THE NEW ZEALAND DEER FARMERS' LANDCARE MANUAL

The New Zealand Deer Farmers Landcare Manual

All enquiries regarding the Manual should be addressed to:
The New Zealand Deer Farmers' Association
PO Box 10-702
Wellington
Phone: +64 (4) 473 4500
Email: info@deernz.org
www.deernz.org

Disclaimer

This Manual has been prepared by the New Zealand Deer Farmers' Association with assistance from others listed in the acknowledgements. While some of the content is taken by permission from other publications and the known research record, much of the information is anecdotal, as supplied by contributing New Zealand deer farmers. Any representation, statement, opinion, or advice expressed in this publication is made in good faith, but on the basis that the New Zealand Deer Farmers' Association and Deer Industry New Zealand are not liable to any person for damage or loss which has occurred or may occur in relation to that person taking or not taking action in respect of any such representation, statement, opinion, or advice. Some activities on farm (particularly activities in waterways) may require resource consent – refer to your local regional council.

Photographs: Amy Wills, Janet Gregory, Jacqui Wellington, Paddy Boyd, Richard Burdon, Sam Zino, Tony Pearse, Trish Smith, William Oliver.

Production: Claire Grant, editorial; Landward Management, case study production; Murray Lock Graphics, graphic design; Orcus Print Solutions, printing.

beef+lamb new zealand

Sustainable Farming Fund
Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere

NZ LANDCARE TRUST

DEER INDUSTRY NEW ZEALAND

NZDFA
New Zealand Deer Farmers' Association

MISSION STATEMENT

A practical landcare guide of best practice for deer farmers to assist in minimising or eliminating any adverse environment effects of deer farming and to enhance the long-term sustainability of the New Zealand deer farming industry.

ACKNOWLEDGEMENTS

We would like to acknowledge the time and input put in by the people who have contributed to this edition of the New Zealand Deer Farmers Landcare Manual.

Funders: Sustainable Farming Fund (MAF), Deer Industry NZ, NZ Deer Farmers Association, NZ Landcare Trust, Hawkes Bay Regional Council, Landcorp Farming Ltd.

Committee: Janet Gregory, NZ Landcare Trust; Edmund Noonan, NZ Deer Farmers Association; Tony Pearse, Deer Industry New Zealand; Amy Wills, DINZ; Richard Burdon, NZDFA; Malcolm Gilbert, NZDFA; John Patterson, Bay of Plenty Regional Council; Ian Millner, Hawkes Bay Regional Council.

Case study farmers: Tim and Trish Smith, Landcorp, Mararoa Station; Richard & Sarah Burdon, Glen Dene Station; Paddy & Barbara Boyd, Haldon Station; Sam & Kiri Zino and Mark Zino, Kanuka Downs and Flaxmere; William & Karen and Mark Oliver, Waerenga Station; Brian & Jacqui Wellington, Te Awamutu Station.

Stakeholders: John Cheyne, Hawkes Bay Fish & Game; Jim Risk, Ballance AgriNutrients; Gary Morgan and Dave Connor, Environment Southland; Susie McKeague, Otago Regional Council; Judith Earl-Goulet, Geoff Thompson, James Hoban, Environment Canterbury; Dave Cameron, Greater Wellington; Malcolm Todd, Horizons; Don Shearman, Taranaki Regional Council; Simon Stokes, Environment Bay of Plenty; Bala Tikkisetty, Waikato Regional Council; Rob Hughes, Auckland Regional Council; Bob Cathcart, Northland Regional Council; David Stevens, Richard McDowell, AgResearch; Peter Weir, Ernslaw One; Gary Wolten, Beef + Lamb New Zealand.

Thanks to Beef + Lamb New Zealand for use of its Land and Environment Planning tools.

CONTENTS

FOREWORD

Deer farmers in New Zealand have a proud history of being environmentally proactive. This has been demonstrated positively with the distribution of the first NZ Deer Farmers' Landcare Manual (2004) and with the Deer Industry Environment Awards programme operating for the last decade.

Today there is an increased expectation from community and customers that farmers are environmentally proactive and accountable. Farmers must be mindful of public expectations, and their statutory obligations in relation to their environmental responsibility. Farming activities can have substantial consequences on the environment, demanding proactive management practices to mitigate that risk. Good on farm environmental accountability demonstrates to the New Zealand public and to global marketplaces that New Zealand's deer farmers integrate environmental responsibility into the farm business and production of the deer industry's unique products.

Innovative deer farmers have developed practical landcare systems and a sustainable approach in environmental management to address this. Adopting proven management tools enables the most efficient use of essential nutrients both for efficient pastoral production and for good water quality management. The most important first action a farmer can take is to develop an environmental management and risk identification plan, one that can be implemented as conditions and finance allow, and that records progress to suit the individual farm's objectives. The Landcare Manual provides an essential guide to preparing the plan.

