and heritage is to be protected from inappropriate subdivision, use or development. This sits alongside section 6e, the relationship of Maori and their culture and traditions with their lands, water, sites, wahi tapu and other taonga.

If resource consent is required for forestry operations, information about heritage places should be included in the Assessment of Environmental Effects. If no sites are known to be present this should be stated. Alternatively, if sites are present any methods proposed to avoid or mitigate adverse effects should be provided. (For further detail, refer to Part 4 Environmental Legislation).

The Historic Places Act 1993 contains provisions relating specifically to archaeological sites. However, there are no formal links between the RMA and HPA processes. If operations are planned in an area containing archaeological sites, the Trust should be contacted regardless of whether resource consent is required or not.

The HPA includes a consent ('authority') process for work that will affect an archaeological site. An authority is required from the Historic Places Trust for any situation where an operation is likely to disturb a site and must be obtained before the start of works. (For further detail refer to Part 4 Environmental Legislation).

3.3.2 Useful References

NZ Historic Places Trust. 2004. Heritage Management Guidelines for Resource Management Practitioners. NZ Historic Places Trust, Wellington.

www.historic.org.nz/heritage/achesites_intro.html#guidelines

www.historic.org.nz/heritage/achesites_protectsites.htm

www.historic.org.nz/heritage/achesites_authorityappln.htm

Walton, A.J. (ed.) 1999. Archaeological site recording in New Zealand. NZ Archaeological Association Monograph 23.

For information about the NZ Archaeological Site Recording Scheme and archaeological issues, see www.nzarchaeology.org/recording.htm

4.1 INTRODUCTION

Scientific values are land and forest values that are of interest to the scientific community. The scientific values of concern are either those values rare, unique, representative or illustrative of natural processes or not readily found elsewhere, or scientific values related to the management of forests – often concerning trials conducted over long time frames or the performance of various species or genetic sources. Scientific values can include geology, land forms (geomorphology), fossils, soils, geothermal activity, hydrology etc.

In addition to creating ecological habitats, these features may have significant scientific value. In New Zealand, these could include:

- Surface volcanic and geothermal features;
- Caves and underground systems;
- Soil profiles, Tephra sequences, and other geomorphologic features. (Refer also to the NZ Geopreservation Index at www.homepages.ihug.co.nz/~bw.hayward/NZGI/)
- Marine and other fossil sites. Much of New Zealand's geological past has been deciphered using the fossil traces of earlier animal and plant communities. Fossil localities are frequently small (on the scale of single road cuttings) and vulnerable to accidental damage. Further information on New Zealand's fossil record can be obtained from the New Zealand Fossil Records Electronic Database (FRED) at www.data.gns.cri.nz/fred.

Tephra Fault Displacement
Omatoroa Forest

New Zealand is a region of frequent seismic activity. The fault traces associated with earthquakes are important sources of information about the history of seismic events especially when models are constructed for future earthquake and volcanic risk.

4.2 Management of Sites of Scientific Value

Management should be directed at maintaining and protecting sites of scientific value. Recording of scientific sites in a Geographical Information System (GIS) should assist in their protection, enabling the sites to be identified before operations take place. The process includes:

(i) Identify the site(s)

The key to successful maintenance of scientific values lies in the identification and preservation of the site and features. If there is any doubt of the locality and extent of a site, seek advice from competent advisors. Identification at an early stage will assist the planner to ensure the protection of the site is explicitly built into the Plan so that operators in the vicinity are aware, and the site is not damaged.

(ii) Alert competent authorities

Managerial staff of the land-owning organisation should be informed first. Ask for their assistance in identifying the values. Contact research and management staff of appropriate organisations if necessary (refer to Appendix A).

(iii) Document the values

This may be a function that can be undertaken by the company or a specific scientific or research organisation may be able to undertake the task. The area should also be identified on appropriate maps or GIS Systems.

(iv) Protect the sites

Establish procedures, which ensure that key sites remain protected at all times. Give forest workers sufficient training and supervision to prevent careless and unintended damage. If sites are close to operations, they should be clearly identified and marked on the ground (electronically or GPS located if necessary).

5.1 INTRODUCTION

Many plantation forests contain areas of indigenous ecological diversity and value. These can include natural resources such as streams, wetlands, and their riparian margins, or areas of native vegetation, which were not cleared during the initial development stage. As ecological knowledge and interest increases, the ecological value of plantation forests themselves is becoming recognised, particularly as a habitat for insects, fish and birds.

Many species of native birds and fish are equally at home in an exotic plantation habitat as they are in an indigenous habitat. Examples include robins, tits, whiteheads, warblers, fantails, tui, falcon, morepork, kiwi and many native fish species - eels, galaxids & bullies. In some cases, plantation forests appear to provide the only known habitat for a particular indigenous species – providing a refuge following the conversion of the indigenous habitat to pasture. (Eg the critically endangered ground beetle Holcaspis brevicula occus only in Eyrewell Forest on the Canterbury Plains (Brockerhoff et al. NZ J Ecol 2005)).

On private land, enclaves of native vegetation have been left and protected from land development. However, while these areas have not been destroyed, their makeup, value and rarity may not been identified and investigated. To rectify this deficiency over all lands, the Protected Natural Areas Programme (PNAP) was initiated by the Crown to meet its obligations under the Reserves Act 1977. Since 1987, the Department of Conservation has been reviewing and updating the PNAP database and in recent years, a number of regional and district councils have also surveyed or partly funded surveys of native vegetation areas and wetlands including some within plantation forests. Councils often use this information in Regional and District plans to protect areas with significant ecological values. Any activities involving those areas are normally subject to restrictive rules.

Today, many forest owners have also taken an active interest in their native areas. Some of this interest is driven by the need to identify native vegetation as a component of forest certification schemes (refer to Section 4.7.4). Identifying and categorizing these areas have identified priorities for management. At a national level, the additional surveys have increased our knowledge of the biodiversity within New Zealand and a large amount of research has been undertaken by the forestry companies as well as DoC, NIWA, Scion and ecological research consultancies to look at the effect of plantation forestry on New Zealand's flora and fauna.

In the majority of cases, afforestation of previously farmed lands has a positive effect on biodiversity and, in many cases, provides replacement forest habitat previously lost to pastoral agriculture. However, it also has to be acknowledged that operations that are poorly planned and implemented can have an adverse effect on the indigenous biodiversity.

5.2 Beneficial Values of Indigenous Vegetation

Indigenous vegetation occurring within the plantation estate can have significant ecological value. These values can arise from:

- Containing a species or composition of species that represents part of the last remaining examples of that type in a region after the major land clearance resulting from New Zealand's development.
- The presence of species or associations of species that occur only in very specific and unique environmental conditions such as around geothermal vents.

Species or associations that represent the extreme margin of natural distribution where bioclimatic conditions lead to a natural succession from one vegetation association to another and where species at the margin are very rare in the area or even reflect a tendency toward hybridisation or different form.

Indigenous vegetation remnants that provide important links between otherwise fragmented indigenous ecosystems – providing a greater habitat benefit than the sum of the individual components. Such benefits can arise when the home ranges of native fauna limit the carrying capacity of individual disaggregated patches. Furthermore, such corridors and patches provide refuges and a capacity for species movement away from plantation operations involving harvesting or land disturbance.

Indigenous vegetation that increase the overall species diversity within a given landscape. At the margin between plantations, open areas, watercourse and adjacent indigenous vegetation, the transition vegetation between the main cover types are often species diverse and highly productive in terms of vegetation and micro fauna.

Indigenous vegetation that provide cross boundary buffering between plantation operations and other 'core protected areas'

Christella Fern found in Kinleith Forest.

Careful felling adjacent to Indigenous Forest.

Plantations can also create beneficial effects for indigenous vegetation. These advantages generally accrue from:

- Microclimatic buffering effects;
- Corridor enhancement;
- Increased receptive habitat area for regeneration and seed spread;
- Fire protection and suppression, and pest control operations;

Indigenous flora and fauna within a plantation estate may extend their range into the plantation areas. For example, species such as kiwi are known to roam between native and plantation areas and, in some cases, fully occupy the 'plantation' habitat.

5.2.1 Adverse Effects of Plantation Management on Indigenous Vegetation

Forestry operations can have an adverse effect on indigenous vegetation. Such impacts are usually associated with the direct physical damage, destruction and/or fragmentation of such areas or the accidental introduction of invasive or modifying agent such as weeds. Such potential adverse effects can be mitigated by appropriate use of (survey) information to establish risks and priorities, good planning, and adherence to best practices as defined in Part 1.

5.2.2 Riparian Areas And (Streamside) Vegetation

Riparian areas are the strips of land and associated vegetation that lie adjacent to a watercourse, wetland or lake. In older plantations, the trees were typically planted right to the stream margins, steep drop-offs, or to where the burn-off had failed. Consequently, riparian strips may feature predominantly plantation canopy species. Where non-planted margins exist, they may range from zero to tens or hundreds of metre widths of indigenous vegetation, particularly in steep terrain. All riparian vegetation, but especially indigenous species provide a number of ecological benefits, including:

- Stream bank stability (reduced erosion and improved water quality);
- Sediment trapping capacity.
- Provision of shade, which maintains cooler and more stable water temperatures and, consequently, high dissolved oxygen levels - essential for native fish and trout.
- Deposition of leaves and detritus into streams that provides food and substrate for invertebrates.
- Providing a source for insects that fall into the water (food for fish).
- Providing a transition environment (ecotone) containing a greater range (diversity) of wetland to forestland plant species.
- Providing a linear corridor function passing through an area or linking other patches and reducing the effects of landscape scaled habitat fragmentation.
- Providing a range of habitats, nesting spawning and roosting space, shelter, and a diverse pool of food sources for invertebrates, birds, bats and reptiles.

- Where riparian margins are very wide, they may be remnants of the older native forests that historically covered most of New Zealand.
- Being aesthetically pleasing and a visual break to large areas of plantation forest – especially at time of harvest.
- Extended periods of low intensity activity, buffering stream habitats from rapid environmental change
- Nutrient trapping and filtering capability to maintain cleaner water.

Planning and operational management required to protect riparian vegetation is usually greater than for indigenous vegetation in general. This is because of the linear, narrow and fragmented nature of the vegetation margins and the increased potential for conflicts associated with road routes, earthworks, stream crossings, and harvesting in steep country.

Riparian margins are often damaged during cable harvesting operations in steep catchments. At times, following careful evaluation during the operational planning phase, it may be determined that the best overall environmental outcome may be achieved by pulling through riparian vegetation. The result may be broken and damaged vegetation, which in most cases will quickly re-establish. However, by doing so, the magnitude of soil disturbance from road and landing construction and the number of stream crossings may be substantially reduced. It may also represent the most cost effective solution.

Where logs are hauled across riparian areas, the effects can be mitigated by application of Best Environmental Practices (Part 1) including the provision of setbacks at replanting to allow reestablishment of indigenous riparian vegetation that in many cases will readily respond due to a ready seed source and additional light reaching the forest floor.

Many councils are actively encouraging riparian setbacks but they also recognize the requirement to pull through these areas and this is specifically referenced in some council plans. When defining riparian buffers or setbacks from planting for the establishment of future indigenous riparian habitats, a minimum margin of 5 m is generally recognised as appropriate for small permanently flowing streams. Around the fragile soils on the margins of wetlands geothermal areas or adjacent to larger streams and rivers, wider widths are often established with widths determined by key functional objectives set for the riparian margin. These can often be sensibly aligned with the natural landforms adjacent to the water body that define soils and geology capable of supporting diverse vegetation types but difficult to harvest or road due to topographical constraints.

5.3 Streams and Wetlands

Forest streams and wetlands provide a habitat for a wide range of fish, macro-invertebrates and aquatic vegetation. The ecological associations vary between catchments and regions according to the natural variations in water chemistry, stream morphology, climate and the wider catchment characteristics. The stream's values cannot be viewed in isolation from the surrounding environment. Their ecological values are linked to the transition that exists between the plantation forest, riparian vegetation, wetlands and the stream's environment and its associated rich and diverse range of ecosystems.

Research has shown that base level water quality in forest streams is usually higher and more stable than for water bodies that traverse urban or agricultural landscapes and it is this stability in quality that enables aqua flora and fauna, including some threatened species, to survive. Comparative studies of fish and aquatic invertebrates in stable plantation forest streams and native forest streams indicate a similar number and species range present in both stream types where other factors remain the same e.g. geology, soil type and lack of physical in-stream barriers.

Electric Fishing is a study method useful for identifying the range of fish present in a stream. It can be particularly useful for fish data before and after an activity such as the installation of a culvert.

Many plantation forests contain important wetland remnants.

5.3.1 Effects of Plantation Management on Streams and Wetlands

Long term studies on the ecology of forest streams have helped forest owners and managers to understand how forest operations can affect forest stream morphology and ecology. These studies have recorded changing conditions and values during different phases of forest operations i.e. before earthworks begin, through to harvesting and re-establishment. Records from different streams in the same forest, where the forests are at different development stages, have also provided useful information of other factors, such as the effects on in-stream values caused by significant storm events.

Degradation of plantation forest streams can occur, particularly during infrastructure construction, harvesting, and land preparation operations. Adverse effects can arise because of:

- Increased sediment discharge into the stream due to soil disturbance;
- Increased nutrient discharge associated with sedimentation, burning or fertiliser applications;
- Chemical or hydrocarbon contamination e.g. fuel spills from adjacent land operations or environmental incidents;
- Physical barriers and oxygen depletion due to slash deposition and decomposition;
- Barriers to fish passage through inappropriate stream crossing design.
- Increased periodicity and peak flow in streams due to large areas of vegetation removal and harvesting in catchments.
- Increased temperature (and loss of oxygen) due to removal of riparian shade
- Destruction of wetlands and stream bank margins important to the breeding cycle of some species such as the native inanga (one of the whitebait species)

In most cases, appropriate application of the recommended BEPs, many of which relate to the management of riparian vegetation, crossing design and water discharge control, will avoid or substantially mitigate adverse effects.

In many areas, past historic practices of planting right up to stream banks have removed all options for undertaking forest harvesting without some degree of adverse impact. The current recommended practice adopted by the industry of a five metre replanting setback or greater where conditions necessitate should help reduce impact in the next harvest cycle.

It is now well established by long run datasets that well managed plantation forests do, overall, protect or even enhance the long run water quality and ecosystem health in catchment systems, especially when compared to alternative primary land use. Additionally, compared to grassland or urban development, plantation forests:

- Have a greater capacity to reduce the risk of short term flooding by intercepting and evaporating some of the rain before it reaches the ground;
- Physically reduce the impact energy of intense rainfall and allowing it to slowly drip through the canopy to the forest floor;
- Increase the time taken for storm flow to reach streams due to the presence of deeper rooting and higher soil permeability, thereby reducing the short term peak flood flows; and
- Reduce levels of soil erosion in general. The Pakuratahi [multidisciplinary land use] study (2006) [conducted by Hawkes Bay over 12 years] quantified sediment production as four times higher in adjacent hill country pasture vs forestry.
  www.hbrc.govt.nz/Land/PakuratahiLandUseStudy

5.4 Soils

The soils on which most New Zealand forests are planted are typically of average to poor natural fertility and are often erosion prone.

Nevertheless, ecologically it is the fundamental structure of soils, their internal reserves of natural biota (insects and fungi), natural nutrient pools and their interaction with sun and climate, that drives and shapes the biological ecosystems operating above them.

In New Zealand the array of native and introduced invertebrates and fungi associated with the decomposition and nutrient recycling processes within soils are still very poorly described and understood. Any detailed site inventory of invertebrates still has a good chance of 'discovering' previously undescribed species, the function and distribution of which will likely be very poorly understood.

Forests, including plantations, provide important ecological services in respect of soils and soils based habitats through:

- Protection of soil structure and organic content – important habitat for invertebrate biota;
- Protection of landforms from soil loss and mass movement thus preventing the loss of nutrients and inherent loss of site productivity;
- Provision of stable under storey environments – promoting the development of certain population assemblages of invertebrates and fungi;
- Relatively low nutrient demand and nutrient input growing cycles that enable existence of 'more natural' assemblages of soil dwelling organisms than exist in 'introduced non-forest' landscapes.
- Mitigation in micro-organism habitat fragmentation and loss resulting from non-forest based land management.
- Increases in Carbon storage deep in the soil profile.

5.4.1 Effects Of Plantation Management Upon Soils And Soils Habitats

Based on current knowledge, long-term plantation forest management has few adverse effects relative to a natural retained indigenous forest cover and many benefits relative to all alternative non-forest land uses.

Adverse environment impacts that do occur are predominantly associated with the temporary clearance of forest cover and the period of transition back to a forested state. Common adverse effects that forest managers should be aware of are;

- Soil disturbance and scour especially during initial road and landing construction or land preparation leading to loss of topsoil, organic matter and nutrients with risk of deposition into streams;
- Soil compaction and soil structure damage following repeated passage of heavy machinery under adverse conditions leading to poor subsequent aeration and growth productivity;
- Organic matter/nutrient loss and volatilisation following wide scale crop removal and/or land clearing burnoff;

- Increased risk of erosion and mass movement for approximately five years following harvest and reestablishment as old root networks rot and weaken but before new roots have fully occupied a site;
- Major changes to the ground level microclimate and food chain/sources after harvest drive significant changes in invertebrate population densities and make-up.

BEPs (Part 1) provide a means to avoid or to substantially mitigate most of the potential adverse effects listed above. In the case of invertebrate populations, the significance of changes is not well understood but the retention of native forest patches and riparian habitats are thought to assist recolonisation of harvested area as the new crops develop.

5.5 Other Ecological Values within Plantation Forests

Whilst our knowledge of the ecological values of native areas, riparian margins and forest streams has been increasing, our understanding of the ecological values within the plantation forests themselves has also been expanding. Scientific studies of a number of species, such as the New Zealand Falcon, Long-tailed Bats, Kiwi, Giant Kokopu, Insects and Trout fisheries indicate that plantation forests can be a valuable component in the conservation and enhancement of these species.

Research on Long-tailed bats has been carried out in various plantation forest areas; Bay of Plenty, Hawke's Bay, and the forests of the South Island's West Coast. The results have indicated larger numbers of bats in the plantation forest than in adjacent native areas, although native areas and wetlands are thought to be important. Bat activity was found to be higher along the forest roads than within the plantation. It was thought that bats used forest roads (which were rich in flying insects) as foraging areas. Riparian areas comprising either exotic or native vegetation are also highly used.

The New Zealand falcon is an endangered species. There are estimated to be only 3000 throughout New Zealand. Research in Kaingaroa Forest showed that falcons are attracted to cutover areas where the insect and bird species they feed on are plentiful. In 2003, 30 nest sites were identified and the birds appear to be breeding freely. This is an example of how normal plantation forest management (large cutover and extensive slash residue) is helping to conserve a threatened species. However, their habit of nesting on the ground and inability to see well at night makes the falcons vulnerable to attack by possums and stoats and at risk from forest operations. Consequently, management initiatives include predator control and avoidance of operations over the breeding season in areas where nesting birds are known.

Many plantation forest areas are providing habitat for the threatened kiwi, which have been shown to breed and survive in numerous plantation forest areas, particularly in the absence of dogs and other predators. The nationally threatened Kaka is also known to feed on the young

growing tips of pines and cypress though the overall importance of these observations is still not well understood. Other declining species such as North Island robin, long tailed cuckoo, kereru and some frog species are known to inhabit many plantation areas.

Even in the invertebrate area, research undertaken by NZ Forest Research Institute in the Whangamata area looked at the abundance of beetle species in a range of habitats that included urban, coastal, farmland, young and old pine plantations and native forest reserves. They found that:

"The greatest diversity and the greatest overall abundance of beetle species was found in the mature pine stand where open canopy favoured the establishment of native plants in the under storey"

Despite the environmental dynamics involved in the cycle of plantation establishment, growth and harvest, many of these ecological values can be retained over time through prudent planning and operational management. In fact, without the degree of landscape scaled connectivity and buffering provided by plantations over extended periods of time, many native forest remnants would assume relatively low ecological value and some fauna species mentioned above would cease to inhabit significant areas of the lowland landscape.

5.6 Conservation Mechanisms

The New Zealand plantation forest estate contains a range of ecological areas and habitats, which provide habitat for a range of flora and fauna. By working within current legislation, voluntary agreements and BEPs, these values can be protected, and in some cases enhanced.