This revised edition (2012) is designed to help deer farmers further improve the Environment Management System they have for their property, and to progress the commitment to continuous improvement in all aspects of farm management and sustainability. The value of this resource is that it is principally based on farmer derived solutions and experiences. These are further supported through collaboration with New Zealand's leading environmental agencies to recommend best practice for all aspects of environmentally friendly farm management. Implementing the tools and systems approach outlined in this manual will ensure that farmers are doing the best they can with the environmental management of their farms, adding both personal and industry value to their land and resources.

Edmund Noonan
Chairman New Zealand Deer Farmers Association

Andrew Macfarlane
Chairman Deer Industry New Zealand

1. SUSTAINABLE DEER FARMING

Introduction

Deer Industry New Zealand and the New Zealand Deer Farmers Association has produced this latest Deer Farmers Landcare Manual, with MAF Sustainable Farming Fund assistance.

The updated Manual aims to be a practical reference guide for all New Zealand deer farmers, experienced and new, to manage their productivity in an environmentally sustainable way to comply with Industry QA Systems and best practice. The Manual describes best management practice options that encourage practical and economic ways to eliminate or minimise damage to soil, water and biodiversity, ensuring the business of deer farming continues from generation to generation, both in profit and in sustainability. This is based on the latest knowledge and techniques on sustainability, combined with practical farmer experience thanks to the deer farmers and the organisations which contributed to the major 2001 New Zealand survey on sustainable deer farming methods.

The Manual will continue to be updated periodically with new knowledge on resource management and on farmers' experiences. Feedback is welcomed.

In the Manual, you will read information and recommendations on how to manage environmental resources and issues caused by the specific needs and behaviour of deer. This includes managing soil, water and nutrients, combating erosion, providing shelter, managing on-farm waste, and a new section on carbon. The Manual also outlines requirements for biodiversity, understanding landuse capabilities, and details on how to manage your environment and risks using Land and Environment Plans. Case studies of six farms provide practical examples of how innovative New Zealand deer farmers are successfully integrating their sustainable farming methods alongside farm productivity and profitability. Each section has links to organisations and websites for more detailed information. The Manual will link to Industry QA Systems – see *www.deernz.org* for details.

Sustainable land management

Sustainable farming encompasses every single aspect of farm management on a day-to-day basis. The objective of farming in a sustainable way is to best protect and enhance individual environmental resources on every New Zealand farm. Sustainability means that the activities being undertaken by a land-user today should not negatively affect the long-term future capability of the operation. To be sustainable on farm, management must aim to:

- Protect natural resources and prevent degradation of soil, water and air quality.
- Identify and take actions to reduce or eliminate environmental risk.
- Maintain or enhance production.
- Be economically viable.
- Be socially acceptable.

The deer industry is committed to being environmentally proactive to ensure New Zealand farmed deer and the land are managed well in every aspect. Deer Industry New Zealand has developed Industry QA Systems which in most cases are incorporated into the current individual company QA accreditation programmes, across all deer management issues, including environment. Compliance to these standards helps protect and enhance ongoing access to our markets, providing customers, consumers, statutory authorities and the public with the assurance that deer farming in New Zealand meets quality standard requirements for being environmentally sustainable with good animal health management and welfare practices. The industry works with local authorities on meeting Resource Management Act requirements.

Water quality is the single most important environmental issue facing all agricultural sectors in New Zealand, as identified in the NIWA report How Clean are our Rivers? *http://www.niwa.co.nz/publications/wa/water-atmosphere-1-july-2010/how-clean-are-our-rivers*. The dairy industry 2003 Clean Stream Accord *http://www.mfe.govt.nz/issues/land/rural/dairying.html* has led to a supply condition for total stock exclusion of accord class waterways by June 1, 2012, and while the dairy industry has been the primary focus of water quality advocates, New Zealand deer farmers will be increasingly scrutinised for their effects on water quality. The Land and Water Forum *www.landandwater.org.nz* was established by the government and composed of all water quality stakeholders to pioneer a collaborative approach to deal with water quality issues in New Zealand.

The industry sets considerable store in its Biennial Deer Industry Environmental Awards programme, which allows deer farmers and the environmental agencies and regional communities to meet on the winning properties and see first-hand the innovation and sound environmental management developed by these industry leaders. This experience forms a key part of the education and practice change programmes promoted by the industry.

Deer farmers have a wealth of experience of impacts of deer on the environment and how to deal with them. Good deer farmers recognise the environmental risks on their farms – those that are obvious as well as the more subtle risks - and take them into account with planning and making day-to-day decisions. Many are formally documenting the issues and progress through environment management systems such as a Land and Environment Plan.

Having an active environment management system is an important pre-requisite for sustainably farming. The deer industry has collaborated with New Zealand Beef + Lamb New Zealand to offer a single unified environment management system, the Land and Environment Planning Tool Kit (LEP) to help deer farmers organise, monitor, achieve and demonstrate environmental performance (*refer Chapter 11, Managing Your Environment*).

Sustainability and the deer farm

The environmental risks on deer farms are different from those faced by sheep and cattle farmers. Deer behave differently, which can have specific impacts on the farm environment, including soil and water, even on mixed livestock farms. There is also a responsibility on all farmers to preserve indigenous bush and wetlands to maintain New Zealand's biodiversity.

Soil and water

The major issue identified by farmers is erosion along fence lines created by deer walking up and down fences in response to behavioural stress or disturbance. Natural deer behaviour includes play on banks and loose soil, wallowing, camping in areas that can become bare, and they can pug soils in wet weather. Sustainable deer farming addresses practical ways of preventing, managing and remedying erosion damage caused by these behaviours.

The most important environmental concern New Zealand faces at the moment is water quality. Deer have an affinity with water. Responsible deer farmers will incorporate this with the wider public expectation and avoid, as much as possible, farming operations that negatively affect water quality. The deer industry standards, in QA programmes and in the welfare code, acknowledge the expression of natural behaviour. These have environmental care strategies, which include management of water quality and effective programmes that demonstrate water quality responsibility.

Nutrient loss pathways

Two of the essential components of farm products are the nutrients nitrogen and phosphorous; it is their diffuse leakage from farming activities that is primarily blamed for water degradation issues such as algal blooms. Typically these nutrients have different escape pathways. Phosphorus tends to escape the farm in runoff events when it is attached to soil particles like in dirty water during rainstorms. Nitrogen escapes mainly by passing through the soil and leaching into the water table in the form of nitrate which is invisible. Nitrogen loss from dairying systems originates from leachate leaving the base of cow urine patches, but because deer excrete small urine deposits they, like sheep, have a relatively low nitrogen leaching result. However deer farming is characterised in nutrient loss models such as OVERSEER® as having a relatively high potential for phosphorus loss. All farms can have hot spots for phosphorous loss and these are called Critical Source Areas. Because P-loss is fairly visible we see where to deal with it in practical ways.

Understanding deer behaviour

The key to avoiding environmental damage is understanding deer behaviour – what activities occur, when and why. Social conditions can differ markedly from the wild, which can conflict with management needs at times, particularly during the rut, calving and weaning. Thoughtful management, combining good management practices, genetic selection for good behaviour and environmental knowledge, reduces unwanted deer behaviours and controls environmental risks, leading to positive outcomes for deer, farmers and natural resources.

In the wild:

- Deer behaviour varies according to their environment.
- Home ranges can cover several hundred hectares, varied between summer and winter, and depending on available food, cover, shade and shelter.
- Deer browse green and fallen leaves, shrubs, herbs and grasses.
- Trees (especially conifers) are used for rubbing.
- Wallows are used by both sexes, but stags wallow more intensively in the rut.
- Deer live in same sex groups with a strict dominance hierarchy most of the year.

- Stags in hard antler in the autumn rut seek hinds to collect a mating group and will defend their hinds from other stags until early winter.
- Pregnant hinds leave their group in early summer, a day or so before giving birth.
- Hinds seek isolated fawning sites with good vantage points and ground cover.
- Hinds initiate a strong bond quickly, cleaning the newborn fawn before suckling.
- Hinds leave their fawns about four hours after birth to graze well away (often a kilometre or more), only returning to suckle two or three times a day.
- Fawns gradually increase time with the hind, both rejoining the herd after 2-3 weeks.
- Weaning occurs any time after seven months.
- Stag calves leave their mothers after two to three years.
- Hind calves stay with their mother and related hinds.

On deer farms:

- Deer are often weaned at three to four months.
- Mobs can range in size from 50 to over 400 or more on the extensive properties, typically grouped by origin, strain and size.
- Deer are divided into large separate stag and hind mobs at 10 months.

- Stags are often kept in smaller age and weight groups in spring and summer.
- Hind mobs may be divided into smaller groups of 40-50 at mating and calving.
- Paddock conditions can limit deer ranging, feeding, sheltering and play.
- Deer contribute to erosion in play, digging on light soils especially on slopes, in pacing, and through bare camping areas.

Good water quality is of concern to everyone

- Deer can pug soils in wet weather.
- Deer are attracted to water and mud for wallowing, playing and cooling.
- Given the opportunity, deer eat many native plants, strip bark and rub on trees.