For more information on rare flora and fauna in plantation forests, including management advice, refer to the NZFOA web site (www.rarespecies.nzfoa.org.nz) and follow the link 'Rare Species in Plantation Forests'.

Native vegetation and habitats (forest and wetlands) within plantation forests are protected in a number of ways:

- Legislation
  - Conservation Act
  - Resource Management Act (via rules in District Plans)

- Voluntary Mechanisms
  - NZ Forest Accord (1991)
  - Principles for Commercial Plantation Forest Management (1995)
  - Certification

The above are covered in detail Part 4 of this Code, however one further voluntary mechanism that is available to forest and land owners is covenanting.

5.6.1 Covenants

Some Forest owners enhance the long term protection of indigenous areas by entering into covenants with, inter alia, the Queen Elizabeth II Trust. QEII covenants areas are, where necessary, fenced against grazing animals and are actively managed for conservation purposes.

Maori managed land can be protected by a Nga Whenua Rahui Kawenata covenant, which is an agreement between Maori and the Crown (Department of Conservation). It can be applied to Crown land held by Maori under a Crown lease or Maori owned land. The purpose of the agreement is to preserve and protect the natural and historic values of the land, or the spiritual and cultural values that Maori associate with the land (Section 27A Conservation Act).

Some Regional Councils operate Environmental Programmes that address the specific environmental issues of a particular property including the protection of areas of indigenous vegetation. District Councils also have a similar method in the form of Local Purpose Reserve Covenants.

Prior to the formation of Regional Councils, Catchment Boards planted privately owned land with high erosion risk under a soil conservation scheme. These schemes recognised the soil conservation value of trees. Some areas or parts of areas were planted in production species with a view to potential future harvest. These schemes usually require that the area remains in permanent tree cover (allowing for periodic harvesting) and remain permanently fenced. Areas that were too steep to consider for production species were often planted in indigenous species or willows.

5.6.2 Pest Control

Many forest owners prefer to maintain full control of their native areas and undertake a programme of identifying the species and specific values of native vegetation and wetlands, and identify priorities for management. One important management tool that has a major bearing on vegetation and bird presence is the control of possums and mustelids (ferrets, stoats and weasels) although control of feral pigs, goats, deer, cattle and horses will be necessary in many parts of New Zealand. Integrated control of possums by DoC, councils and large landowners, can have a major benefit in the conservation and enhancement of native species over large areas. Regional Councils have a statutory function to produce Regional Pest Management Strategies that aim to define priority pest plants and animals and define strategies and obligations for control at the regional level. While these can create an obligation for private involvement and action, assistance in the form of advice, resources and sometimes finance can be provided.

5.6.3 Ecological Restoration

In limited cases, specific high value ecosystems may be in a location and in a state where active management for restoration to an improved or near original state is both possible and justified. This can be a very specialised task and there are a number of avenues from which assistance can be sought, including regional councils, DoC, the Native Forests Restoration Trust and ecological consultancies.

6.1 INTRODUCTION

Forests, both exotic and indigenous, have great potential to absorb large numbers of people while still retaining a sense of isolation.

While almost all plantation forests in New Zealand are privately owned assets, recreational use is an integral part of management for many plantation forests. There is a wide variety of uses and users, and they range from free public access to organized events. Plantation forests provide a wide range of recreational opportunities including; walking, sightseeing, viewing wildlife, picnicking, fishing, horse riding, hunting, jogging, cycling, motor-cross/car rallies and collecting plants, undertaken as individual and private to organised events activities.

As populations grow, the use and appreciation of plantation forests as a recreational resource is increasing, especially near urban populations. In many districts, forested areas have become an assumed part of local recreational open space supporting a large range of individual users, clubs and organisations. Public access to plantation forests is compatible with many forest operations and it can be assumed that members of the public are likely to be present. Safety considerations mean that at some times during the forest rotation public access to all or part of the forest may be restricted and many forest companies manage this by way of a "permit system".

Recreation activities in "working forests" often require consideration by management.

6.2 Interaction between Forestry Operations and Recreational Users

Recreational use is of public-relations value to forest owners. However, when a recreational facility has to be removed for operational reasons especially without adequate warning, there could be an adverse public reaction. This is a particular problem where a facility has been well used for many years and people believe, incorrectly, that it is theirs to use as a matter of right.

A number of forestry operations can have an adverse effect on recreational uses. This does not mean that the operation should not be carried out; it does however require good planning and prior notification before commencing an operation to successfully manage the interaction between operations and recreational users both for safety reasons and in the interests of public relations.

A common example where forest operations impact upon recreational values is when harvesting occurs in areas containing tracks used for walking, running and cycling. This is likely to be more common in forested areas close to towns or cities.

Operational requirement for safety also often create a temporary conflict with public usage, examples being:

- The use of chemical sprays and aerial sprays in areas where people are recreating.
- Logging trucks using forest roads that have been used by pedestrians, cycles, horses, public cars and motorcycles.
- Pest control operations (poisoning) in areas where domestic dogs are exercised, or people go hunting.

6.2.1 Managing The Operation To Mitigate The Impact

Effective communication of intentions is a big factor in mitigating the impact of an operation and maintaining good public relations. The key is to know who the stakeholders and users are and to make reasonable efforts to inform recreational users and for potentially hazardous operations to be clearly marked where appropriate.

Carefully plan, well in advance of the operation and communicate these operational intentions to potentially affected stakeholders.

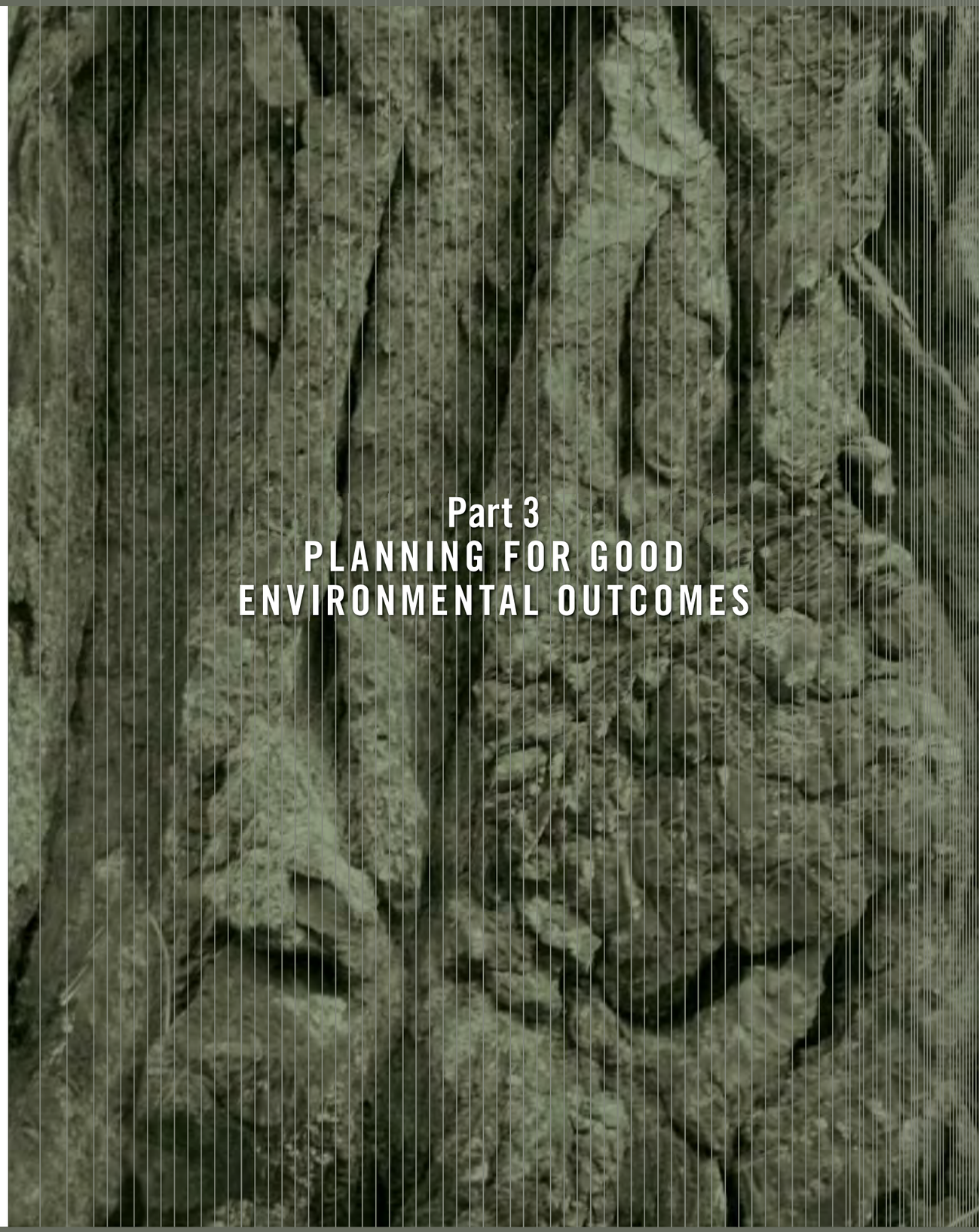
Check with the forest owner regarding known activities such as events, permitted activities and commonly used areas. If the operation is in a known recreational area, also check with local councils and information centres. Only allow public access if it is safe and operationally prudent to do so.

Once a planned operation is ready to be implemented, a number of actions may be taken to manage the interface with public users. Examples are:

- signs indicating the use of poisons, detailing the type of poison laid, the date laid and the area covered;
- signs indicating areas to be harvested, detailing the dates and the fact that entry to operational areas is prohibited to the public; hazard tape marking off any known walking or cycling tracks that enter operational areas;
- prominent signposts in car parks detailing hazardous operations in areas close to the car park; public notification of widespread operations such as aerial spraying near built up areas;
- notify any staff of the forest owner that interact with the public so they can pass on information when contacted for permits;
- contact organisers of any public events using the area if there is any likelihood of conflict;
- contact local information centres or the local council or any other bodies who provide recreational information to the public and advise them of the type, location, and duration of the operation.

In some situations, removal of a recreational facility may be advertised in the local media.
Ensure that operational staff are aware of and alert for recreational users, particularly in high use areas. The public are unpredictable and have been known to wander into operational areas despite the most comprehensive sign posting and notification available (for example deliberately going over or under hazard tape to continue a walk or cycle).

Consider having a permit access system. This enables forest owners/managers to target those individuals or groups with information. For example, if pesticides are being applied, information can be supplied to hunting clubs, either directly to individual permit holders, or via the appropriate club secretary.



Part 3
PLANNING FOR GOOD ENVIRONMENTAL OUTCOMES

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1 INTRODUCTION

Planning is a critical aspect of effective forest management. Those involved in forest planning typically have strong technical and field experience, and know how and when to draw on specialist advice and skill to assist sound decision-making.

Forest planning covers all forest operations from establishment, through silviculture, earthworks, harvesting and transport. Effective planning requires consideration of all relevant factors including safety, commercial viability and environmental and social effects.

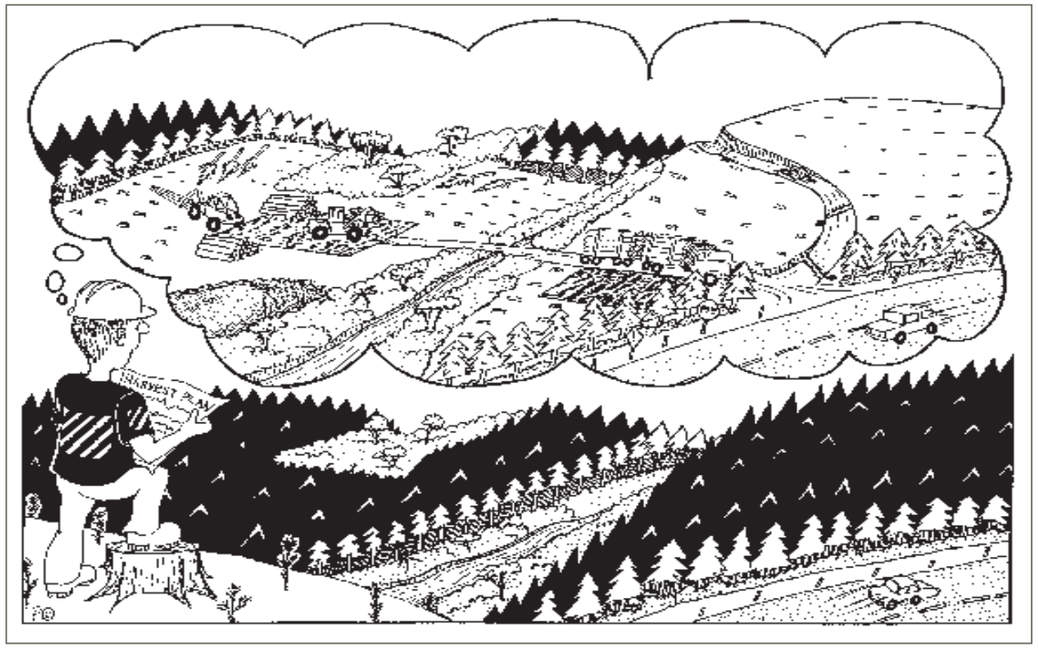
Thorough planning, well in advance of the operation, is important to ensure that operations are efficient and have minimal adverse environmental effects. By identifying how an operation could affect these values, the planner will be able to develop a strategy to manage and minimise potential adverse effects. This code is designed to assist with sound decision making and selection of appropriate operational systems and techniques.

This code is primarily intended for use at the operational planning level. However, environmental values should be considered at each of the levels of forest planning described below:

1.1 Strategic and tactical planning

This is high level planning and focuses on how the resources of a district or region are to be utilised. Resources (required and produced) will be assessed. These include, among others, wood flows, markets, processing plants, infrastructure and labour. At this stage, it is essential that key environmental values such as water, soil and ecological values are recognised and considered. Regional and district plans need to be considered as part of the decision making process, along with consultation with appropriate groups or agencies.

Decisions need to be made on whether the development is technically feasible, socially acceptable, environmentally sustainable, and cost efficient.



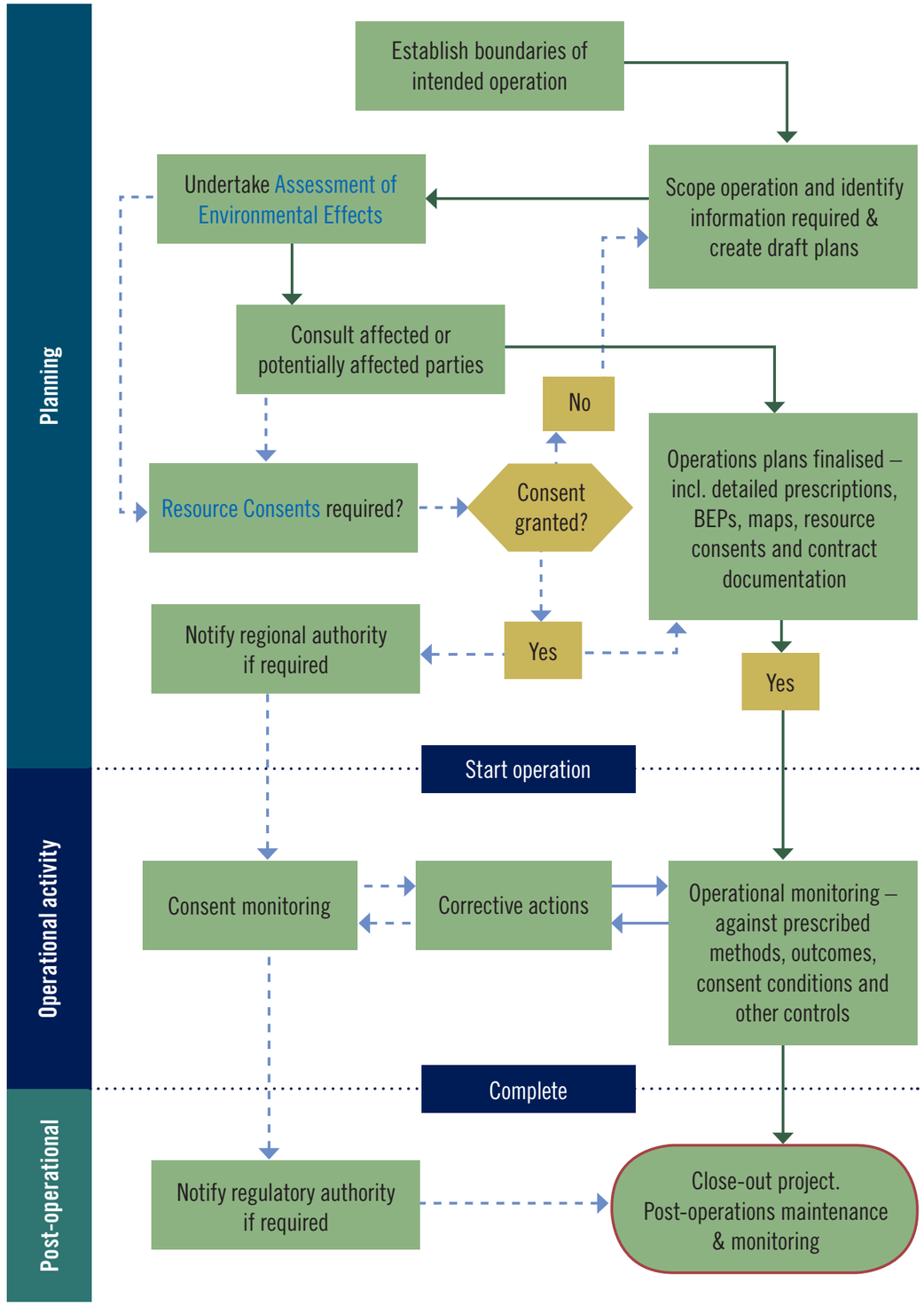
This level of planning is where staff implement strategic planning decisions at the forest or stand level. When an operation is well planned and implemented, it will most likely achieve the desired environmental outcomes.

Operational Planning involves activities such as:

- Planning the sequence and timing of a series of forestry activities.
- Defining operational boundaries and environmentally sensitive areas within information systems (mapping) and in the field.
- Defining road, landing, track, and firebreak locations.
- Maintenance of infrastructure.
- The selection of specific logging systems.
- The selection of land preparation techniques.
- Silviculture management.
- The selection of chemicals, fertilisers, and the use of appropriate application techniques.
- Consultation with affected parties.
- Reviewing relevant council plans.

In order that critical elements are not overlooked in what can sometimes be a complex and protracted planning process, it is recommended that forest managers develop and follow a robust planning process, similar to that illustrated below, to ensure planning completeness and consistency. While some operations are often simple, the basic process remains the same. However, small operations that often appear simple such as small woodlots often belie hidden complications that are easily overlooked unless a robust process is followed.

Framework for a robust planning and implementation process for Forestry Operations.



Planning for management of environmental values is a subset of the larger operational planning process where required constraints are factored into a plan along with health & safety, productivity, quality & value recovery issues. The main environmental values as detailed in Part 2 that require consideration are:

- Soil and Water
- Scenic and Landscape
- Historic and Heritage
- Scientific
- Ecological
- Recreational
- Potential impacts upon forest neighbours and adjacent road users

Operationally, there are three main steps involved during the process of identifying important environmental values. They are:

- Acquiring background data & information
- Field Survey
- Assessment of environmental effects
- Consultation
- Legal compliance & approvals

This process may be completed in a relatively short period if the area does not contain sensitive values; or an area with many complex values may take several months to compile all the information, some of which may come from independent experts or through consultation.

2.1 Acquisition of Background Data

Most forest companies have detailed information upon which to base some of the complex planning decisions. Information is often sourced externally and imported into their systems. For small independent forest owners or small woodlot situations information can be sparse. In either case, those planning operations may need to make considerable use of the external sources of information listed in Appendix A.

The availability and use of good quality, detailed mapping is important through all planning phases, and is critical to achieving the incorporation of knowledge of identified environmental issues into executable operational plans. Good mapping will also help to identify areas that require further investigation during field survey.

A typical standard of map for operational planning and fieldwork has a scale of 1:5000 or 1:10000, with 5 or 10 metre contours. Contours, sometimes overlain on an ortho-rectified air photo (on orthophoto).