Balancing sustainability and profit

The deer industry promotes ongoing sustainability improvement and also actively advocates its basic rights to land use. Farmers view their operations holistically, allowing environmental aspects to be managed as an integral part of the business alongside other issues affecting production and profitability, rather than in isolation. Improvements in environmental performance require success of the business enterprise – progress from profit. Deer farmers strongly advocate that ongoing effective environmental improvements can only be made through profit to be able to pay for costly developments such as riparian fencing. Some require considerable funding which will only be achieved with mutual co-operation and cost sharing from the wider community.

Environment Awards

The Deer Industry Environmental Awards are a biennial competition, funded by Deer Industry New Zealand and managed through the NZ Deer Farmers' Association, to recognise deer farmers who are farming productively and in harmony with their local environment. As well as the Premier Elworthy Award, established by the late Sir Peter and Fiona, Lady Elworthy, Merit Awards provided by industry sponsors are also awarded for innovations and success. Contact Deer Industry New Zealand *www.deernz.org* for details.

The Deer Industry Environmental Awards aim to:

- Reward innovative deer farmers for implementing and practicing sustainable and profitable deer farming practices in land and deer systems management.
- Promote the adoption of sustainable deer farming practise on all deer farms.
- Encourage sharing of experiences and proven best management practise and innovation through the resource of the Deer Farmers' Landcare Manual.
- Disseminate practical knowledge as part of the deer industry's environmental awareness programme.

Deer farmers are also able to enter the Ballance Farm Environment Awards (BFEA), managed by the New Zealand Farm Environment Award Trust *www.nzfeatrust.org*.

2. SOIL PROTECTION

Soil is our most precious natural resource. Its depth, type, and health pre-determines the land's basic potential to grow grass and its capability to support management of deer. Every effort must be made to maintain its quantity, health and fertility. The movement of soil away from where it has naturally formed is erosion. New Zealand has wide-ranging soil types and underlying geology across regions, causing different erosion issues ranging from surface effects to deep seated mass movements. While essentially a natural process, erosion can easily be activated and worsened by inappropriate management of farmed animals including deer that can quickly accelerate soil losses and permanent damage. This not only robs farmers and future landowners of the full productive potential of the land, but can also shift sediment and soil nutrients into waterways.

This section describes the types of soil damage that can occur on some deer farms and lists the techniques that can be used to avoid damage from pacing, development of bare areas and soil pugging, and suggests ways of fixing any damage.

Check with your local council for information on erosion management and knowledge of local soil types.

(a) Pacing

TOP TIP: Avoid overstocking – stocking rates should be appropriate to the capability zones of each farm. Shift deer from any risk areas at the first sign of any damage as this will rapidly escalate.

When deer become upset they pace up and down fence lines. The grass wears away with constant tracking, the soil becomes exposed, and is washed away during rain. This erosion can lead to deep ruts, especially on sloping land (*refer to Chapter 1, understanding deer behaviour for more information*).

Paddock management

Consider paddock size, shape, contour, and location to other disturbances to prevent deer pacing erosion.

Recommendations:

- Fence vulnerable areas.
- Double fence critical slopes and tracking areas.
- Use square rather than rectangular paddock subdivision if possible.
- Shift or remove gateways that don't work well.
- Consider increasing paddock size by removing subdivision fencing if fence pacing is continual.
- Install safe obstructions such as concrete posts, rocks, logs, branches and haybales.
- Break up straight fence lines with trees in triangular barriers or barrels with netting.
- Divert water from running down the fence line.
- Lay shingle before drilling fence posts in soft paddocks.
- Keep fences off steep areas. Fence around rather than up a hill, choosing a favourable contour rather than the shortest, steepest route.
- Keep an empty paddock between mobs.
- Use other stock (fallow deer, sheep or cattle) in erosion-prone areas.
- Protect problem areas with electric fences. Ensure outriggers don't cause entanglement or shift pacing further out, and check frequently, particularly with larger mobs of stags.

Stock management for all stock classes

TOP TIP: Keeping deer settled and content is the key to preventing fence line pacing.

Recommendations:

- Keep deer in familiar groups with same age and size, or groupings of related hinds.
- Avoid adjacent mobs, mixing mobs, high stocking densities and small paddocks.
- Match mob size to paddock size.
- Feed plenty of fresh, clean, varied, quality food with ample energy and nutrients.
- Alter feeding out times if deer are pacing, such as feeding out just before dusk.
- Feed supplements to tame younger animals and new arrivals.
- Shift deer to new paddocks before feed runs out and fence pacing occurs.
- Shift large mobs regularly, especially if paddocks are small and increase frequency of shifting in bad weather, particularly during the wet.
- Avoid using steep paddocks during weaning, calving, the rut and wet weather.
- Provide trees, shrubs or scrub between paddocks, for screening, hiding and shelter.
- Provide varied topography for shelter, vantage points, camping and hiding.

- Provide wallows that are not connected to waterways.
- Remove unsettled deer from the mob.
- Minimise disturbances from humans, unfamiliar sources, and farm activities.
- Handle deer consistently and quietly in the yards.
- Avoid handling during or just before bad weather.
- Introduce new deer to mobs carefully, in groups and use neighbouring paddocks.
- Run deer in the same paddocks as cattle to settle.
- Provide toys or piles of soil to reduce boredom.

Rutting stag management

Pacing by rutting stags is thought to result from the desire to roam and access hinds, to defend, or to fight or flee from other stags. Red deer, particularly Eastern red deer, are considered more prone to pacing than other breeds. Older and dominant stags and ex-sires seem to pace the most.

Recommendations:

- Create small mobs (25-30 stags) and run them in large, familiar paddocks if possible, or in paddocks with varied topography on smaller farms to allow stags to separate and hide from each other.
- Avoid placing single sire mating groups in adjacent paddocks.
- Keep cycling hinds well away from other stag groups.
- Spread out stag food supplements well.
- Provide multiple sources of drinking water.
- Avoid shifting mobs to new paddocks during the rut if possible.
- Return stags to large paddocks.
- Add spiker males with first fawners in January to socialise and settle and enhance their mating success.
- Keep stags paddocks as far as possible from areas of disturbance such as yards.
- Run 2-3 older stags with mobs of spikers to suppress spiker rut behaviour.
- Allow each stag a 30 m² diameter area when allocating space and stocking rate. A stocking rate of no more than nine per hectare is recommended.

Newly weaned fawn management

Pacing by newly weaned fawns typically reflects a desire to rejoin their mothers for social reasons, and some have a lactation nutrition drive if early weaned. Weaners may often be placed in unfamiliar surroundings, grouped with other deer, or have been transported to a new property, which unsettles them.

Recommendations:

- Provide high quality, familiar feed, and ample water of good quality in a familiar place.
- Wean into a familiar secure paddock, ideally one previously grazed by the hind/fawn group for 3-4 days prior to weaning.
- Feed supplements, especially grain, for two weeks before and during weaning, to allow the hind fawn mob to become familiar with the feeding routine and adapt to the feed type. Continuing that routine after weaning is a critical management tool.
- Retain fawns in the same mobs as before weaning.
- Add some settled older deer such as dry hinds or young stags to the mob.
- On large farms separate fawns from hinds as far away as possible, out of sight, smell and hearing. On smaller farms use adjacent secure paddocks.
- Wean in fine, warm, settled weather.
- Wean into large paddocks with low stocking densities.
- Avoid disturbing newly weaned fawns, keep away

Irrigation ponds provide sources of habitat for wildlife too and add other values to a property

Selecting the correct pasture species and retaining good pasture covers aids in soil protection in drier areas

Development of high quality pasture next to hind blocks allow for transition to high quality feed when feeding fawns.

from roads, unfamiliar people.
- Use mob sizes of 50-200 fawns.
- Consider soft weaning by removing groups of hinds from the mob progressively.
- Consider delaying weaning until after the rut, or later if possible.
- Add 20 – 40 fawns at a time if creating large mobs.
- Avoid using the same paddocks for weaning each year if damage is apparent.
- Tag and carry out animal health activities 3-4 weeks prior to weaning to avoid adding additional stress at this vulnerable time.
- Ensure fawns kept in yards after weaning have shade, shelter, good feed and water and monitor at least daily.

Hind management

Newly weaned hind pacing generally reflects a desire to be with her fawn and may also be due to discomfort from a full udder. Some farmers think that the hinds that pace the most are the best mothers. Minimising pacing damage from newly weaned hinds follows the same practise as recommended for fawns (as above).

Recommendations:
- Use large, lightly stocked familiar paddocks.
- Avoid using large mobs.
- Provide supplementary feed to help settle hinds.

Fawning hind pacing just prior to birthing is thought to reflect a need for the hind to find its own, secluded, quiet place to give birth, which is safe and has cover for the fawn. Hinds will also pace if they have lost a fawn through the fence. Discomfort may also cause pacing. Often it is an indication of overcrowding or overstocking in the fawning paddocks.

Recommendations:
- Provide plenty of low scattered cover in the paddocks (e.g. long grass, weeds, scrub, cut branches) and topographical variety such as hollows or gullies. Consider not harvesting/cutting an area in the middle of the paddock to provide cover.
- Provide space using large paddocks, lightly stocked with small mobs.
- Use paddocks far from disturbances.
- Feed the hinds well.
- Use familiar paddocks, ideally the same ones each year.
- Consider leaving gates open between paddocks if the pacing situation worsens, although this can risk fawn problems and fence entanglement when they are very young.

Deer are naturally inquisitive and like high points where they can see what is happening in their place.

(b) Bare areas

TOP TIP: Prevent deer congregating.