Among the external sources of environmental information, a number operate comprehensive specialised mapping information systems, providing district/regional plans/maps, ecological areas, historic/cultural heritage sites, public roads and reserves, neighbours, land of different

2 Operational Planning *(continued)*

ownership, proximity to neighbouring dwellings/buildings, utilities such as power and gas lines.

The following organisations as well as those listed in Appendix A may provide useful information and mapping resources:

Government departments

- Land Information New Zealand (LINZ) www.linz.govt.nz
- Historic Places Trust, www.historic.org.nz
- Landcare Research (Land Environments of New Zealand (LENZ)) – www.landcareresearch.co.nz/databases/lenz/about.asp

Maps Online

- Terralink – www.terralink.co.nz
- Tumonz – www.tumonz.co.nz
- Landonline – www.landonline.govt.nz
- Regional and District Plans/Maps
- The forest owners GIS (Geographical Information System)

As well as topographical maps and aerial photographs.

2.2 Field Survey

Field surveying is an important part of the planning process because it provides the opportunity to "ground truth" the initial background data and collect additional information upon which to base planning decisions.

Field survey should record all aspects of the immediate and surrounding terrain, resources and the specific environmental values. This information is used to develop an appropriate operational response to the environmental constraints imposed by the site. Detailed notes of all field inspections should be kept for future reference. These notes can become more useful as time passes and the plan develops.

Site notes may include:

- Types of vegetation,
- Soil types
- Slopes
- Distances
- Existing infrastructure
- Environmental values and sensitive areas
- Neighbours
- Fences
- Utilities, including domestic and community water intakes
- Other unique site features

Forest Planning

It is important to allow sufficient time to complete the planning and information gathering process. An unrealistic timeframe could result in sub-optimal planning poor outcomes or delay operational start-up due to resource consent processing delays or objections.

2.3 Assessment of Environmental Effects

Upon completion of field surveys and the gathering of information, the Operational Planner will have identified the significant environmental values in the area of interest and have some understanding about concerns of affected parties. At this stage, the plan will be evolving as more knowledge is gained.

It is useful to undertake a structured process to list and quantitatively assess those aspects of an operation that that are perceived to create an environmental risk. An Assessment of Environmental Effects (AEE) (refer to example form on following page), is a method to list the environmental values that may be compromised and to estimate the degree of risk in terms of probability, severity and longevity of that risk. This can assist in clarifying the specific management actions that will be required to avoid remedy or mitigate the risks.

The illustration below provides an example of how the AEE process can be used as a framework for operational planning, providing a formalised process linking the preliminary information acquisition phases of planning with the final selection of the techniques to be used and the detailed specifications of the operational plan. Though many companies will have more complex planning processes to assist in achieving consistent and appropriate decisions, the same basic process apply to small and large scaled operations. The example provides guidance on usage while the full form is contained in Appendix H.

Once the operational planner has identified the level of risk to identified environmental values, they are in a position to determine:

- What effects on the identified environmental values are acceptable and what are unavoidable?
- What combination of methods/techniques and equipment gives the optimal balance of least effect and economic viability.

The planner needs to be aware of and to address potential off-site impacts. These usually apply to immediate neighbours, but effects can reach further a field. Forest operations such as spraying, harvesting and engineering have the greatest risk of creating downstream effects. These effects can include noise, dust, loss of water quality, spray drift etc.

Consultation at an early stage may assist planners to identify certain values that need to be included in any assessment. Consultation with potentially affected parties may also be required to finalise appropriate methods for avoidance or mitigation of potential risks identified in the AEE.

EXAMPLE

The example below shows how to use an Environmental Assessment of Effects form for a planned cable logging operation. For simplicity two values have been identified – heritage sites and a stream.

For values associated with heritage sites, the probability of the effect occurring has been assessed as low (one bar out of five) but the severity is ranked highly adverse (five bars) while the duration is moderate in length (three bars).

For Stream values the probability of the effect occurring has been judged as very high. Although the severity of the effect if it occurs is assessed as low to moderate, the duration effects are judged adverse and medium term. In assessing the duration of effects, short term effects would equate to a period of days to weeks – long term effects in years.

ASSESSMENT OF ENVIRONMENTAL EFFECTS

Forest:	Forest Manager:	Compartment:	Operation:	Date:

Attach any supporting documents or further details of mitigation and emergency procedures. Where risk or potential adverse impacts are HIGH, mitigation will usually be necessary.

		Adverse	Neutral	Beneficial	
OPERATION SEGMENT	**VALUE(S) AT RISK**	adverse **5 4 3 2 1**	increasingly **/ + + + + +**	beneficial	**MITIGATION** – include specified actions & BEPs as part of operational prescriptions or contract documentation where relevant
		Probability of impact	Severity of effect	Duration of effect	
Example					
Cable Harvesting	Heritage sites present	1	5	3	Specify the actions & BEPs etc to be used to avoid remedy or mitigate the risk factors – use as many lines as required.
	Stream	5	2	3	Specify ……"……."……"

Initial values identified through Acquisition of background data, field survey and consultation → **RISK ASSESSMENT** → Operational plan after consultation with potentially affected parties and verification against legal requirements

2.4 Consultation

Consulting with operational experts, regulatory agencies and potentially affected parties is important and will help to better determine specific environmental values particular to an area. For example, it is often useful to contact soil and water management staff from regional councils. They can provide useful advice on sensitive areas within your forest. It is also prudent to involve harvesting and/or roading contractors or managers. They can provide expert advice with regard to operational methods and provide feedback on the feasibility of a plan as well as the all important and invaluable 'local' knowledge.

Consultation with environmental groups, agencies or iwi can help to determine environmental values and ways to minimise potential adverse effects. Other sources of information and advice include local land owners, community groups and environmental NGOs.

Defining the environmental values can sometimes be difficult and quite technical. They may require further analysis and expert opinion to better determine their value, e.g. more detailed analysis of habitats such as streams, native vegetation and/or wetlands may be required. The identification of historic and heritage or cultural values and the search for new and unknown sites usually requires input from an archaeologist and, possibly, iwi.

In many situations, legal approval (resource consent and/or historic places authority) may be required. These processes will help determine the environmental values and the acceptable outcomes. Consent applications usually require consultation with affected parties, which may include the Department of Conservation, Fish and Game Council, neighbours, iwi or other councils. Refer to Appendix A for other sources of information.

Consultation can be a good way to educate the public, councils, community and neighbours about the forestry cycle and to obtain their feedback - particularly for an operation that may have an effect in the area for the first time. Often, people will appreciate the information and the effort undertaken to consult and this can avoid a negative reaction when works start with little or no warning.

Consultation with affected parties is one area where it is difficult to accurately predict the time and resources required. If consultation is not carried out in an open and timely fashion, it may damage relations with affected parties and bring about delays in operations.

2.5 Legal Compliance and Approvals

The Planner must know of the legal requirements of a planned operation, including the resource consents that will be required if any.

A resource consent(s) from the regional and/or district council may be required for some operations, especially any involving vegetation removal, earthworks or waterway crossings. If resource consents are not required, it is likely that there will be standard conditions, referred to as permitted activity rules, which must be understood and complied with. The requirements vary between regions and districts and depend on the type, location and extent of the operations to be carried out.

In addition, an Historic Places Authority will be required for any operations that could damage, destroy or modify an archaeological site. Both resource consents and historic places authorities must be obtained before the start of an operation, so it is vital that these are applied for well in advance to avoid delays.

Refer to Section 4 'Environmental Legislation' for the various legal requirements relevant to plantation forestry.

3 Producing the Operational Plan

Producing the operational plan is an all-encompassing exercise that should involve recording specific terrain/physical data relevant to the operation and, at the same time, identifying important values and constraints.

Once the values are identified, decisions need to be made as to what are the acceptable effects from the proposed operation. As with any plan, forestry or otherwise, tradeoffs between factors are inevitable and there is rarely one single optimal outcome. The planner should identify possible combinations of technique, equipment and infrastructure location for the proposed operation.

For each combination, the planner should define the potential environmental effects and the operational cost. This detail should be documented; it will help the planner to clarify the important issues and define the best option. Further technical analysis may be required to assist in the decision making. This might be the use of software programs such as:

(i) CYANZ – a cable yarding analysis package designed to optimise cable extraction settings and infrastructure location. Reference – www.cyanz.com

(ii) RoadEng – a terrain analysis package used to optimise the construction of difficult roads (www.softree.com/products/roadeng_forest_pro.htm).

Earthworks and harvesting operations have potentially the greatest potential effect on environmental values. They are also a large component of the forest management cost. Therefore, greater care and investment, with good operational planning, have the potential to return better overall results for all the key parties – the forest owner, authorities/agencies, iwi, and neighbours or the surrounding community.

It is essential that the planner have a good understanding of the proposed operation, the methods and techniques that will be used, and the potential effects of the final solution. Use of the BEPs from this Code should assist with the selection of methods and techniques to minimise potential effects of the proposed operation. If there are knowledge gaps, expert assistance may be necessary.

Sometimes the best option comes down to the option with the least effect when selecting the final method. For example, the two best options both have effects, but one may be more acceptable or cheaper than the other. Other factors can influence the final selection of a system or technique and how the plans are implemented. These include the availability of appropriate equipment, at a reasonable price, within an acceptable timeframe, and the availability of suitably skilled personnel. However, the result should be an appropriate balance between the many variables encompassing environmental, health & safety, productivity and economics, quality and operational logistics issues.

4 Monitoring Performance

Performance monitoring should be an integral component of forest management. It provides the critical feedback loop to the operational planning process. It is important to monitor the performance of specified operations resulting from a plan and to use that information to evaluate the efficacy or otherwise of environmental mitigation techniques and to underpin future modifications to operational planning and execution to achieve or improve environmental outcomes.

Monitoring is best carried out during and immediately after an operation and may be repeated periodically after that.

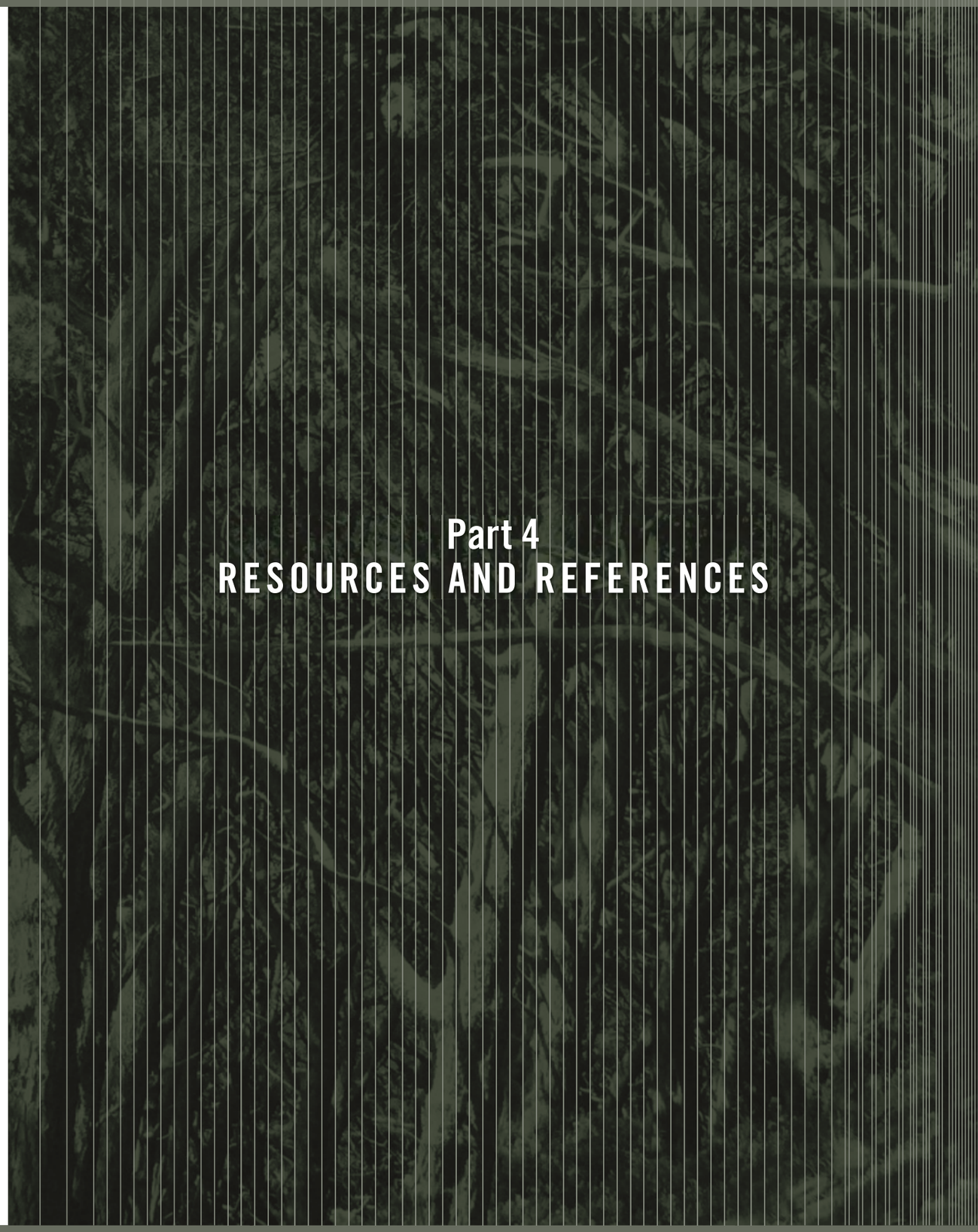
Monitoring has four major benefits:

- Checks that compliance with resource consents has been achieved.
- Checks that the plan has been followed and that the desired effects have been achieved from a forest management point of view
- Provides feedback, training, and information for future planning, and.
- Allows for management review.

Any adverse effects identified by monitoring should be quickly remedied or mitigated.

For many companies, standard management practise includes standardised checklists that list the major elements of operations that can cause adverse environmental outcomes. These lists usually require some form of scoring or signoff in an ordered and systematic approach to validate the performance of the operation in meeting the prescribed, legal or desired outcomes.

It is recommended that forest mangers adopt and follow robust monitoring processes as part of their operational planning and management activities.



Part 4
RESOURCES AND REFERENCES

TABLE OF CONTENTS

1.1 INTRODUCTION

Forest operations can be controlled or affected by a wide range of legislation. To ensure legal compliance, it is important that relevant legislation is understood and incorporated into forest planning and operations.

All personnel must know the legal compliance requirements related to their work. However, it is the responsibility of the Planner and operational managers to ensure that legal requirements are identified at the planning stage and operationally met.

The following section summarises the Acts that are most relevant to planners and operators in the forest industry: Appendix C has additional summaries of legislation not covered in this section.

- Resource Management Act 1991
- The Conservation Act 1987
- Hazardous Substances and New Organisms Act 1996
- Historic Places Act 1993
- Antiquities Act 1975
- Biosecurity Act 1993
- Building Act 2004
- Trespass Act 1980
- Wild Animal Control Act 1977
- Wildlife Act 1953
- And any and all amendments to the above Acts.

Legislation regularly changes so it is essential to work to the most up to date version of any legislation. The easiest way to do this is to refer to the government website, www.legislation.govt.nz, which is regularly updated. For legislation that has been repealed or partly repealed such as the Water and Soil Conservation Act 1967, reference should be made to www.knowledge-basket.co.nz

2.1 INTRODUCTION

This is the main legislation that affects environmental management in the forest industry. It is now the principal statute for the management of all air, land and water resources.

The purpose of the Resource Management Act 1991 (RMA) is;
'To promote the sustainable management of natural and physical resources.'

'to manage the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well being and for their health and safety while:

a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

b) Safeguarding the life supporting capacity of air, water, soil, and ecosystems; and avoiding, remedying or mitigating any adverse effects of activities on the environment.'

The RMA is effects based legislation, which requires accountability at all levels. If correctly applied, it should enable people to undertake any form of land use so long as adverse effects are avoided, remedied or mitigated to an acceptable standard.

The following table illustrates areas of responsibility under the RMA:

MINISTRY FOR THE ENVIRONMENT	
Responsible for: • Legislation • National Policy Statements (Optional) • National Environmental Standards (Optional)	**Explanation:** Monitoring effect and implementation of the RMA. States policies of national importance, e.g. NZ Coastal Policy Statement. National Policy Statement on Biodiversity, e.g. National Environmental Standards for Air Quality
REGIONAL COUNCIL	e.g. ⚬ Environment Waikato ⚬ Environment Bay of Plenty ⚬ Canterbury Regional Council
Responsible for: • Regional Policy Statements (mandatory) • Regional Plans (Coastal mandatory, others voluntary)	**Explanation:** ⚬ Outlines the significant issues for the Region and how the Regional Council intends to deal with these. ⚬ Provides rules to manage the issues/effects that Regional Councils have statutory responsibility for e.g. Regional Land Management Plan, Regional Coastal Plan. *Areas of responsibility include:* • Land use – soil conservation – water quality and quantity – natural hazards – hazardous substances • Coastal marine area (with DoC) • Discharge of contaminants to water, land and air • Water – taking, use, damming, diversion • Beds of rivers and lakes • Indigenous biodiversity
TERRITORIAL AUTHORITIES	e.g. ⚬ South Waikato District Council ⚬ Rotorua District Council ⚬ Waimakariri District Council ⚬ Rodney District Council
Responsible for: • District Plan (mandatory)	**Explanation:** ⚬ Provides rules to manage the issues/effects for which Councils have statutory responsibility. *Areas of responsibility include:* • Land use • Subdivision • Noise control • Natural hazards • Hazardous substances • Surface of rivers and lakes • Landscape values • Heritage Values (natural, cultural, archaeological) • Contaminated land • Indigenous biodiversity

There are some authorities that carry out the functions of regional and territorial authorities. These are called 'Unitary authorities. Examples of Unitary Authorities are Gisborne District Council and Tasman District Council.

There are some areas of overlapping functions between Regional and District Councils such as land use and maintenance of indigenous biodiversity.

2.2 Council Responsibilities

Councils regulate activities through rules in district and / or regional plans. Planners and Operations Managers must be aware of the provisions in these plans for the areas where they are operating. While some forestry related activities may require consent at the outset, many activities are likely to be classified as Permitted Activities (i.e. a resource consent is not required). However, permitted activities are frequently subject to compliance with activity standards, which must be met in order to be considered a permitted activity.

Forest operations classified as permitted activities in one region, may require a resource consent in an adjacent region. As all plans are different and contain different rules, each specific forest activity needs to be assessed against the rules contained in the relevant regional and/or district plans. A single operation may require resource consents from both the Regional Council and District Council. It is essential to know if the forest or operation crosses council boundaries. Where this occurs, both sets of council plans must be reviewed and where necessary, resource consent(s) should be sought from the appropriate council(s). This could lead to two different compliance standards required in different parts of the same forest or block.

It is essential that planners and/or operators identify RMA compliance requirements and obtain the necessary resource consents before operations begin. The process can be time consuming, so an application should be prepared well in advance of the proposed start date.

If granted, a resource consent will contain conditions that, along with any standards contained in the regional or district plan, must be complied with. These are legally enforceable requirements. Plans can include methods other than rules to achieve their objectives, such as education, or incentives.

2.2.1 Types of Resource Consents

Under the Resource Management Act, there are five types of resource consent. Controlled: The application must be approved by the council, but may be subject to conditions of consent:

- Restricted Discretionary: The application can be declined but it will only be considered against clearly defined matters over which council has reserved discretion;
- Discretionary: The application can be declined and council's discretion can be very wide;
- Non-complying: The application must meet statutory criteria before council can consider the application
- Prohibited: The application cannot be considered.

To determine whether a resource consent(s) is necessary prior to undertaking the activity, planners should consult the appropriate regional and/or district council plan and review the operation in relation to the council rules. They should also discuss the proposed operations with the planning or consent department of the relevant council.

Depending on the plan, resource consents may be required for land use, use of the bed of a river, or any discharge to water or air. As forest managers, the most common consent applied for will be a Land Use Consent, but there may be occasions where other consent types are sought. Often land use consents will include associated discharges to water, e.g. consent to do earthworks or install a culver in a stream, and the associated discharges of sediment to water.