Persistent bare areas in deer paddocks can be caused by stock camping sites, areas where young stock play, feeding sites and following pasture and soil damage such as from rabbits, heavy machinery, overgrazing dry soils, and pugging from heavy deer concentrations (*refer Chapter 1, Sustainable Deer Farming for further information on deer behaviour*).

Stock management

Deer can be managed to help avoid congregating in one area.

Recommendations:

- Shift stock regularly, especially in wet weather or in drought conditions.
- Protect vulnerable areas with temporary electric fences, depending on stock type.
- Rest paddocks from deer by using other livestock such as cattle (but not bulls).
- Keep young stock off erosion-prone areas and shift weaners early.
- Control rabbits and other sources of pasture damage.
- Feed hay in the bare area to encourage early weed-free re-seeding.
- Consider re-fencing and different land use such as trees.
- Avoid high stocking densities and large mobs in paddocks that are too small for them.
- Drain wet areas, but not managed wetlands.
- Avoid overwatering on irrigated properties.
- Provide play areas, such as a mound of soil. On small farms consider providing toys (eg plastic fishing floats, clean drench drums etc) for young stock.
- Improve paddock contour.
- Maintain good grass cover, oversowing if necessary.
- Wean post-rut.
- Consider weaning post-rut when separation stress is lower if weather conditions allow.
- Fertilise bare areas when sown for rapid pasture establishment.

Camp site management

TOP TIP: Give the deer several camping options.

Mobs of deer rest in one area of the paddock close to each other, choosing camping areas for their comfort, flatness, safety, distance from human activities, views of the area and other deer, shelter and warmth in cold weather, and shade and breeze in heat. Deer are most content when they have a hard, rocky or dry area as a campsite. Deer without suitable camping sites, particularly in small paddocks, may pace instead of resting, or camp near the gate, and those without shade in hot weather seek windy knobs or exposed ridges. Stags do not cause problems for much of the year. Fallow deer graze the site harder than red deer.

Recommendations:

- Use shade, shelter, cover and varied topography to provide several good camping sites in all weather.
- Provide several suitable camping sites in large paddocks to disperse camping.
- Avoid high stocking densities.
- Avoid long stock rotations (long duration in a set rotation pattern).
- Encourage camping in desired areas by planting shade and shelter.

Protection of shade trees within paddocks will provide long term protection

- Locate and protect deciduous trees (not conifers) in the middle of the paddock, for breeze and shade at all times of the day.
- Prune individual shade trees high so the shade moves around and away from the tree.
- Shift fences if necessary to change some camping sites.
- Avoid feeding near gates if possible.
- Spell the paddock or graze cattle.
- Spread out camping activity by allowing deer access to their previous paddock.
- Feed hay on the bare damaged soil.
- Keep paddock angles, and fences or tree lines, at 90 degrees or more, as deer congregate in acutely angled corners of paddocks.
- Avoid planting the highest clear spot, as it will block the mob's ability to watch.

Play site management

TOP TIP: Don't put young stock into vulnerable paddocks.

Deer, especially young stock, play when they are happy and healthy, but also when bored, needing exercise, or for social reasons. They like to play on the most erosion-prone areas where soil is easy to dig, such as warm sunny slopes, on bare ground, ridges and gullies. They will play near water, and when shifted into a new paddock. Many farmers feel that play is a sign that deer are thriving, and aim to control its effects rather than prevent play.

Recommendations:

- Keep young stock off vulnerable areas like steep slopes and banks.
- Use thick, high pasture cover in paddocks for maintaining high quality young stock.
- Avoid using large mobs and high stocking densities, especially for young stock.
- Allow one area of bare ground and an associated wallow area.
- Mix younger and older deer in a mob.
- Keep weaners on a fast rotation.
- Provide shade in hot weather to prevent deer digging to find cool dirt.
- Provide play objects such as drench containers, cleaned oil drums, tree stump or felled tree.

(c) Pugging

TOP TIP: Act quickly to move deer off at the first sign of pugging problems.

Pugged soils are highly compacted and have lost their natural soil structure, which inhibits grass growth and rainwater absorption, leading to rapid surface water run-off. It may be possible to separate areas of free-draining lighter soils from susceptible heavier soils,

allowing them to be managed differently (*refer to Chapter 9, Land use capability for more information on land use options*). Pugging happens after prolonged wet weather at any time of the year but commonly in winter. Management factors that can lead to pugging are weaning, underfeeding, overstocking, not shifting deer to new pasture soon enough, shifting the deer onto and off crop paddocks, and lack of shelter.

Recommendations:

- Feed deer well prior to and during cold, wet weather.
- Use short rotations or lightly set-stock, low stocking densities and small mobs in wet weather.
- Keep deer off vulnerable areas such as heavy, saturated soils.
- Avoid repeated shifting between pasture and crop paddocks.
- Back-fence on crop paddocks so deer cannot return and cause further pugging.
- Shift deer to dry, sheltered areas before wet weather arrives.
- Shift deer onto feed pads with good surrounding shelter during the wet.
- Avoid high deer numbers in holding paddocks with clay rich soils near yards.
- Wean in good weather.
- Use scrubby undeveloped run-off paddocks in wet weather.
- Fence marginal ground such as a deer campsite after grazing developed pasture.

(d) Remedies for erosion damage

TOP TIP: Rest and re-sow areas.

Prevention should always be the aim. Minor bare areas, such as stock camping sites, are not always a problem. However, remedial action is best taken sooner rather than later. If damage persists despite repeated repairs, farmers should change stock management around the problem area. Soil needs to be rested, and treated to improve air circulation through the soil structure.

Recommendations:

- Cultivate or fill in the area with soil, clay, gravel, rocks, waste wood pulp, silage waste, branches, or small hay bales. Overfill to make it last longer.
- Sow other grasses using double the sowing rate (e.g. natural grasses, browntop, unpalatable grasses, kikuyu) by spreading hay over the affected area and leaving to reseed.

Riparian areas need to have wide margins to filter any run off from winter crops

- Encourage seed establishment by applying fertiliser.
- Rest treated areas well then graze lightly.
- Fence off bare areas and plant trees such as Tasmanian blackwood (in warmer areas), poplar, honey locust, willow, toetoe, and flax for shade, shelter, fodder, timber, and a barrier between paddocks.
- Cultivate, harrow or sub-soil the ground and re-sow by direct drilling pasture mix.
- Protect treated areas, using material such as branches or electric fences.
- Change the paddock use with older stock, sheep, cattle or silage.
- Drain the area, using mole drains, novaflow drainage coil or tiles, ensuring the water table is correctly aligned for water channels.
- Use waste pulp to bulk up sandy hill country.
- Bury old concrete posts.
- Add river shingle to the bare ground.
- Improve the contour of the paddocks.
- Move hay feeder to allow for hay seed to be spread around the bare areas.
- Lay recycled trawl netting or geotextiles over the bare area.
- Improve gateways by installing rock or pieces of old concrete (sills, old posts etc).
- Improve the amount of organic matter and earthworms and micro flora in the soil.
- Ensure soil is at its optimum pH.

Shade trees can be planted in clumps alongside fences and also used to protect infrastructure

3. WATER PROTECTION

Although there are short term advantages in allowing deer access to natural water sources, such as preventing competition for troughs and allowing natural behaviour, like other livestock, deer can permanently damage and pollute waterways. Farmers must take steps to protect water resources on deer farms. This does not necessarily mean fencing off all forms of water, which often is clearly impracticable and unaffordable. Planning and implementing key water quality management techniques, including developing riparian strips around streams and establishing and protecting wetlands to trap sediment and nutrients, can mitigate the effects and create a quality habitat for aquatic life.

This section describes how deer farming can affect water resources, how to avoid and remedy negative effects from wallowing, how to prevent access to waterways and manage erosion, as well information on wetland management.

Councils are responsible for monitoring and managing natural water under the Resource Management Act, and are required to ensure that water users avoid, remedy, or mitigate any adverse effects of their use on the environment. Some councils have clear rules specific to their region on excluding stock from waterways to improve water quality, that must be adhered to. Council approval is required for abstracting, damming or diverting water, discharging pollutants into it, or placing structures on the beds of lakes, rivers and the coast. The Department of Conservation has responsibility for managing water bodies on conservation land.

(a) Wallowing

TOP TIP: Investigate providing a suitable area away from waterways for safe wallowing.

Wallowing is a natural behaviour of deer, thought to benefit stock through tick control, hair removal, cooling and social interaction. Wet areas, especially surface water that can be stirred up into mud, attract wallowing. Hot weather encourages wallowing, but deer also wallow in cold, wet weather, and when there is a change in paddocks at any time of the year. Red deer may wallow more than other types. Farmers often allow a wallow in paddocks, as deer will create another or target troughs if wallows are removed. However this becomes a management problem if wallows are connected to waterways and become a potential source of contaminants, transferring muddy soil and nutrients from wallows to other parts of the farm. There may also be an associated health risk through creating an environment that harbours infective bacteria associated with Johnes disease infection, Leptospirosis etc that can be passed from deer to deer.

Recommendations:

- Fence stock out if wallows are made in a significant natural wetland. Do not tap springs or drain wetlands.
- Provide an alternative, scooping out a damp hollow away from watercourses.
- Fence wet areas temporarily or permanently.
- Keep deer out of paddocks with poor drainage during wet weather.
- Design and manage troughs well.
- Design and manage wallow sites with sediment traps.
- Limit stock time in vulnerable areas.
- Provide shade trees to keep stock cool.
- Reduce stocking density.
- Integrate other stock such as fallow deer, sheep or cattle.
- Use large rocks in wet areas to prevent deer starting a wallow.