2.2.2 Penalties

Non-compliance with a central or local government policy statement or plan can result in the individual and/ or company involved incurring substantial penalties such as fines and in the extreme, imprisonment.

The maximum penalty for breaching the RMA is up to 2 years imprisonment and a fine of up to $200,000, with an additional $10,000 per day for continuing offences.

There are also a range of other penalties such as infringement notices and abatement notices.

2.2.3 Certificate of Compliance

If you believe that your activity is permitted under either a District or Regional Plan, but wish to have certainty, you can request a Certificate of Compliance (s. 139 RMA). The Certificate of Compliance is a written document that will state that your activity is permitted (providing you meet the permitted activity status of the Plan). It is in effect a resource consent for a permitted activity.

The council may request that you provide further information and pay administration charges, much as they would for a resource consent application.

Certificates of Compliance are not frequently used and many councils are reluctant to issue them. However, the RMA requires a council to issue a Certificate of Compliance upon request, providing the proposed activity meets the requirements of a permitted activity.

2.3 Applying for a Resource Consent

Any person may apply to the relevant local authority for resource consent. This includes forest managers making applications for consent ***on behalf*** of landowners or on behalf of forest owners with whom they are employed or contracted.

2.3.1 What to include in Resource Consent applications

An application for a Resource Consent must be in the prescribed form. Most councils provide useful guides and forms (hard copy and electronic) to assist with consent applications. Planners should make use of these forms where practical and seek council assistance when applying for resource consents.

The information required to complete an application must include:

- A description of the activity for which consent is sought and its location
- An assessment of any actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated (refer to 2.3.2 below)
- Any information required to be included in the application by a plan or regulations
- A statement specifying all other resource consents that the applicant may require from any consent authority in respect of the activity to which the application relates, and whether or not the applicant has applied for such consents.

The information required in an Assessment of Effects on the Environment (AEE) is set out in the fourth schedule of the Resource Management Act and reproduced in 2.3.2 and 2.3.3 below. Planners should be aware that statements made in the AEE may ultimately form part of the consent conditions. As operational methods may change over time, definitive statements about proposed operations should not be made unless there is certainty that these will be undertaken in the exact manner prescribed.

2.3.2 Matters to be included in an Assessment of Effects

(This and the following section are taken directly from the 4th Schedule of the RMA.)

(a) A description of the proposal.

(b) Where it is likely that an activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity.

(c) [repealed]

(d) An assessment of the actual or potential effect on the environment of the proposed activity.

(e) Where the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment, which are likely to arise from such use.

(f) Where the activity includes the discharge of any contaminant, a description of;

  (a) The nature of the discharge and the sensitivity of the proposed receiving environment to adverse effects; and

  (b) Any possible alternative methods of discharge, including discharge into any other receiving environment:

(g) A description of the mitigation measures (safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect.

(h) Identification of the persons affected by the proposal, the consultation undertaken, if any, and any response to the views of any person consulted.

(i) Where the scale or significance of the activity's effect is such that monitoring is required, a description of how, once the proposal is approved, effects will be monitored and by whom.

1AA To avoid doubt, clause 1(h) obliges an applicant to report as to the persons identified as being affected by the proposal, but does not:

(a) oblige the applicant to consult with any person; or

(b) create any ground for expecting that the applicant will consult with any person.

1A Matters that must be included in an assessment of effects on the environment

An assessment of effects on the environment for the purposes of section 88 must include, in a case where a recognised customary activity is, or is likely to be, adversely affected, a description of possible alternative locations or methods for the proposed activity (unless written approval for that activity is given by the holder of the customary rights order).

2.3.3 Matters to be considered in an Assessment of Effects on the environment

Subject to the provisions of any policy statement or plan, any person preparing an assessment of effects on the environmental should consider the following matters:

- Any effects on those in the neighbourhood, and where relevant, the wider community including any socio-economic and cultural effects.
- Any physical effect on the locality, including any landscape and visual effects.
- Any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity.
- Any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual or cultural, or other special value for present or future generations.
- Any discharge of contaminants into the environment, including any unreasonable emission of noise and options for the treatment of disposal of contaminants.
- Any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

2.3.4 Scope of a consent

If the consent is for a controlled or discretionary (or restricted discretionary) activity over which the local authority has restricted the exercise of its discretion, the assessment of effects that is required need only address those matters specified in the plan or proposed plan over which the consent authority has retained control, or to which the consent authority has restricted the right to exercise its discretion.

For a discretionary consent, the assessment of effects will need to address all those matters set out in the 4th Schedule of the Act as well as any assessment criteria the Plan may specify.

2.3.5 Liaison

It is important that planning staff and operation managers maintain good working relationships with council staff and liaise regularly to inform council of their intentions and to ensure they do not contravene council regulations.

Included in the broad topic of liaison is consultation with iwi, neighbours, special interest groups, Department of Conservation, Fish and Game Council etc. While consultation is not a legal requirement, an applicant may be required to provide information on the effects upon interests of iwi, neighbours, etc that may only be provided through consultation with such persons. If that is likely to be the case, early discussions with a party may identify issues that can be easily rectified before plans progress too far.

Operation managers should carefully consider the nature of the proposed activity, the location and their knowledge of local issues to determine whether or not consulting with one or more of the above will assist the application. If in doubt, ask the advice of the Consent Authority.

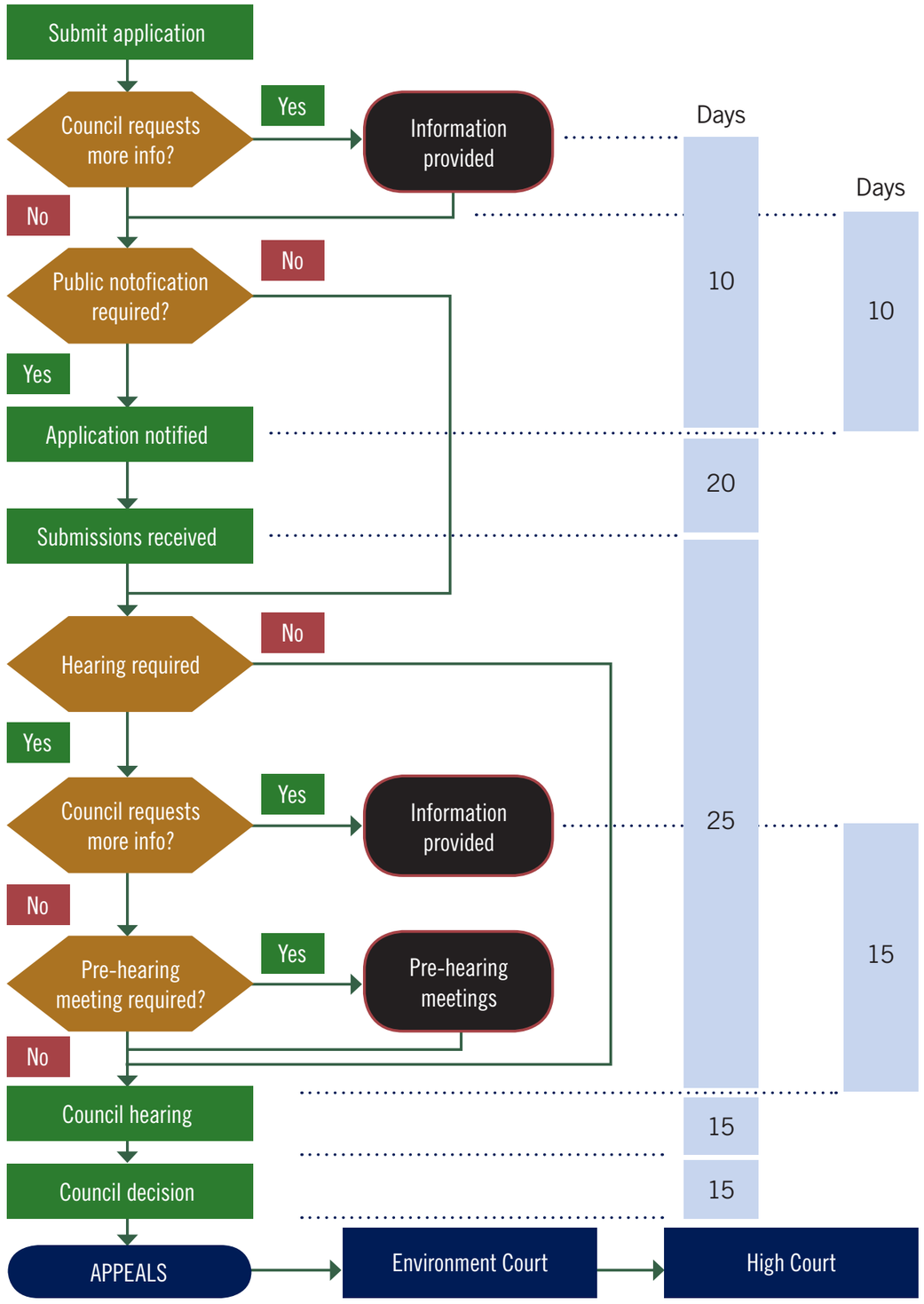
2.3.6 Resource Consent processing times

Planners need to consider the extent of notification and hearings that may be required for their consent application and ensure sufficient time is allowed for the process.

Controlled activities and activities where adverse effects are minor are not required to be publicly notified. If such activities are not notified, a council is required to serve notice on all persons they consider to be adversely affected. It must be noted that plans may include specific rules requiring notification of controlled activities.

The RMA and council plan provisions should be carefully checked as to what activities will require notification and the extent of such notification. It should be noted that notification will add significantly to the costs of, and time taken, to process a consent application. The following chart sets out an ideal time line for a consent application. Notwithstanding delays due to poor process, a council may choose to double the stated statutory timeframes.

The Resource Consent Application process



3.1 INTRODUCTION

The purpose of the Conservation Act 1987 is to promote the conservation of New Zealand's natural and historic resources. The Act formed, and now guides, the Department of Conservation ("DoC") and the New Zealand Fish and Game Council.

The key objectives of the Conservation Act are:

- It allows land to be acquired and held for conservation purposes
- The preservation of indigenous freshwater fisheries.
- The protection of recreational freshwater fisheries and freshwater fish habitats.
- Conservation advocacy.
- Promotion of the benefits of international co-operation on conservation matters.
- Promotion of the benefits of the conservation of natural and historical resources in New Zealand.
- The provision of educational and promotional conservation information.
- Fostering of recreation and allowance for tourism on conservation land, providing the use is consistent with the conservation of the resource.
- Provision of advice to the Minister.

3.2 Relevance of Conservation Act to Forest Managers

The Conservation Act is relevant to forest operations in three main areas:

a) Where the plantation is adjoining or close to a Conservation Area or Crown land which is managed by DoC for conservation purposes. Section 24h of the Conservation Act also gives the Director General of Conservation a special interest in specifically designated 20m wide marginal strips along some waterways in Crown Forest Licence (CFL) areas.

b) Where areas within the plantation forest have particular conservation or habitat values that could be compromised by forest operations. An example is an enclave of Hochstetter's frogs is known to exist in an area that is scheduled for harvest. In this type of example, DoC would have been identified as an affected party in the resource consent consultation process. It is highly likely that DoC would seek assurance that the habitat would be protected. This may take the form of a management plan agreed by both parties, which would probably be incorporated into the resource consent as a condition.

c) Where the forest owner is signatory to the **New Zealand Principles for Commercial Plantation Forest Management** (refer to Section 8.3) there is recognition that the forests are established for commercial purposes. However, it also states that if rare or endangered species are discovered, the owners will consult with DoC on management practices with the objective of conserving the population. Most forest owners have a good working relationship with DoC and the Fish and Game Councils. Whilst the forest owners and the conservation organisations have different objectives, there can often be areas of mutual interest. It is well worth developing and maintaining good working relationships with these bodies.

The maximum penalty for failure to comply with the Act is; imprisonment for 1 year and; a fine of up to $80,000 for corporates, or $40,000 for individuals and $10,000 per day for continuing offences.

Further details on the function and responsibilities of the Department of Conservation and the NZ Fish and Game Councils can be viewed on the respective web sites: www.DoC.govt.nz and www.fishandgame.org.nz

4.1 INTRODUCTION

The HPA is intended to promote the identification, protection, preservation and conservation of the historic and cultural heritage of New Zealand. The Act is administered by the New Zealand Historic Places Trust (HPT), which maintains a network of regional offices, many of which have regional archaeologists. For contact details refer to the HPT website www.historic.org.nz

4.2 Relevance of NZHPT to forest managers

1. Administers statutory consent process for work affecting archaeological sites.

2. Maintains Register of Historic Places and Areas, Wahi Tapu and Wahi Tapu Areas.
   (a) Note that the register is for information only and to assist with protection under the RMA. Places on the register do not have any additional legal protection unless they are scheduled and protected in District Plans.

4.3 Archaeological Site Definition

Under the HPA, an archaeological site is defined as:
...any place in New Zealand that:
(a) Either;
   (i) Was associated with human activity that occurred before 1900; or
   (ii) Is the site of the wreck of any vessel where that wreck occurred before 1900; and
(b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand:

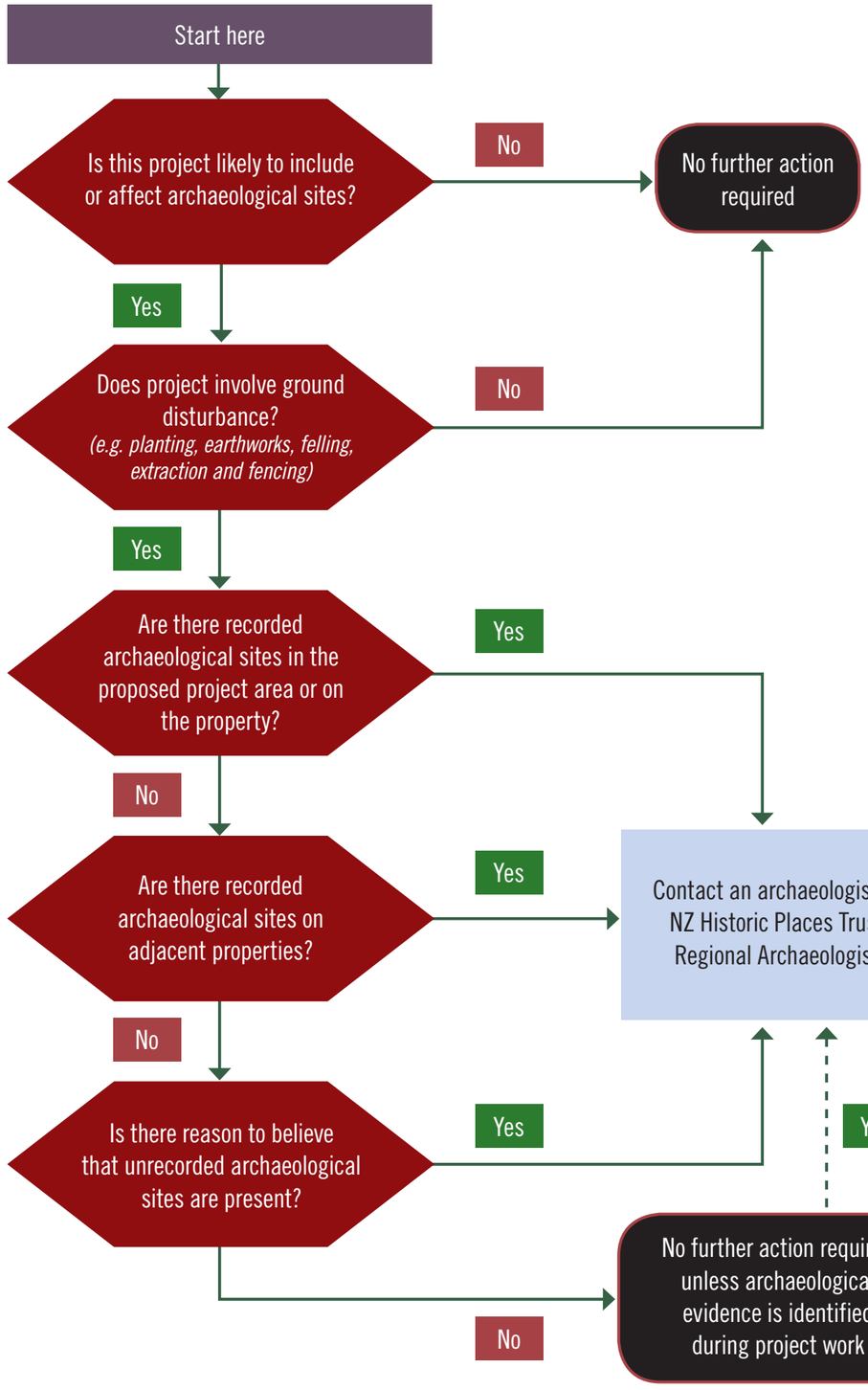
The key points are that the site must be pre-1900 and able to be investigated through archaeological methods.

4.4 Process to seek Archaeological Authorities

An authority (consent) from the HPT is required for any work that may affect an archaeological site. The Act applies to sites on land of all tenure including public, private and designated land. An authority is required regardless of whether the activity is permitted under the District Plan or resource consent has been granted.

The HPA sets out the information required and process that the HPT must follow, when considering an archaeological authority application. Application forms can be downloaded from the HPT website or obtained from the HPT regional archaeologists. The process is illustrated below.

Historic Places Act and Forestry



The 4 main parts of an authority application are:

- Details of the archaeological site and its archaeological values.
- Description of activity taking place, e.g. track formation, harvesting and the effect that activity will have on the archaeological site.
- Details of consultation with tangata whenua, including an assessment of any Maori values of the site and the effect of the work on those values.
- Proposed mitigation e.g. covenant site.

It is recommended that a qualified and suitably experienced archaeologist is engaged to prepare the authority application unless the applicant is experienced or familiar with the process. Anyone may apply for an authority, as long as they have the permission of the landowner.

Once the HPT has received a completed application, a decision is usually made within 4 to 6 weeks. The HPT must make a decision within three months, unless further information is required. At present, there is no charge for authority applications.

Pohaturoa near Taupo. This very significant historic site was successfully harvested by helicopter after thorough consultation with a number of iwi.

Historic rock carving.

4.4.1 Authority Decisions

Applications may be granted with conditions or declined. The applicant either accepts or appeals the decision. Affected parties may also appeal the HPT's decision within 15 working days of the decision. This is done through the Environment Court.

If the HPT decides to grant an authority, mitigation is normally required for any damage to the site. The authority sets out conditions that must be complied with. For forestry operations, these may include:

- Taping off sites and avoiding during operations.
- Felling to waste on sites.
- No replanting on the site.
- Preparation of an archaeological management plan to guide operations.
- Monitoring by an archaeologist of any work that affects the site.
- Investigation and recording information relating to the site.
- Following tikanga Maori protocols that may include site monitoring.

NZHPT must approve the archaeologist who will be responsible for carrying out the archaeological work required as a condition of the authority. This person can be specified in the application.

Authorities are non-transferable and, if granted after 2004, usually expire five years after the date of issue.

All stages of forestry operations, from clearing, land preparation, planting, thinning, tracking and roading, landing formation, felling, hauling and other miscellaneous activities, can have an adverse effect on heritage resources such as archaeological sites, waahi tapu and other places of historic and Maori significance. All forestry lands have the potential to contain heritage resources. It is essential that archaeological and cultural sites are identified, recorded and managed.

4.5 Penalties

It is a criminal offence to damage or destroy a site without an authority. Fines of up to $100,000 can be imposed for unauthorised damage, destruction or modification.

Forest Owners also have statutory responsibility under the Antiquities Act 1975, which:

"... provides for the better protection of antiquities, to establish and record the ownership of Maori artefacts, and to control the sale of artefacts within New Zealand"

An Antiquity is defined to include any chattel, carving, object, or thing which relates to the history, art, culture, traditions, or economy of the Maori or other pre-European inhabitants of New Zealand and which was or appears to have been manufactured or modified in New Zealand by any such inhabitant, or brought to New Zealand by an ancestor of any such inhabitant, or used by any such inhabitant, prior to 1902:

Any chattel of any kind whatsoever, which:

- Is of national, historical, scientific, or artistic importance; and
- Relates to the European discovery, settlement, or development of New Zealand; and
- Is, or appears to be, more than 60 years old and
- Any type specimen of any animal, plant, or mineral existing or formerly existing in New Zealand:
- Any meteorite or part of a meteorite recovered in New Zealand:
- Any bones, feathers, or other parts or the eggs of the moa or other species of animals, birds, reptiles or amphibians native to New Zealand, which are generally believed to be extinct.

Upon discovery of any artefact in the course of forestry operations, the object should be left in situ and the Historic Places Trust and local Iwi (if relevant) notified. They will organise appropriate uplift and stewardship of the item.

The following notes are a brief summary of the key points of the Act. Refer to the appropriate web sites, which contain current details on the legislation (including amendments to the act since this Code was produced) and its application in New Zealand. The relevant web sites are www.ermanz.govt.nz and www.mfe.govt.nz.

6.1 INTRODUCTION

The Hazardous Substances and New Organisms Act (HSNO) is designed to protect the environment and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

The Act established the Environmental Risk Management Authority (ERMA) to control:

- The importation or manufacture of hazardous substances for the first time in New Zealand; and
- The importation, development, field trial or release of new organisms, including genetically modified organisms (GMOs).

6.2 Hazardous Substances

These are substances that can harm people and/or the environment e.g. petrol. The importations of hazardous substances that are not already in New Zealand require the approval of ERMA.

The transportation and use of hazardous materials will also come under the HSNO requirements. This will be a phased process, so existing laws may still apply during the transition phase. The Act covers substances from their manufacture through to transportation, use and disposal. A number of different agencies are involved in enforcement of the 'Hazardous Substances' part of the act, these include;

- Local Authorities
- Ministry of Consumer Affairs
- Ministry of Health,
- Department of Labour
- Police and LTSA
- Maritime Safety Authority
- Civil Aviation Authority
- NZ Customs Service
- The HSNO Regulations incorporate mainly performance based requirements, i.e. they specify the objectives to be met, not what you must do to meet the requirements.

6.3 New Organisms

These animals, plants or microorganisms were not present in New Zealand before July 1998. The Ministry of Agriculture and Forestry (MAF) has a tentative list of plants, animals and known organisms that were known to be in New Zealand before this date.

"Introduction" includes:

- Introduced intentionally e.g. imported livestock, plants, fruit, seeds etc.
- Organisms that are developed in New Zealand through genetic manipulation.

New organisms that may be introduced unintentionally e.g. fungi or insect on imported timber are covered by the Biosecurities Act 1993. The aim of this Act is to ensure that pests and diseases that are already known are kept out of New Zealand.

6.4 Reference to 'Codes of Practice'

The controls that apply to each approved substance are listed in a public register that is maintained by ERMA (refer to www.erma.govt.nz). In order to comply with the provisions of the HSNO Act, many users will choose to operate in accordance with an 'Approved Code of Practice'. Under the HSNO Act, codes of practice that are approved by the authority effectively provide the practical guidance to enable users of hazardous substances to comply with regulations under the HSNO Act. Following a Code of Practice (including record keeping) is considered a statutory line of defence in the event of an unforeseen event.

6.4.1 New Zealand Standard 8409:2004 Management of Agrichemicals

The aim of the Standard is to ensure that if agrichemicals are required, they are used safely, responsibly, conservatively and effectively, with minimal adverse impact on the environment and human health. The Standard is consistent with legislation and the requirements given on agrichemical product labels. The Standard is divided into a number of sections (Management, Transport, Storage, Application, Disposal and Product data). Appropriate Environmental requirements are covered in each section. The Standard also includes a training and certification process, which requires evidence of compliance with the Standard. There are number of different certification levels available. The certificates incorporate NZQA unit standards and link with the FITEC national certificates in forestry. Details about the Growsafe programmes are available on the website www.growsafe.co.nz.

ERMA has endorsed the Standard and many Regional Plans require that people applying agrichemicals, particularly aerially, hold a current GROWSAFE certificate as a standard condition for permitted activities. Most forest companies also have a similar requirement as part of their management procedures.

6.5 Relevance of HSNO to Forestry Operations

The main relevance to forestry is:

Undertaking any activity involving the storage, use, disposal or transportation of any hazardous substance, or their development (e.g. fuels and agrichemicals, including requirements for different sizes and types of fuel containers). Recent (2004) requirements were introduced covering transportable (sled, trailer and vehicle tray) and smaller fuel containers. These affect most forestry operations, particularly harvesting, earthworks and mechanical land prep. For a copy of these requirements, refer to Appendix E.

Of further relevance to forestry is the compliance certificate (formerly Dangerous Goods Licence) required for storage facilities (pesticides, fuels etc). ERMA requires Controlled Substances Licences for Vertebrate toxins, as well as Approved Handlers certificates for those people involved in handling hazardous substances. This includes all those receiving, transporting, and using moderate quantities of class 9.1A, 9.2A, 9.3A or 9.4A (Ecotoxic substances) which includes most agrichemicals used in forestry. Users of vertebrate toxins (1080, cyanide, etc) also require an Approved Handler's certificate.

6.6 Overlap with RMA

There is an overlap with RMA, particularly via provisions in district plans covering hazardous substances. For example, a resource consent may be required to store a quantity of a certain chemical where that quantity exceeds the volume threshold for permitted activities.

6.7 Compliance and Penalties

Everyone who is involved with hazardous substances and new organisms has a duty to meet the requirements of the HSNO Act.

Failure to comply with the main provisions of the Act may result in the following penalties:

- Fine of up to $500,000 for an individual
- For a Corporate, the greater of $10 Million ***or*** 3 times the value of any commercial gain derived from the contravention ***or*** 10% of the total turnover of the Body Corporate
- A further fine of $50,000 per day for a continuing offence
- Imprisonment for up to 3 months.
- The offender may be required to remedy or mitigate any adverse effects of the non-compliance at their own cost.

There are lesser fines for less serious offences.

The Act also regulates research in such fields of development such as testing of genetically modified trees or new biological control agents.

7.1 INTRODUCTION

The Biosecurity Act 1993 is an Act to restate and reform the law relating to the exclusion, eradication and effective management of pests and unwanted organisms. It covers importation of Risk Goods, surveillance and prevention, pest management and administrative bodies, enforcement and penalties.

This replaces a number of Acts including the Noxious Plants Act 1978 and the Pesticides Act 1979.

The objectives of the Act are:

- To prevent, through border control, the introduction of unwanted organisms not already established in New Zealand.
- To manage unwanted organisms in New Zealand, through mechanisms such as Pest Management Strategies.

The Biosecurity Act covers border control for all organisms that may be imported unintentionally, and for managing pest species already in New Zealand.

7.2 Administering Agencies

The Ministry of Agriculture and Forestry is primarily responsible for administering the Act, however a number of other bodies including local and regional councils and ERMA also play a role.

7.3 Implications

The Act covers regulations for border control to prevent the introduction of unwanted pests, and covers a range of offences associated with being found in procession of, or importing unauthorised goods. It also covers offences relating to failure to comply with national and regional pest management strategies (among a number of other offences). Penalties in the Act include jail terms and individual fines of up to $100,000.

7.4 Relevance

The main relevance to forestry is the pest strategies in place, both nationally and regionally, and any obligations that must be adhered to under these strategies. They are usually aimed at control of specific species potentially including plants, animals, insects and micro-organisms, and some of these may be common in plantation forestry or aimed at protecting forests.

National pest management strategies are administered by the Ministry of Agriculture and Forestry.

Current strategies relevant to forestry being pursued nationally include work on the Asian Gypsy Moth and the Gum Leaf Skeletoniser.

Regional strategies are formulated and administered by the appropriate Council and again information is available either from their website or by contacting the council. It is important to ensure that any copies used are still current, as the strategies generally operate within a given date range.

An example of a regional strategy is Environment Bay of Plenty's classification of Woolly Nightshade as a "Progressive Control Pest Plant", which means that land owners are required to control it on their property. The same applies to Old Man's Beard and both are species that can occur in plantation forests. Therefore, it is important, particularly when holding responsibility for block management, to be aware of any obligations regarding pests on the land.

Information on strategies, proposed strategies and submissions on proposed strategies can be accessed on the MAF website or by contacting MAF or through web sites of the various councils. It is important to use this or an alternative ***current*** source (MAF or contact the councils direct) as plans are constantly being changed and updated.

8.1 INTRODUCTION

In addition to meeting legislative requirements, much of the plantation forest industry operates under a number of voluntary agreements, accords, industry standards and certification systems including:

- New Zealand Forest Accord 1991
- Principles for Commercial Plantation Forest Management 1995
- Third party forest certification systems
- NZFOA National Standard for Environmental Certification of Well Managed Plantation Forests in New Zealand

8.2 New Zealand Forest Accord 1991

The New Zealand Forest Accord is a voluntary agreement between many of the country's conservation groups and the forest industry represented by the NZ Forest Owner's Association (NZFOA) and the NZ Farm Forestry Association. The Forest Accord was signed in 1991 and contains the following objectives:

- To define those areas where it is inappropriate to establish plantation forestry.
- To recognise the important heritage values of New Zealand is remaining natural indigenous forests and the need for their protection and conservation.
- To acknowledge that the existing areas of natural indigenous forest in New Zealand should be maintained and enhanced.
- To recognise that commercial plantation forests of either introduced or indigenous species are an essential source of perpetually renewable fibre and energy offering an alternative to the depletion of natural forests.
- To acknowledge the mutual benefits emanating from an accord between New Zealand's commercial forestry enterprises and conservation groups and the example this unique accord can provide for the international community.

A summary of the seven instruments of the Accord is provided in Appendix E, which explains how the Accord is applied. The Forest Accord is available on the NZFOA's website.

8.3 Principles for Commercial Plantation Forest Management 1995

Following on from the NZ Forest Accord, the Principles for Commercial Plantation Forest Management were signed in 1995. The document was signed by a number of environmental non-government organisations (NGOs), the NZ Forest Owners' Association and the NZ Farm Forestry Association representing plantation forestry interests.

The 'Principles' complement the NZ Forest Accord and acknowledge the following;
Plantation forestry has an important economic value for the national and regional economies.
Well managed plantation forests present positive environmental benefits and any potential negative impacts can be minimised.

The document also includes some practical guidelines for shaping commercial plantation management from an ecological, social and economic point of view. This document is available on NZFOA's web site and is copied in Appendix E.

8.4 Third Party Environmental Certification of Forests

Globally, there are a various third party certification systems in place. The most significant are;

- Forest Stewardship Council (FSC)
- Programme for Endorsement of Forest Certification Systems (PEFC)
- American Forest and Paper Associations Sustainability Forestry Initiative (SFI).

These environmental certification systems provide assurance to purchasers that timber and other wood products are produced from forests that are sustainably managed. Certification is held by a company or forest owner for a specified area of the forest. If a forest is sold, the new owner will be required to reapply for certification.

Growth in demand for certified wood products originated in the USA and Europe and arose from concerns about unsustainable logging of native forests, particularly in the tropics. Public pressure on retailers such as Home Depot in the USA lead them to move towards stocking certified products as a means of providing assurance to their customers. Some retailers have a policy of increasing the percentage of certified wood products as it becomes available. Government Procurement policies increasingly reference environmental sustainability and are an additional motivation to seek environmental certification.

Certification includes identifying the chain of supply from the forest to finished products available to the consumer. Certifications are independently audited.
It is clear that consumers are not prepared to pay a premium for environmentally certified wood and wood products. However, suppliers may require certification for market access reasons rather than for a price premium.

International Standards Organisation (ISO) 14000 series standards were widely used prior to the development of performance standard based Certification Systems. ISO does not have operational performance standards, except legal compliance, but can provide the framework and control mechanisms for management to certification standards specified elsewhere.

As at 2005 just over half of the 1.8 million hectares of plantation forests in New Zealand has obtained Forestry Stewardship Council (FSC) Certification and this proportion is expected to increase. Products from certified forests can carry the FSC Logo on their documentation and stencilled onto logs and wood products.

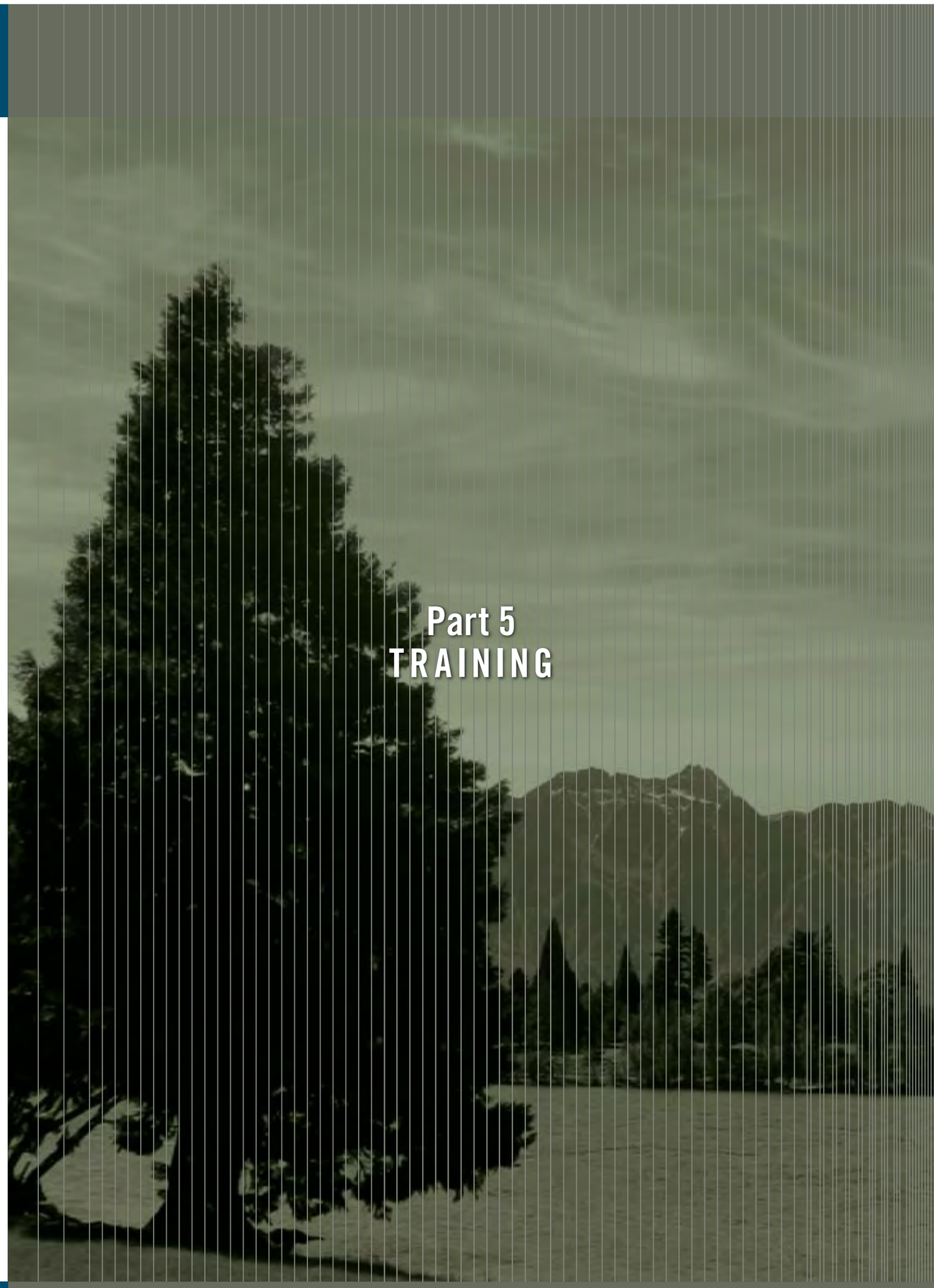
8.5 The National Standard for Environmental Certification of Well-managed Plantation Forests in New Zealand

The 'The National Standard for Environmental Certification of Well-managed Plantation Forests in New Zealand' was released on 11th August 2005. The Standard can be viewed on the NZFOA website www.nzfoa.org.nz.

As more forests in NZ become formally certified under third party schemes such as FSC the NZFOA standard for plantation forests in New Zealand currently serves a purpose in providing a guide for the use of members who, while not yet ready for full independent third party certification, may wish to start proceeding down that path.

While this current standard does not form any part of any independently verified or audited certification scheme it can be used as a guide to benchmark a forest company's current management performance against many of the key indicators that they are likely to need addressing to meet current "official" certification requirements.

The Standard is intended to build upon, and in some aspects exceed, relevant regulatory requirements as a means of distinguishing and promoting forest products managed in accordance with it. It is not intended that it form the basis of, or justification for, regulatory change.



1 The Code as a Training Tool

The Forest Operations Best Environmental Practices have been developed as an operational tool for planners, owners and operators. The BEPs are intended to be referenced as and where required in relation to forest planning and operational issues.

The focus of formal environmental training (environmental unit standards) or degree papers, is to equip people to plan and undertake forest operations whilst meeting appropriate environmental standards and to achieve legal compliance. As the content of the unit standards is there to assess understanding and knowledge of the issues, this Code can be used as a background document to completing the training and unit standard assessment process as well as providing links to a number of other organisations and sources of information which may be useful in the training process.

2 The Need for Environmental Training

Plantation forestry is a sustainable land use if operations are planned and managed in a way that identifies environmental values and applies appropriate Best Environmental Practices (BEPs) to ensure that identified values are not damaged.

Forest operations are undertaken in the natural environment that means that each block and each operation can represent a unique set of circumstances. The environmental factors that make a block unique include:

- Soil type, slope, rainfall;
- Proximity to streams, habitats, native vegetation, neighbours and other boundaries;
- Proximity to physical resources such as roads, culverts, gas lines, water mains, power supplies;
- Proximity to Historic and Heritage Places;
- Landscape features and visual values.

In addition, the environmental effects of operational factors such as machine capabilities, tree piece size, landing size, fuel delivery/storage, machine maintenance location, spray swath, herbicide storage and mixing locations are key considerations.

It is the responsibility of the planner, owner and/or operator to identify the best operational method(s) to achieve the required standards for the particular operation on the particular site. Environmental training helps broaden understanding of the range of values within a plantation forest and the potential adverse effects of forest operations on those values. It will help to identify the range of BEPs that can be applied to operations in different situations and how they should be used.

Training courses can also assist in developing a working knowledge of the environmental legislation that affects operations in the plantation forest industry. The required level of knowledge will vary according to job or function.

Everyone working in the forest should receive some environmental training appropriate to their role. This may need to be continued as the individual's responsibilities increase or change. The environmental requirements on plantation forestry are constantly changing and people in the industry need to be aware of the changes and how they affect their job or their operation. People may also require training to operate under a specific company Environmental Management System (EMS), which may contain procedures and standards that should be met.

3 Operational Training Available

It is essential that all people working in the forest industry understand that we are operating in the natural environment and that we have the potential to cause short and long term damage to the environment. By knowing what the risks are, and understanding what 'tools' are available it is possible to avoid, remedy, or mitigate those risks.

Forestry training is available at a number of different levels, ranging from university undergraduate and post-graduate degrees to diplomas, industry based training, apprenticeships, one-off courses and seminars. Any of these may include environmental training. This code is for use in the working forest industry, so the following comments will concentrate on operations based environmental training.

FITEC is the industry training organisation (ITO) which oversees operational training within the forest industry. It sets industry standards for training and ensures that there are identifiable training paths for people at all levels within the industry. FITEC coordinates trainers and assessors and develops new unit standards and other training resources where a need is identified.

Training is linked to the unit standards. These are nationally recognised qualifications forming part of a series of national certificates, registered and recorded by the New Zealand Qualifications Authority (NZQA). Refer to Appendix A for details of the FITEC and NZQA web sites.

Six unit standards cover the operational environmental issues in forestry. Unit Standard 17772 is an introductory unit suitable for all operational people in the industry. The other unit standards (17773, 6963, 6964, 6965 and 6966) are higher level units, which test an individual's understanding and ability to apply more advanced knowledge in a work situation. Each unit standard is described in Appendix B

Abutment: A construction that supports the end of a bridge.

Assessment of Environmental Effects: A process of systematically identifying elements of the environment that may be impacted by an operation or undertaking, the estimation of the degree, certainty and longevity of any effects and the specifying of the means to avoid remedy or mitigate these effects.

Batter: A constructed slope of uniform gradient.

Berm (ing): A raised earth or engineered structure parallel to the edge of a road or track, designed to contain and direct surface water runoff and sediment to controlled discharge points.

Birds Nest: Accumulation of slash and waste wood material around the edge of a landing arising from harvesting operations.

Buffer Zone: An area adjacent to a perennial stream, lake, wetland or other sensitive area, where special care and consideration is given to activities to minimise soil disturbance, or other adverse environmental effects.

Bunding: Secondary containment system around an operation or storage facility to contain or prevent leakage that may contaminate ground water, natural watercourses or susceptible soils. Generally either a purpose built steel or plastic tray, or placement of soil or other material to form an earth barrier.

Catchment: A geographical unit that carries surface runoff under gravity by a single drainage system to a common outlet or outlets. Also commonly referred to as a watershed or drainage basin.

Catchment Hydrology: Term describing the measurable patterns of water flow from a catchment including water yield, flood flows, flood response and other characteristics.

Compaction: In engineering terms, compaction in soils is any process that rearranges the soil grains to decrease void space and bring them into closer contact with one another, thereby increasing the weight of solid material per unit of volume, increasing their shear and bearing strength and reducing permeability. In soil management terms, compaction of soils arising from repeated passage of heavy machinery is an adverse effect causing reduced soil aeration and water capacity with consequential loss of growing capacity.

Culvert: Pipes or enclosed channels for conveying a watercourse or stream below formation level.

Cut-off: Shallow channels/earth mounds constructed across a road, track or firebreak and used to divert and control runoff. Cut-offs are constructed to minimise sediment movement and scouring by preventing the accumulation of sufficient flow and velocity to support erosion. Unlike water bars, cut-offs are normally used in impermeable soils and are not used for retaining runoff.

GLOSSARY

Decommission: The process of actively removing, deconstruction and making safe and secure, engineered structures such as roads and landings that are no longer needed after completion of operations.

Deposition: The build-up of material that has settled because of reduced velocity of the transporting agent (water or wind).

Earthflow: An area of land where deep seated layers of soil lack sufficient cohesion to remain in place and start to flow slowly downhill due to the force of gravity. The loss of cohesion is usually a function of soil type combined with an excess of moisture.

Fill: Re-deposited soil material above the natural ground surface.

Flume: An open channel, conduit, made from plastic, galvanised corrugated steel, and sometimes concrete, or timber, which is used to carry runoff from earthworks over loose fill or erodible material so that it can be discharged onto less erodible surfaces.

Landing: *(Pad, Skid)* flat area of land upon which machinery operates to haul trees and logs in from the forest, process them into marketable grades and load them out onto trucks for delivery to processing plants

Mulch: Covering of loose organic or other materials applied over surface of soil to protect it from raindrop impact and to enhance certain characteristics, such as improved water retention and seed germination. In the context of land clearance, mulching refers to the grinding up of stumps and logging waste and branches into small chips and respreading the organic material over the land.

Native Forest (vegetation): Areas of land that are predominantly covered in indigenous tree species that are naturally established, including managed indigenous forest areas where regeneration is supplemented by planting of indigenous species.

Post-operational: Usually in reference to management and administrative activities undertaken to complete a forestry operation after the main physical operational activities have finished.

Protected vegetation (areas): Areas of native or exotic vegetation within or adjacent to a plantation forest that are protected for various purposes including ecological, erosion & sediment protection, genetic, landscape and visual, recreational, and scientific.

Restricted area: *(also Environmentally-Important Area)* Any area that contains or is adjacent to one or more environmental values, including: a riparian area, erosion-prone area, historic and heritage, native/protected vegetation, neighbouring property, public utility recreational values, scientific or visual/landscape values and from which forest operations activities must be excluded or subject to prescribed controls.

Riparian area: *(also known as Streamside Management Zone Riparian Buffer Riparian Setbacks or Riparian Management Zone)* The narrow strip of land adjacent to the banks of a stream, river, lake or wetland. Riparian areas often contain diverse assemblages of native flora and fauna and

contribute to ecological function to an extent greater the sum of their areas. Riparian functionality is often determined through the combination of both the stream and riparian land area width. (Refer to Part 2 Riparian areas & streamside vegetation.)

Road line salvage: Harvesting of trees from the intended route of a new road prior to its construction.

Runoff: Surface water from rainfall that flows off sloped areas.

Sediment: Solid material, both mineral and organic, that is in suspension (suspended sediment), is being transported, or has been moved from site of origin by air, water, gravity or ice and has come to rest on the earth's surface either above or below water.

Set back: *(sometimes referred to yards or yard standards)* defined distance (width) of land between productive crop or proposed operation and an identified environmentally sensitive value. Used to buffer environmental value(s) against adverse effects of forests or forest operations. Refer also to riparian setback.

Slash: Branches, tops, chunks, cull logs, uprooted stumps, slovens and broken trees and other waste wood left behind after harvesting.

Splash Erosion: The erosion caused by rainfall impact, which causes the initial dispersion of soil particles.

Stabilisation: Providing adequate measures, vegetative and/or structural that will protect or reinforce exposed soil to prevent erosion.

Swing Yarder: A specialist cable log hauling machine configured like a crane and capable of swinging around on its base thus pulling logs up onto the landing along side. Such machines are capable of operating on smaller landings than conventional cable haulers.

Water control structure: Any engineered structure designed and installed for the purpose of directing, limiting, reducing or containing the surface flow of stormwater in order to protect structures or the land from erosion or to limit the carriage of sediment into water bodies or protected areas.

Water table: The shaped or engineered depression running parallel to the edge of a road surface that is designed to catch stormwater runoff from the road surface and carry it to suitably located and constructed discharge points.

Waterway: *(also stream, river, ephemeral stream water body excluding wetlands)* Natural channel system carrying flowing water or surface water permanently or intermittently in the course of a year.

Windthrow: Trees blown down by action of wind.

Wetland: permanently or intermittently wet areas, shallow water and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.

GLOSSARY

Glossary of Commonly Found Archaeological Site Types

Under the HPA, an ***archaeological site*** is defined as:
"Any place in NZ that ***(a) either;*** Was associated with human activity that occurred before 1900; ***or;*** Is the site of the wreck of any vessel where that wreck occurred before 1900; ***and (b)*** is or may be able through investigation by archaeological methods to provide evidence relating to the history of NZ".

The key points are that the site must be pre-1900 and able to be investigated through archaeological methods.

Archaeological sites that post-date 1900 may still be ***historic and heritage places***, as defined by the RMA and need to be managed appropriately.

Maori Pa sites are fortified places, usually with earthwork banks and ditches. Pa are typically located on naturally defensible high points, such as the end of a steep sided ridge or coastal headland. Pa were also built on the edge of swamps or even on flat land.

A terrace is an artificially levelled area, which is often found in association with evidence of cultivation and settlement. Archaeological investigations have shown that Maori terraced sites usually include evidence of houses, food storage pits, designated food preparation and cooking areas.

Pits, either rectangular or circular depressions, may be the remains of structures or cellars used for storing kumara, or potatoes.

Artefact finds are also common in some forests. These include wooden artefacts such as pigeon troughs and palisade posts, stone adzes, hangi stones etc.

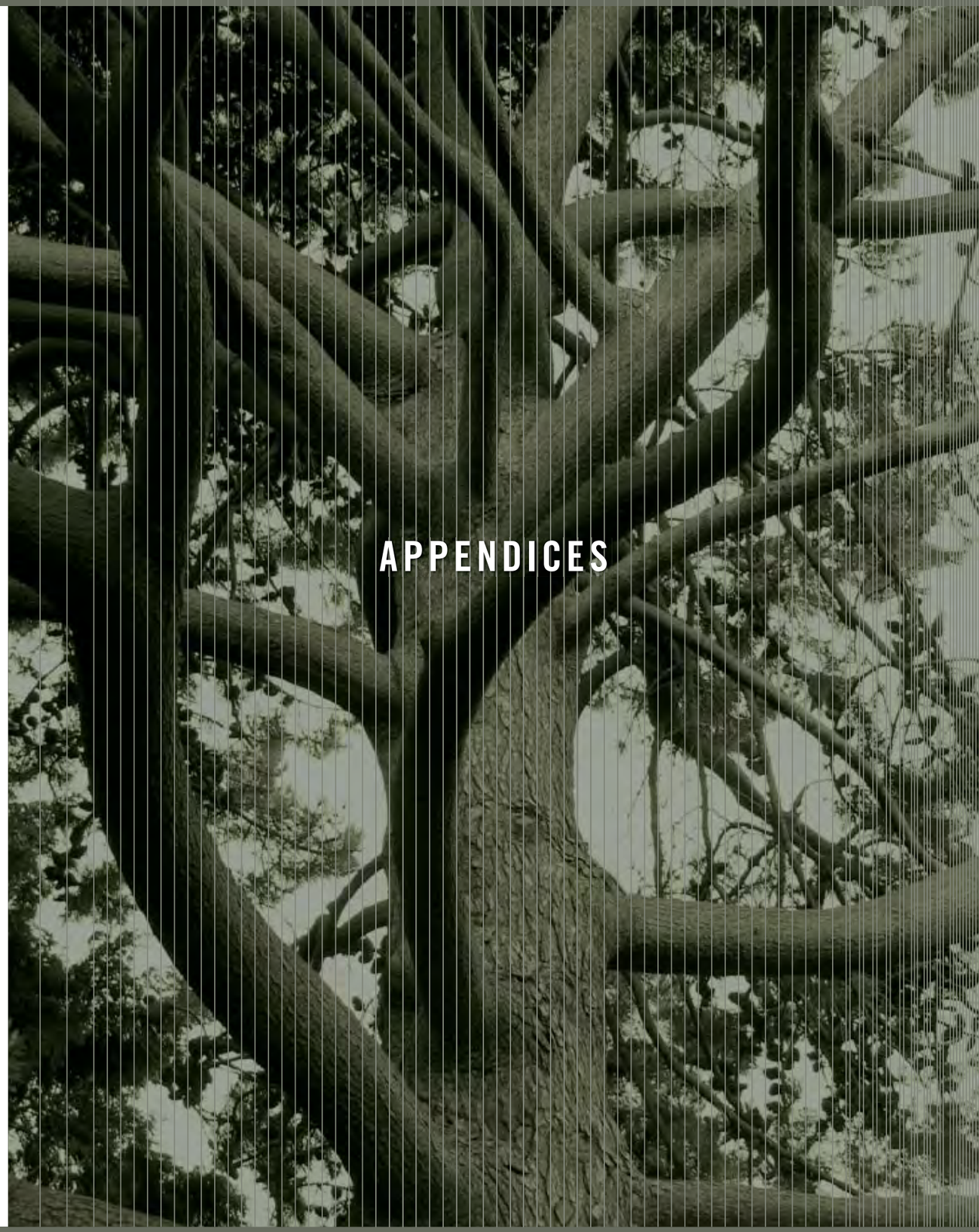
Middens are rubbish dumps that may contain shells, bones, artefacts, charcoal and sometimes oven stones, glass and crockery. They are a common feature in New Zealand archaeology and can relate to Maori or European activity.

Maori burial sites may be uncovered during earthworks or in cliffs. Burial sites may be unmarked, or sometimes contain recent graves with headstones or fenced surrounds.

Gold mining sites show the changing technology from simple manual methods to large-scale steam and water powered machinery. Gold mining took two main forms: alluvial mining from river gravels and hard rock mining where the gold was mined from seams beneath the ground. Hard rock mining requires complex machinery to mine, crush and chemically treat the rock to extract the gold. Hard rock mining is still carried out today. Archaeological remains of gold mining include the alluvial gold-fields marked by tailings, working faces, water races and miners' huts and camps, and remnants of hard rock mining such as stamper batteries, shafts, cable and railways, and cyanide tanks.

Timber milling sites relating to earlier indigenous milling. Evidence may include forestry camps and settlements, post splitting camps, tramways, bridges, hauler and bullock tracks. Kauri milling sites may be in association with evidence of Kauri gum digging – including camp sites and gum extraction areas.

For information about the different types of archaeological sites in New Zealand refer to the NZ Historic Places Trust web site www.historic.org.nz



APPENDICES

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Appendix A: Sources of information

	Erosion & sediment control	Water quality	Soil conservation & quality	Air quality	Aquatic life	Native wildlife	Native vegetation	Historical heritage values	Landscape & visual values	Neighbours	Public utilities	Recreation values
Local Government bodies	●	●	●	●	●	●	●	●	●	●	●	●
NIWA	●	●		●	●							
Landcare Research NZ Ltd	●	●	●			●	●					
FITEC	●										●	
Scion Limited	●	●	●	●		●	●		●			
NZFOA	●		●			●	●					
Cawthorn Institute	●	●			●							
NZIF	●		●			●	●	●	●			
NZARM	●	●	●	●	●	●	●	●	●			
Agricultural engineering	●		●									
ERMA					●	●	●					
Min for Environment	●	●	●	●	●	●	●	●	●	●		
NZ Archaeological Assoc.								●				
Dept of Conservation	●	●	●	●	●	●	●	●	●		●	●
MAF	●	●	●		●							
NZ Inst. of Landscape Architects									●			
Local Iwi								●		●		
Land information NZ	●		●								●	
NZ Historic Places Trust								●				
Fish and Game NZ		●			●	●						
School of Forestry	●		●			●	●		●			
NZ Hydrological Society	●	●			●							

1. Local Government Bodies

A list of Local Government Bodies and their contact web sites can be found on the 'Local Government New Zealand' website www.lgnz.co.nz. From the home page, select the 'Local Government Sector tab at the top of the page, and then select the 'Council Websites and Boundary Maps' option from the menu on the right of the page. This lists 12 regional councils and 73 territorial authorities (of which 16 are city councils and 57 district councils) and has the web site and a direct link to it where one exists. It also details council boundaries to aid in selecting the correct council.

2. National Institute of Water and Atmospheric Research - NIWA

Information held by The National Institute of Water & Atmospheric Research can be found at www.niwa.co.nz. The web site contains a list of all national centres and information on a broad range of associated topics and research.

3. Landcare Research NZ Ltd

Landcare Research NZ Ltd has an extensive website listing them as 'New Zealand's foremost environmental research organisation' which can be found at www.landcareresearch.co.nz. The organisation is the custodian of a number of collections and databases, which are listed and described on the website, along with information on research, media releases, services, education and publications.

4. FITEC

FITEC is the forestry industry training organisation with a website found at www.fitec.org.nz. This holds information on the organisation and on training opportunities, qualifications and publications including best practice guidelines.

5. Scion Limited

Scion Limited is a Crown Research Institute that covers three main areas: forest, wood and fibre products, biomaterials development and sustainable consumer products. Their website at www.scionresearch.com details among other things, services offered, information and publications and current research. Scion was formerly known as New Zealand Forest Research Institute (FRI).

6. New Zealand Forest Owners Association – NZFOA

The NZFOA was created as in 1927 as an advocacy group for commercial plantation forest owners, and its members own more then 80% of the New Zealand's plantation forest. Their website at www.nzfoa.org.nz has information on the organisation, current issues being faced and addressed, rare species (information and management) events, bulletins, media releases and general information on New Zealand plantation forests. http://rarespecies.nzfoa.org.nz

Appendix A

7. Cawthron Institute

The Cawthron Institute is a private, independent, non-profit making research centre with specialist fields in aquaculture, biosecurity issues, marine and fresh water science, analytical chemistry and microbiology. Their contact web site is www.cawthron.org.nz.

8. New Zealand Institute of Forestry NZIF

The New Zealand Institute of Forestry aims to provide a forum where those involved in forest management, utilisation, research and consulting can exchange ideas and information and keep up to date with industry trends. It is committed to serving the practice of forestry and the wider community through education, accountability and its codes of ethics and performance standards. Increasingly it fulfils a quality assurance role, setting the benchmark for professionalism and the quality of advice and practice by which members and others in the profession are measured. Its web site is www.forestry.org.nz.

9. The New Zealand Association of Resource Management – NZARM

NZARM is an Incorporated Society with membership drawn from those engaged in the management of natural and physical resources. It aims to represent and promote the views and interests of persons who are involved or interested in resource management, to promote good practice, competence, and ethics in resource management, to promote effective communication and transfer of information between members, other resource management practitioners, and the community, concerning resource management and to encourage community awareness of the nature and value of resource management. They have a web site at www.nzarm.org.nz.

10. Forest Engineering

Information on qualified engineers and services can be found on www.ipenz.org.nz. IPENZ, the Institution of Professional Engineers New Zealand is the professional body that represents professional engineers from all disciplines. Information can also be found through the School of Forestry at www.foresteng.canterbury.ac.nz/Forest_engineering.htm

11. Environmental Risk Management Authority (ERMA New Zealand)

The Environmental Risk Management Authority (ERMA New Zealand) makes decisions on applications to introduce hazardous substances (HS) or new organisms (NO) including genetically modified organisms (GMOs). At their web site www.ermanz.govt.nz you can find information about ERMA and their decision making processes, how to apply to introduce a new hazardous substance or apply to introduce a new organism, make a submission, or search their registers of applications, new organisms and hazardous substances. The Te Putara will give access to information on Maori perspectives.

12. Ministry for the Environment New Zealand (MfE)

This government organisation works to achieve good environmental leadership and decision making at all levels so they can deliver the environment that New Zealanders expect and deserve. On their website at www.mfe.govt.nz you can find out about issues that affect the environment, environmental laws and treaties and the state of the environment. There is also information on what you can do for the environment, copies of their publications and information about the organisation, including job opportunities.

13. New Zealand Archaeological Association – NZAA

The association is an incorporated society with a membership of both professionals and amateurs interested in archaeology. They host a website at www.nzarchaeology.org, which has information on, among other things, sites and their Site Recording Scheme, issues, contacts and available professional resources.

14. Department of Conservation – DoC

The Department of Conservation is the central government organisation charged with conserving the natural and historic and heritage of New Zealand. Their website at www.DoC.govt.nz has information on current topical issues being researched and addressed, contacts, publications, services provided and areas covered.

15. Ministry of Agriculture and Forestry – MAF

The website at www.maf.govt.nz has information on roles of the organisation, services provided, publications, media releases, research, legislation and contacts.

16. The New Zealand Institute of Landscape Architects – NZILA

The NZILA aims to foster and develop an understanding of the physical and cultural processes that affect the landscape and to ensure that this knowledge is applied in such a manner as to preserve or enhance the quality of all natural resources and human values. Their website at www.nzila.co.nz has information on issues, the RMA, practitioners and contacts.

17. Local Iwi

A useful website to identify which iwi groups to contact in a specific area is that of TAKOA Ruamano at www.takoa.co.nz. This networking resource contains over 2000 listings and includes both North Island and South Island maps with iwi boundaries. Another useful source is website of the Library of the University of Auckland www.library.auckland.ac.nz/subjects/maori/guides/iwi_map.htm. In addition to the map, there is also a tab that leads to a whakapapa guide, which has a number of contact websites for different iwi. www.library.auckland.ac.nz/subjects/maori/guides/whakapapa guide.htm

An alternative way to source information on individual iwi, once you have the name of the iwi you wish to contact, is to use a search engine. Search directly on the iwi name (preferably limit your search to New Zealand pages) as many iwi have their own website with contact details.

18. Land Information New Zealand – LINZ

LINZ is responsible for providing New Zealand's authoritative land and seabed information. Its responsibilities and information held are detailed on the website at www.linz.govt.nz. In addition, there is information on crown licenses, topography maps, charts, land titles and survey records.

19. NZ Historic Places Trust – NZHPT

This is the agency in New Zealand charged with administering the Historic places Act and the protection of sites and buildings that are of cultural and historical significance to its peoples. Their website at www.historic.org.nz has information about the trust, news and issues, publications and contacts.

20. Fish and Game New Zealand

This is an angler and game bird hunter organisation which has a statutory mandate to manage New Zealand's fresh water sports fish fisheries and game bird hunting (except for Lake Taupo). Their website at www.fishandgame.org.nz contains updated information on current issues and contacts and rules and regulations for the twelve regional offices.

21. School of Forestry, Canterbury University

The School of Forestry provides a range of services alongside education, including research, consultancy and professional development, including environmental science courses. Information can be found at www.fore.canterbury.ac.nz.

22. NZ Hydrological Society

Professional society which published many of NZ's forest hydrology paired catchment, flood hydrology and similar studies. Journal articles on line at www.hydrologynz.org.nz/

OTHER USEFUL CONTACTS

1. Rural Fire Officers

Information on National Rural Fire Authorities can be found at nrfa.fire.org.nz (note there is no "www" at the start of the website address). Information on fires, rules and regulations is included as is a list of the regional territorial authorities with contacts for each one.

2. Forestry Companies

Most large forestry companies have websites that can be accessed by searching on the company name using a search engine. As company names, boundaries and forest ownership are constantly changing, this is the best way to ensure up-to-date information.

3. Occupational Safety and Health – Department of Labour

The Department of Labour's, health and safety section have a website at www.osh.govt.nz. The site lists the organisations functions including assistance for business, work place inspections, accident investigations and compliance with legislation. DOL produces the Approved Code of Practice for Safety and health in Forest Operations. This booklet contains statutory requirements for all organisations and individuals operating in the forest industry

4. New Zealand Qualifications Authority – NZQA

The NZQA provides national and international leadership in assessment and qualifications. They quality-assure secondary and tertiary qualifications and education providers, evaluate overseas qualifications and administer the New Zealand Register of Quality Assured Qualifications and the National Qualifications Framework. Their web site for further information is www.nzqa.govt.nz. It contains details of all unit standards and qualifications that are listed on the New Zealand Qualifications Framework.

APPENDIX B: NZQA ENVIRONMENTAL UNIT STANDARDS

Six unit standards cover the operational environmental issues in forestry. Unit Standard 17772 is an introductory unit for all operational people in the industry. The other unit standards (17773, 6963, 6964, 6965 and 6966) are higher level units, which test an individuals understanding and ability to apply the knowledge in a work situation.

Unit Standard 17772 Level 3, Credits 5

Demonstrate Knowledge of Environmental Requirement in Forest Operations.

This foundation unit is suitable for all levels of the industry. It covers environmental value, adverse effects, BEPs, Legislation and Industry standards/agreements. This unit should be delivered by people with environmental experience in the forest industry. It can be delivered in a group environment, which allows for interaction and discussion. This is a pre-requisite to the higher level environmental units, which build on the knowledge base of this unit standard.

HIGHER LEVEL UNIT STANDARDS

The following higher level unit standards will be assessed on an operational site. Assessors require a higher level of environmental knowledge, particularly the background and application of the Resource Management Act with regard to forest operations.

Unit Standard 6963 Level 5 Credits 12

Plan Forest Operations to Meet Environmental Requirements

This unit standard is aimed at people planning forest operations. It differs from the other operational units, as it requires a detailed understanding of Council Plans and the RMA process including status of operations and the resource consent application process. The applicant is not required to complete a resource consent application, just to know what processes are involved. It is also useful for evaluating the reporting requirements of Environmental Management Systems (EMS) for identifying and managing environmental risk. The assessment is carried out on an operational site.

OPERATIONAL UNIT STANDARDS

The following unit standards are all operationally based. Candidates should select the unit(s) most appropriate to their function.

The operational units were originally designed for people who are in charge of operations. If people want to complete the unit and they are not in charge of operations, they need to assume responsibility for the environmental management of the operation for the purpose of the assessment. The assessor can usually help to explain the requirements. The assessments are carried out on site it includes checks to ensure that documentation is correct and that there is good communication of environmental information to the crew. However the main thrust of these assessments is to ensure that Best Environmental Practices are understood and being applied, and that all relevant legislation is understood and being complied with.

Unit Standard 17773 Level 4 Credits 8

Apply Environmental Management to Harvesting Trees in a Low Environmental Risk Situation

This unit standard is aimed at people in charge of harvesting operations in a low environmental risk situation, e.g. the flat areas of Kaingaroa or the Canterbury plains. This unit was developed because people in the flat areas without streams or other environmental issues could not amass sufficient evidence to complete US 6964. This unit should not be seen as an easier option than 6964.

If the operation area contains sufficient environmental issues for US 6964 to be completed, the assessor is unlikely to be prepared to assess US 17773 on its own.

Unit Standard 6964: Level 4 Credits 10

Apply Environmental Management to Harvesting Trees (in a *High* Environmental Risk Situation)

This unit standard is aimed at people in charge of harvesting operations in a high environmental risk situation. A high risk situation could include some of the following features:

- Streams, boundaries, culverts, historic sites, neighbour boundaries etc.

These features may be on a number of different sites. The assessment will look for evidence that the BEPs covered in US 17772 in the classroom are being applied on the work site. It will also include communication, record keeping and compliance with legislation and any specific company requirements. The assessment is carried out on site it includes checks to ensure that documentation is correct.

Unit Standard 6965 Level 4 Credits 12

Apply Environmental Management to Forest Roading and Earthworks

The same criteria apply to this unit standard as 6964, but applied to roading and earthworks operations.

Unit Standard 6966 Level 4 Credits 10

Apply Environmental Management to Mechanised Land Preparation Operations

The same criteria apply to this unit standard as 6964, but applied to land preparation operations.

Trainers and assessors for the above unit standards can be contacted through FITEC. The major forest companies also know the appropriate assessors, as they are usually involved in other environmental work within the forest industry.

Training and Assessment guides are available from FITEC.

APPENDIX C: ENVIRONMENTAL LEGISLATION

The most relevant environmental legislation is described in Part 4. However, there are other pieces of legislation that may be pertinent to environmental issues. These are briefly summarised below. The list is not exhaustive and does not extend to other legislation that may affect forestry, such as the Crown Forest Assets Act 1989 or the Crown Minerals Act 1991.

As at 01 August 2005:

- Animals Law Reform Act 1989
- Forests Act 1949 and Forests Amendment Act 1993
- Forest and Rural Fires Act 1977
- Hauraki Gulf Marine Park Act 2000
- Health and Safety in Employment Act 1992
- Reserves Act 1977
- Soil Conservation and Rivers Control Act 1941
- Wild Animal Control Act 1977
- Wildlife Act 1953

Further detailed information on all public statutes can be accessed on the internet at www.legislation.govt.nz, and copies are held at public libraries. Clarification on issues and compliance with statutes can also be gained by contacting the administering agency. It is important to realize that statutes are constantly being amended, revised and updated so when searching for information it is critical to ensure that you have the most recent set of amendments.

ANIMALS LAW REFORM ACT 1989

Purpose

This Act reforms the law relating to liability for damage caused by animals.

Administering Agency

Ministry of Agriculture and Forestry

Implications

This act covers liability from damage caused by animals,

Contact for information

Ministry of Agriculture and Forestry
Pest management staff of Regional Councils

FORESTS ACT 1949 and Forests Amendment Act 2004

Purpose

The Forests Act 1949 establishes the Ministry of Agriculture and Forestry and provides for its functions.

Administering Agency

Ministry of Agriculture and Forestry

Implications

The Act makes provision for regulation of the import and export of forest produce, for the making of regulations to protect forest health, and to allow the Ministry to act as an agent for private forest owners. It also includes provisions relating to the control of felling of indigenous forests, sawmill controls and export controls.

Contact for Information

Regional office of the Ministry of Agriculture and Forestry
Indigenous Forestry unit, MAF (Christchurch & Rotorua)

FOREST AND RURAL FIRES ACT 1977

Purpose

The Forest and Rural Fires Act 1977 provides for the safeguarding of life and property by the prevention, detection, control, restrictions and suppression of fires in forests and rural areas. The Act establishes rural fire authorities.

Administering Agency

Department of Internal Affairs, with implementation by the New Zealand Fire Service Commission as the National Rural Fire Authority and rural fire authorities.

Implications

Each rural fire authority is required to have an operative fire plan, which is to be in accordance with the Rural Fire Management Code of Practice.

Rural fire authorities can prohibit the lighting of fires in the open air during times of extreme fire danger and restrict activities in areas of risk. Permits are required during a restriction on fires in the open are for prescribed burning. The rural fire authority can prescribe the equipment required and establish guidelines for protection of forest areas registered with them.

Contact for Information

Principal Rural Fire Officer (through the rural fire authority)
Regional Rural Fire Officer (through the New Zealand fire service)

HAURAKI GULF MARINE PARK ACT 2000

Purpose

The purpose of this Act is to, among other things, integrate the management of the natural, historic and physical resources of the Hauraki Gulf, its islands and catchments and establish the Hauraki Gulf Marine Park.

Administering Agency

The Hauraki Marine Park Gulf Forum was established by the Act. It is made up a number of representatives from iwi and central and local government. It assigns one body to administer the Act for a three year term.

Implications

Land located within the Hauraki Gulf includes forestry land on the Coromandel and eastern Waikato. Land located in this area is governed by this Act, in conjunction with the RMA and when considering a resource consent application the relevant council must have regard to the relevant provisions of the Hauraki Gulf Marine Park Act.

Contact for Information

The regional or local authority where the forestry land is situated.

HEALTH AND SAFETY IN EMPLOYMENT ACT 1992

Purpose

The focus of this act is on prevention of harm arising out of work activities not only to employees but other people, including members of the public. The three means to achieve the objective are:

- The promotion of excellence in health and safety management by employers
- Prescription of duties to employers and others, to prevent harm to employees
- Provision for the making of regulations and approved codes of practice relating to specific hazards, e.g. Approved Code of Practice for Safety & Health in forest operations (the "Bush Code")

Implications

A Principle to a Contact (typically the forest owner) must take all reasonably practicable steps to ensure that no contractor or sub-contractor, and no employee of a contractor or sub-contractor, is harmed while doing any work that a contractor has been engaged to do. Principals duties extend to informing contractors of known hazards and recording and reporting any Serious Harm injuries. Refer to http://www.osh.govt.nz/order/catalogue/pdfs/principals.pdf

Employers have a duty to take all practicable steps to ensure the safety of employees while at work. They must ***identify*** hazards and ***eliminate, isolate*** or ***minimise*** them. Employers must involve their employees in the development of health and safety procedures relating to the management of hazards and dealing with emergencies and imminent dangers. The responsibility is with the employer to assess what the hazards are and deal with them.

Administering Agency
The Health and Safety Section of the Department of Labour

Allied Legislation
Employment Relations Act 2000
Injury Prevention, Rehabilitation and Compensation Act 2001

Contact for information
Forestry inspectors at the regional offices of the Occupational Safety and Health Service of the Department of Labour

Note
Replaces the Bush Workers Act 1945 but the Safety Codes for Forest Operations remain in place.

RESERVES ACT 1977

Purpose
The Reserves Act 1977 provides for the purchase and management of areas of special interest for public use.

Administering Agency
Department of Conservation

Implications
Areas of publicly-owned land can be designated as recreation, scenic, historic, native or scientific reserves. Activities that will adversely affect the plant life or wildlife of a reserve are not permitted. For most forest owners, the only major problem would be burning-off operations where it was not possible to firebreak the boundary with the reserve.

Contact for Information
Regional or district staff of Department of Conservation.

SOIL CONSERVATION AND RIVERS CONTROL ACT 1941

Purpose
The overriding purpose of the Soil Conservation and Rivers Control Act 1941 is to make provision for the conservation of soil resources, the prevention of damage by erosion and to make better provision for the protection of property from damage by floods.
Regional Councils are responsible for the activities in their district and are given wide ranging powers to achieve the purpose and objects of the Act.

Administering Agency
Ministry for the Environment
Regional Councils

Contact for Information
Ministry for the Environment
Regional Councils

WILD ANIMAL CONTROL ACT 1977

Purpose
The Wild Animal Control Act 1977 provides for the control of harmful species of wild animals and for the regulation of recreational and commercial hunting on crown land.

Administering Agency
Department of Conservation.

Implications
For forest owners, the main use of this Act is to deal with illegal hunting of deer and other game animals.

Contact for Information
Specialised staff with the Department of Conservation.

WILDLIFE ACT 1953

Purpose

This Act provides for the conservation and protection of absolutely or partially protected species of native animals, lizards, birds, insects etc.

Administering Agency

Department of Conservation

Implications

The term 'wildlife' has a very wide definition as being 'any animal that is living in a wild state...'. However, it does not include animals such as deer, chamois, goat, opossum, pig, thar or wallaby, which are wild animals subject to the Wild Animal Control Act 1977.

The Wildlife Act provides for the protection of wildlife through wildlife sanctuaries, reserves and refuges, prescribes hunting seasons for game animals and authorises the appointment of rangers.

Contact for Information

Regional offices of Department of Conservation

Local Fish and Game Councils

Associated Regulations

There are many sets of regulations and orders establishing particular sanctuaries and refuges.

APPENDIX D: INTERNATIONAL AGREEMENTS OF INTEREST

New Zealand is the signatory to a number of international agreements and conventions and party to a number of processes that influence legislation and determine Government policy. The following are those that are of interest to plantation forest owners:

The Millennium Declaration (UN General Assembly, 2000) upholds human dignity, equity, poverty eradication, protection of the common environment, human rights, democracy, gender equality, good governance and the formation of a global partnership for development. If soundly planned and managed planted forests will contribute positively towards achieving these fundamental human values and goals.

The Forest Principles (UNCED, "Agenda 21", 1992), the non–legally binding authoritative statement of Principles for the sustainable management of forests worldwide, recognised the important role of planted forests and stated that they applied to ...all types of forests, both natural and planted,.... The socio-economic and environmental Principles described in the Forest Principles underlie FAO's Planted Forest Code.

(www.fao.org/docrep/009/j9256e/j9256e00.htm)

Working Paper FP/37E: Responsible management of planted forests

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCC) provides that industrialized countries may offset some of their greenhouse gas emissions by sequestering CO2 in carbon "sinks" through afforestation, reforestation and forest management activities. Besides creating financial incentives for these carbon offsets, it also contains a general mandate for developed countries to promote afforestation and reforestation and sustainable forest management practices. The Kyoto Protocol may thus be one of the most important drivers for planted forest programmes in future.

New Zealand ratified on 19 December 2002, and the Protocol came into force on 16 February 2005. New Zealand's government has entered into a binding agreement to constrain its atmospheric greenhouse gas emissions in Commitment Period One (between 2008 and 2012), to 1990 level. .

The Protocol recognises that a change in land use from grass to trees takes carbon dioxide (one of the greenhouse gases) out of the atmosphere. The Protocol therefore allows for "forest sink credits" for forests established since 1990 on land not previously forested

At time of Writing, the New Zealand Government is still considering its policy options in relation to the treatment of forestry in New Zealand under our Kyoto commitments.

Convention on Biological Diversity (CBD) The objectives of the Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Its provisions thus relate to the conservation of ecosystems and of genetic resources in planted forest development. The CBD promotes the rehabilitation of degraded lands by planted forests.

Convention to Combat Desertification (CCD) The Convention addresses the delicate balance to achieve sustainable livelihoods and sustainable natural resources management in fragile arid and semi-arid ecosystems through integrated land-use approaches with major multi-stakeholders. The mechanism to achieve this is through National Action Programmes, in which natural and planted forests make a significant contribution in rehabilitation of degraded lands and combating desertification • The International Plant Protection Convention (1991) has the objective of securing action to prevent the introduction and spread of pests and diseases of plants and plant products across national borders and to promote measures for their control. • The Declaration on Fundamental Principles and Rights at Work (ILO 1998) is an expression of commitment by governments, employers' and workers' organisations to uphold basic human values that are vital to our social and economic lives.

Indigenous and Tribal Peoples Convention (1989) The Convention aims to protect indigenous and tribal populations in independent countries against abuses. It applies to tribal peoples whose social, cultural and economic conditions distinguish them from other sections of the national community and peoples in independent countries who are regarded as indigenous on account of their descent

International meetings related to enhancing the role of planted forests in sustainable forest management, include:

The International Expert Consultation on the ***Role of Planted Forests in Sustainable Forest Management*** (1999, Santiago, Chile) was held to assist the Intergovernmental Forum on Forests (IFF) in recognising and enhancing the role of planted forests as an important element of sustainable forest management. The meeting addressed the underlying causes of deforestation, needs and requirements of countries with low forest cover, future supply and demand for wood and non-wood products, rehabilitation of degraded lands and other relevant issues

The ***Intercessional Expert Meeting of the UNFF*** on the ***Role of Planted Forests in Sustainable Forest Management*** (2003, Wellington, New Zealand) recommended inter alia that planted forests play an increasingly important role in the provision of a range of goods and environmental, social and cultural services, be considered as a mechanism for the alleviation of poverty, and that sustainable management of planted forests be achieved through the promotion and implementation of good governance frameworks and mechanisms.

APPENDIX E: OTHER DOCUMENTS OF INTEREST

- ***New Zealand Forest Accord 1991***
- ***Principles for Commercial Plantation Forest Management in New Zealand 1995***

Summary of the Instruments of the NZ Forest Accord

1. A native tree is defined as any indigenous wood plant that can eventually form part of a canopy of a natural forest and can attain a diameter at breast height (dbh) of at least 30cm.
2. When NZFOA members are establishing plantation forests, they will exclude from land clearance and disturbance, the following areas of indigenous vegetation:
   - Any area greater than 5 hectares containing indigenous tree species of any height
   - Any area of natural indigenous forest greater than 1 hectare where the average canopy height is greater than 6 metres, which is practical to protect.
   - Any vegetation recommended for protection in a survey report in the Protected Natural Areas Programme (PNAP) or classed as a Site of Special Wildlife Interest (SSWI) in a published report by the former Wildlife Service.
   - In ecological districts where such surveys have not taken place, areas that would qualify as Recommended Areas for Protection (RAP) or a SSWI in the professional opinion of the Department of Conservation.
3. Areas of naturally occurring indigenous forest will only be harvested where such activities are conducted on a sustainable basis.
4. The conservation groups acknowledge the importance of plantation forests as a means to produce wood and energy on a sustainable basis, whilst promoting the protection and conservation of the remaining natural forest and to promote these understandings within New Zealand and internationally.
5. The accord excludes high country Crown land. Crown pastoral leases and land controlled by the Department of Conservation.
6. Where there are existing arrangements to supply native timber, the accord will not be applied to those areas.
7. The parties agree to meet from time to time to monitor the implementation and address any issues which may arise.

Because the NZ Forest Accord is a voluntary agreement, there is no legal obligation to conform with it. However it is a very valuable document in establishing a workable position between the plantation forestry interests and conservation groups, and as such, plantation foresters are strongly recommended to conform with the agreement.

www.nzfoa.org.nz/file_libraries/agreements_accords

Principles for Commercial Plantation Forest Management in New Zealand

OBJECTIVES

To promote understanding between the signatory parties with a view to New Zealand achieving environmental excellence in plantation forest management and participating as an effective advocate internationally for the sustainable management of plantation forests and the protection, preservation, and sustainable management of natural forests. These principles are complementary to the New Zealand Forest Accord (August 1991).

SCOPE

These principles have been written to apply to New Zealand's plantation forest management and do not cover environmental and social issues associated with processing, products and use beyond the forest gate. It is recognised that criteria and standards for plantation forest management are being developed through various processes.

DEFINITIONS

Natural Forest – Areas of land that are predominantly covered in indigenous tree species that are naturally established, including managed indigenous forest areas where regeneration is supplemented by planting of indigenous species.

Plantation Forest – Areas of land predominantly covered in trees grown for cropping and managed primarily for commercial purposes and excluding natural forests as defined here.

Natural Areas – Areas of land with a predominant cover of indigenous vegetation, including natural forests as defined above and also naturally occurring water bodies.

Sustainable Management – In the context of New Zealand's Resource Management Act (1991) sustainable management includes:
Managing the use, development, and production of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while - Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and Avoiding, remedying, or mitigating any adverse effects on the environment.

Global Consensus on Sustainable Forest Management

The parties recognise that the process of inter-governmental consensus building on sustainable forestry management is ongoing under the aegis of the United Nations and that non-governmental organisations continue to work towards complementary goals. These Principles represent a New Zealand response with regard to commercial plantation forests.

New Zealand Forest Accord

The objectives of the New Zealand Forest Accord form the basis for these Principles. These objectives are:

- to define those areas where it is inappropriate to establish plantation forestry
- to recognise the important heritage values of New Zealand's remaining natural indigenous forests and the need for their protection and conservation
- to acknowledge that the existing area of natural indigenous forest in New Zealand should be maintained and enhanced
- to recognise that commercial plantation forests of either introduced or indigenous species are an essential source of perpetually renewable fibre and energy, offering an alternative to the depletion of natural forests
- to acknowledge the mutual benefits emanating from an accord between New Zealand commercial forestry enterprises and conservation groups and the example that this unique accord can provide for the international community.

PRINCIPLES FOR PLANTATION FOREST MANAGEMENT

The parties agree that:

- the inter-dependence of ecological, economic and social sustainability must be recognised;
- efficient and effective monitoring is required in the implementation of these Principles;
- in the implementation of sustainable land management, rural land users should be treated equitably, based on the environmental effects of their activities;
- management practices must meet or improve on all statutory requirements and accepted best practices.
- Ecological Principles.

Recognising the need for operational flexibility, forest management activities shall be carried out in accordance with the following principles:

- **Indigenous Biodiversity**
    - The parties agree that the protection of New Zealand's indigenous biodiversity and, where appropriate, its restoration, are important objectives.
    - Indigenous biodiversity will be protected primarily in natural areas.
    - The protection of indigenous biodiversity in plantation forests is not the primary objective but should be recognised and provided for where appropriate.
    - Where threatened species are known to occur within plantation forests and their presence is considered significant by the Department of Conservation, plantation managers shall consult with the Department of Conservation on management practices with the objective of conserving the population.
    - Plantation forests shall not replace natural forest and other natural areas, as agreed under the instruments of the New Zealand Forest Accord.

- Plantation managers shall take all practical steps to protect indigenous vegetation along the margins of water bodies where appropriate.
- Plantation managers shall recognise, and where appropriate, facilitate the restoration of depleted indigenous habitat on critical areas under their management.
- Plantation managers shall take all practical steps to safeguard designated reserved natural areas within or adjoining plantation forest boundaries from any adverse effects of forest operations.
- The spread of wilding trees into natural areas is a matter of national concern. Plantation managers acknowledge their responsibility to prevent, to the best of their ability the spread of wilding trees from within their plantation forest boundaries, while recognising the property rights of adjacent land owners.

• Air, Water, Soil and Ecosystems

- Plantation management shall safeguard the life-supporting capacity of soil, water and air.
- Plantation managers shall maintain or enhance soil quality and minimise soil erosion for the purpose of maintaining site productivity and water quality.
- Forestry operations shall be conducted in a manner that safeguards stream margins and water bodies with the objective of achieving healthy aquatic ecosystems.
- Any applications of agrichemicals, including fertiliser, will be undertaken in a manner to avoid adverse environmental effects.

• Resource, Energy and Waste Management

- Plantation managers will, to the best of their ability, conduct forestry operations in an energy and resource efficient manner, minimising and disposing of waste in an environmentally acceptable way.

• Agrichemicals, Biological Control, Pests

- Animal and plant pests can substantially reduce crop productivity and therefore should be controlled. Plantations can also harbour weeds and other pests that can spread to nearby natural areas.
- The application of agrichemicals should be conducted according to the New Zealand Agrichemical Users Code of Practice and minimised to levels essential for ensuring a commercially viable crop without causing adverse environmental effects.
- An integrated management approach to pest control will be adopted recognising that pest problems can be minimised by appropriate management regimes.
- Pest control methods should have minimal and environmentally acceptable impacts on non-target species.
- Biological control agents and the introduction of other new organisms are limited to those that have been screened for non-target impacts and a precautionary approach taken with respect to potential adverse environmental effects.

Appendix E

• Social

- Public Access
  - Access to some plantation forests for recreation is important to the general public.
  - Plantation managers should provide for responsible public access to forests where appropriate.
- Tenure and Use Rights
  - Secure tenure and use rights to land and forest resources are important to provide investor confidence in plantation forestry.
  - Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.
- Landscape, Aesthetics, Recreation and Cultural Heritage
  - New Zealand contains many distinctive natural landscapes that are important for public use, appreciation and identity.
  - Landscape, amenity and recreation values should be considered and, where appropriate, provided for in the planning and management of plantation forests.
  - Plantation management will provide for the protection of discrete sites of important cultural and historical significance on the recommendation of a recognised authority.
- Community Consultation
  - Community consultation is an important component of responsible forest management.
  - Plantation managers should consult on management operations that impact on significant public use, environmental, and amenity values of plantation forests and neighbouring areas.
- Social Effects
  - Plantation management provides both social benefits and costs to communities and society.
  - Plantation managers shall protect the health and safety of their people and the public through meeting statutory requirements and using codes of practice.
  - All industry employees will be qualified in the skills that are relevant to the tasks they are performing or be under training to acquire such skills.

- **Economic**
  - Plantation management is primarily concerned with the establishment and harvesting of tree crops for commercial purposes. The industry operates in a market environment and managers need the freedom to change management practices to meet changing consumer preferences in pursuit of maximising economic returns.
  - Plantation managers will be free to maximise the economic return from plantation forests provided their operations meet statutory requirements and comply with these Principles.
  - The costs and benefits of environmental effects should be incorporated into forest industry annual statements.

Implementation:

The parties to these Principles agree to meet from time to time to monitor their implementation and address issues which may arise.

Additional interested parties are welcome to become signatories to these Principles with the full support of the signatory parties.

The Principles are agreed between the following parties and signed in Wellington on Wednesday 6th December 1995:

- New Zealand Forest Owners Association Inc.
- New Zealand Farm Forestry Association Inc.
- Royal Forest & Bird Protection Society of New Zealand Inc.
- WWF-NZ (World Wide Fund for Nature New Zealand).
- Federated Mountain Clubs of New Zealand Inc.
- Maruia Society Inc

APPENDIX F: HSNO FUEL & OIL MANAGEMENT GUIDE FOR FOREST OPERATIONS

1. ALL TANK AND CONTAINER TYPES

Applicable to moveable stationary tanks (skid/sledge), trailer tanks, slip on units and surface containers

Emergency Management

- Keep ALL SOURCES OF IGNITION away from petroleum products and their vapours.
- A 2.7kg Dry Powder OR 9 litre High Pressure Foam located within 30 metres.
- A readily accessible Emergency Response Plan (ERP) on site. Safety Data Sheets (SDS) for diesel and petrol are a valuable information source when compiling a plan. All crew should know where to find the ERP (Recommendation: keep a master copy with your safety management plans). The plan should be tested every 12 months.

2. SKID / SLEDGE TANKS CONTAINING DIESEL

Considered to be MOVEABLE STATIONARY CONTAINERS

General Requirements

Test Certification

- No on-going requirement if capacity < 5000L.

Labels and Marking

- Tank clearly identified with fuel common name and hazard type (i.e. flammable) and action to be taken in an emergency

Maintenance

- Tanks should have regular visual inspections (fortnightly recommended). Date, time, and results of visual inspections (condition of bund, connections, seals, pipe work and taps as well as weld integrity, support structure condition and corrosion checks) should be recorded.
- Any repairs must conform to the latest standards

2.1 Capacity > 1000 Litres and in use PRIOR TO 1 APRIL 2004

Specific Requirements – Secondary Containment

- Acceptable Secondary Containment (Bunding) methods are determined by the date that the tank BEGAN USE.
- Where earthen bunding is used the
  - collection area must be capable of collecting 110% of the capacity of the largest container and be subject to recorded weekly inspections
  - top width must be 300mm, extending to 600mm if the wall height is greater than 750mm. The walls shall have a slope no greater than one to one and shall be compacted and impermeable.
  - collection area should have a drainage system for managing any accumulation of water.
- Where another form of Secondary Containment is used it should be constructed of a material that is chemically resistant to the substance expected to be contained and allow for spillage recovery, subject to unavoidable wastage.
- Built in (integral) secondary containment where water CANNOT enter containment system must be capable of collecting 100% of the capacity of the primary container. (includes double skinned tanks)
- Build in (integral) secondary containment where water CAN enter the containment system and non-integral secondary containment systems shall;
  - have a drainage system for managing the accumulation of water.
  - ensure trays and bins open to the weather are capable of collecting 110% of the capacity of the primary container
- Tanks will generally have been approved by the chief inspector under the Dangerous Goods Act 1974.

2.2 Capacity > 5000L and in use PRIOR TO 1 APRIL 2004

Requirements of 1, 2 and 2.1 above plus...

- Marking requirements
  - Name or mark and address of manufacturer and date of manufacture
  - Materials used and design pressure and temperature max and min values
  - Safe fill level
  - Serial number that relates to Test Certificate
- Test Certificates:
  - Without integral Secondary Containment and > 5000L 3.1D – every 3 years
  - With integral Secondary Containment and > 5000L 3.1D – every 5 years
  - Not required for tanks < 5000L

2.3 Capacity > 1000L and commissioned AFTER 1 APRIL 2004

Requirements of 1 and 2.0 above plus

- New tanks require a design test certificate. This will require that the tank is manufactured in accordance with current regulation, including integral secondary containment capable of collecting 100% of the capacity of the primary container. (includes double skinned tanks).

3. TANK TRAILERS

Requirements of 1 above plus

Structural

- Rear end collision and run-under protection in place.
- Fittings should be capable of resisting impact.
- Designed and constructed with at least 2 means that operate independently, to shut off the flow of liquid.
- An in-service test certificate should be obtained every 2 yrs.

Secondary Containment

- NO Secondary Containment (Bund) requirement (A tank trailer comes under the definition of a tank wagon, which is classed as a vehicle).

Labels and Marking

- Tank clearly identified with fuel common name and hazard type (i.e. flammable) and action to be taken in an emergency.

New Units

Designer must obtain a design test certificate to certify that the trailer tank complies with the design requirements of the regulations. Before operating, a person must apply for a pre-commissioning test certificate.

Existing Units

Will generally have been approved by the chief inspector under the Dangerous Goods Act 1974 and will have been issued with a Labour Dept (LAB) number by the Chief Inspector of Dangerous Goods.

4. SLIP-ON UNITS – Utility Vehicles

NOT fixed to chassis but secured to the deck. Otherwise they are considered SURFACE CONTAINERS (see 5).

General Requirements

- There is NO Secondary Containment (Bund) requirement ('a place that is a vehicle').
- There is NO on-going certification requirement for the tank.
- Signage that advises the action to be taken in an emergency (If > 250 litres Petrol or 1000 litres Diesel).
- Tank clearly identified with fuel common name and hazard type (i.e. flammable).

New Units

- New transportable containers require a design test certificate.

Existing Units

- Will generally have been approved by the chief inspector under the Dangerous Goods Act 1974.

5. SURFACE CONTAINERS

General Requirements

- The requirement for Secondary Containment (Bunding) is triggered if the aggregated total of fuel or oil > 1000L. The capacity of bund is then determined by largest container and total pooling potential.
- If containers are less than 60L and pooling potential is < 5000L Secondary Containment must be capable of containing 50% of total pooling potential
- If containers are between 60L and 450L and pooling potential is < 5000L Secondary Containment must be capable of containing 100% of total pooling potential
- Containers should be clearly identified with fuel common name and hazard type (i.e. flammable).
- Signage that advises the action to be taken in an emergency if > 250L PETROL or 1000L DIESEL.

6. TRANSPORTING DANGEROUS GOODS (AS TOOLS OF THE TRADE)

General Requirements

Refer to LTNZ Fact Sheet 68 www.landtransport.govt.nz/factsheets/68.html

You also need to have either a D-endorsement on your driver licence or an Approved Handler Test Certificate, issued under the Hazardous Substances and New Organisms Act 1996, showing you have passed a course on the transport of dangerous goods if transporting more than 250L of Petrol. Diesel fuel and motor oil are not classified as dangerous goods for transport.

7. APPROVED HANDLERS

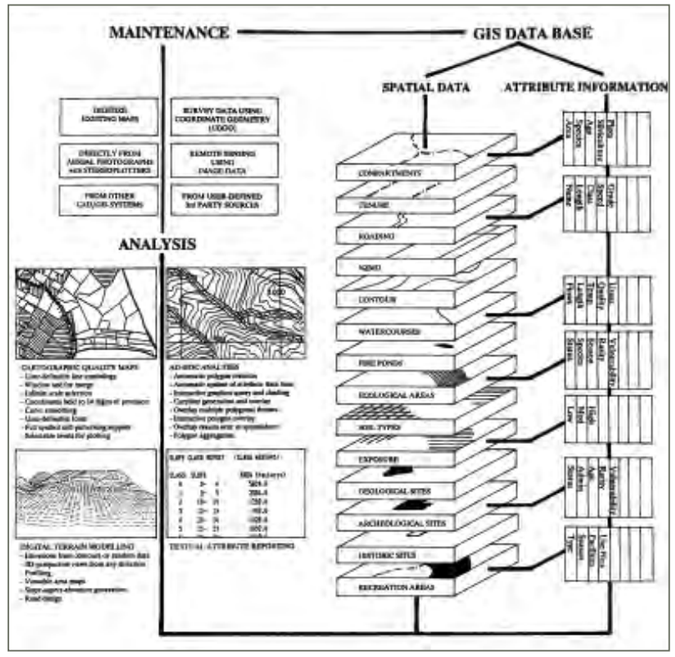
General Requirements

If handling more than 100L Petrol, an Approved Handler Test Certificate (or access to an Approved Handler) is required. There is no Approved Handler requirement for Diesel.

APPENDIX G: GEOGRAPHICAL INFORMATION SYSTEMS

Integrated resource management requires integrated data management and the forestry sector in New Zealand is following overseas practice with the implementation of Geographic Information Systems (GIS).

Essentially, a Geographic Information System is a hybrid data base that uses both spatial (where) and associated attribute (what) information to report on an area. The figure below illustrates a simplified model of the three basic system components.



The data base is best imagined as a series of referenced map layers that record spatial data such as forest compartments. The attributes describe the characteristics of this spatial data such a species, age, silviculture. GIS is a tool to create and maintain these data bases. This may be through digitizing existing maps, aerial photographs or importing data from other systems.

While GIS can be used as a competent mapping system, its most important feature is the facility to analyze the relationship between mapped features. This is what distinguishes GIS from simple drafting or computer mapping systems.

As a support system for assessing environmental impacts, GIS provides a management tool to answer five general types of questions.

Location. What is it...?

Because map data is stored relative to known locations (usually expressed in NZ map grid) the data base can be queried to display information held about any given place, providing the data is stored as part of the GIS. This enables rapid sorting of an enormous quantity of spatial information to quickly locate potential problem areas and enable alternative options to be evaluated. For example, a proposed road alignment and its associated width of ground disturbance can be analyzed to identify conflicts with other data sets that locate areas of significant habitat or archaeological value.

Conditions. Where is it?
This is the converse of the example given in 1 above. Instead of identifying what exists at a given location, the system can be queried to find locations where certain conditions are satisfied. This enables seasonal ground impact constraints and equipment availability to be matched to a suitable forest resource. For example, identify areas in the current harvest period that are over 20m from main water courses, are north facing and are on slopes of 0-16 degrees.

Trends. What has changed since?
This question seeks to find the differences within an area over time. This provides a mechanism to display changes that have been recorded over known sites. The following example would enable more efficient handling of information relevant to game management. For example, show hunting permit returns of animals taken within silvicultural treatment type x for period y.

Patterns. What spatial pattern exists?
This type of question would relate to querying the database to explain relevant causes of certain forest conditions. The following example might confirm site categories that are inappropriate for certain species, provenances or timing of planting. For example, show new planting sites with greater than 10% seedling mortality categorized by species, planting month, aspect and 20m altitude bands.

Modeling. What if...?
"What if" questions are posed to determine what happens, for example, to travel distances or vehicle counts along route x if another road is added to a forest network.

These categories of questions identify some of the potential benefits of GIS to the assessment and management of environmental impacts. GIS provides a common platform to deal with essential inventory, data management and mapping requirements, while at the same time providing the capability to perform complex spatial analysis of management alternatives.

How to get GIS software
There are a number of free GIS viewers or small GIS software packages available at low cost or in some cases free. The most common GIS software in forestry is MapInfo or Arc. Most other GIS software can load or save files in one or both of these formats. By searching on the internet, it is relatively easy to find software that can be used. Names to look for are ProViewer for MapInfo or Arc Explorer for ARC. These viewers are useful, but CantoMap or fGIS are more proficient and free. Both these simple GIS packages can take both Raster and Vector format files.

How to get information into the GIS
This step in the GIS system construction is very time consuming (expensive).
While base mapping information in the form of Orthophotos is available or can be readily obtained

Appendix G

at reasonable cost, the provision / entry of attribute data is not so easy. Without the attribute data, the use of the GIS is essentially limited to producing maps and their use as a management tool to answer questions as previously outlined is very limited. If the GIS is to be used in limited areas as part of a Forestry contract, it may be possible to obtain much of the required information from the Forest Company.

Internet Sources of additional information:

A collection of useful internet links:

- University of Washington: www.ruraltech.org/gis/map_info/gis_links/
- The New Zealand LINZ site for orthophotos: www.linz.govt.nz
  Follow the orthophoto links to the downloadable orthophoto images. In general, the medium .JPG files at 6–10 MB per image are adequate for most work. LINZ quotes the pixel size as 2.5m and the positional accuracy as +-12.5m.
- www.Earth.Google.com and www.Maps.Google.com may also prove useful.

Use GOOGLE or a similar search engine to find other sites as required

Orthophoto Examples
An example of the LINZ orthophotos showing the extent of a typical image file (be37b_tm_fy_03_04.jpg) (Rotorua District)

Showing the detail readily available. Part of Whaka forest extracted from the image above. Note how useful road, compartment, adjoining land use and crop information can be readily identified.

Orthophoto images from the LINZ website.

APPENDIX H: ASSESSMENT OF ENVIRONMENTAL EFFECTS

ASSESSMENT OF ENVIRONMENTAL EFFECTS

Forest:	Forest Manager:	Compartment:	Operation:	Date:

Attach any supporting documents or further details of mitigation and emergency procedures. Where risk or potential adverse impacts are HIGH, mitigation will usually be necessary.

		Adverse	Neutral	Beneficial	
OPERATION SEGMENT	**VALUE(S) AT RISK**	adverse **5 4 3 2 1** Probability of impact	increasingly **/** Severity of effect	beneficial **+ + + + +** Duration of effect	**MITIGATION**

APPENDIX I: WILDING RISK CALCULATOR

CALCULATING WILDING SPREAD RISK FROM NEW PLANTINGS

(Answer all 5 questions)

1. Species – spreading vigour
   * Radiata and muricata pine 1
   * Ponderosa pine and larch 2
   * Corsican pine and Douglas-fir 3
   * Scots pine and Lodgepole (p.contorta) pine 4

   Enter score (1, 2, 3 or 4) here

2. Species – palatability
   * Radiata and ponderosa pine 1
   * Lodgepole pine and larch 2
   * Scots pine and Douglas-fir 3
   * Corsican pine 4

   Enter score (1, 2, 3 or 4) here

3. Siting
   * Sheltered sites, or slopes facing NE to SSW (compass 45° to 200°) 1
   * Sites partially exposed to N and W (200° to 45°) 2
   * Sites fully exposed to N and W (200° to 45°) 3
   * Take-off site – i.e. ridge tops, on or at base of slopes (>10°) or undulating land fully exposed to N and W (200° to 45°) 4

   Enter score (1, 2, 3 or 4) here

4. Downwind land use – within 200 m
   * Developed pasture/regular mob stocking (sheep) or closed canopy scrub/forest 1
   * Semi improved grazing/occasional mob stocking 2
   * Extensive grazing only 3
   * No grazing 4

   Enter score (1, 2, 3 or 4) here

5. Downwind land use – from 200 m to 400 m (if 1 or 2 scored in 'Siting'),
or, from 200 m to 2 km (if 3 or 4 scored in 'Siting')

* Developed pasture/regular mob stocking (sheep) or closed canopy scrub/forest	1
* Semi improved grazing/occasional mob stocking	2
* Extensive grazing only	3
* No grazing	4

Enter score (1, 2, 3 or 4) here

TOTAL SCORE

NB *A score of 12 or more means high spread risk.
*A high risk does not necessarily mean "No trees". A change of species or siting, or downwind land management can significantly lower spread risk.

Or, a commitment to wilding removal can be made – this is not onerous, particularly with regard to long distance spread from plantings on flat land (Q 3 – scores 1, 2 or 3).

Long distance spread. This is likely if a score of 3 or 4 in 'Siting' (Q 3) is followed by a 3 or 4 in 'Downwind land use' (Q 5), especially if larch, Douglas-fir, or Corsican, Lodgepole or Scots pines are involved.

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Sustainable Farming Fund

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