Managing wallowing in water troughs

Deer like to play in water, so splashes and leaks at troughs can quickly become major wallow holes.

Recommendations:

- Allow only a small area for drinking, covering the remaining opening with wooden boards, wire and mesh, rails or concrete posts.
- Use a greater number of small troughs.
- Locate troughs against or beneath fences which can serve 2-4 paddocks.
- Locate troughs on raised mounds, like a rock/shingle platform 300-400 mm high.
- Locate troughs on well-drained sites, improving drainage if necessary.
- Locate troughs where deer do not congregate.
- Check regularly that there are no valve faults or overflows.
- Fix leaks as soon as possible.
- Provide shade in the paddock to prevent deer from cooling in trough water.
- Provide a wallow elsewhere in the paddock.
- Reduce water pressure in pipelines or at a trough.
- Consider alternatives to using electric outriggers over troughs, as it is a fear barrier that can easily

discourage drinking. Carefully monitor deer behaviour.

- If stock water is supplied via a dam, install a gravity-fed reticulated system adjacent to the dam rather than direct access, to prevent damaging the dam and surrounding area, and to provide cleaner water.
- Use a concrete post border and fill the wallow with gravel.

Remedies for repairing wallow sites:

- Fill with gravel, broken concrete, rotten rock, limestone, lime, sand, pumice, or stones plus soil, then overfill with soil.
- Re-sow the filled wallow with scattered hay or pasture species that thrive locally.
- Drain the area using Novaflow drain coil pipe, tiles and scoria as appropriate.
- Remove water sources like leaks, unless it is a natural wetland.
- Level the site and re-contour.
- Protect filled wallows with fences/branches.

Limited access to waterways needs to ensure banks are protected from erosion

Good margins along riparian areas aid in water quality

- Fence and plant with wet tolerant trees or grasses/ sedges.
- Use good grass establishment methods, with the appropriate rate of seed, seed type and fertiliser, and ensure soil is at optimum fertility levels to maintain growth.
- Use hardy species on the downhill side of a wallow.

(b) Preventing deer access to waterways

TOP TIP: Have a plan that prioritises waterway areas to fence.

Deer farmers should fence off waterways where practical and feasible to exclude deer, and unfenced waterway areas should be managed to minimise effects. Any effects on water quality should be rectified before it leaves the property.

Fences

Excluding deer from streams, ponds or lakes prevents direct sediment and faecal material contamination, while allowing vegetation to grow.

Recommendations:

- Construct permanent fence structures with posts and netting or battens where practical.
- Consider if a gate is needed into the fenced area for retrieving any escaped deer.
- Build portions of the fence without battens if they are likely to be hit by flood waters, placing posts a little closer together if necessary.
- Install fence wires on posts on the side away from where flood waters leave the stream channel. Use unbarbed staples that pop under the weight of flood waters.

Flood gates

Fencing across streams is undesirable but not always avoidable, so installing swinging flood gates is recommended. Wide streams may need several separate swinging gates.

Recommendations:

- Construct floodgates from corrugated iron, timber, reinforcing mesh or netting.
- Clear debris from mesh and netting regularly.

Correct culvert size and placement is critical for water flow and fish passage.

- Run a separate wire strain across the entrance and exist to the flood channel as a sacrifice section, or construct the fence with a break link. Flood water may remove this part but will not rip out the rest of the fence.
- Use sheep, or possibly fallow deer, rather than deer or cattle where it is impractical to fence off streams and waterways.
- Only allow access to small areas where stream bank damage is less likely, such as gently sloping banks, if streams are the sole viable water source on farm.
- Protect stream access further using rocks and shingle.

Culverts

Farm bridges and culverts must be constructed to allow stream life to pass freely. Care should be taken to ensure there are no drop-offs, especially on the downstream side, that could prevent fish from migrating upstream to spawn. Structures over streams are regulated under the Resource Management Act, and bridges and culverts may require council resource consent. The Department of Conservation may also have requirements. The NZ Forest Road Engineering Manual 2012 has valuable information on Water, Erosion and Sediment Control and Waterway Crossings with information on culvert sizes required for different catchment areas.

Recommendations:

- Use large size pipe.
- Build sturdy culvert sides using logs, cement or timber to withstand erosion.
- Position culverts where deer will move easily across them, where possible.
- Install sediment traps on the approaches to bridges and culverts to reduce the amount of sediment reaching the stream.

(c) Water quality and erosion

TOP TIP: Do what you reasonably can – if you dirty it, fix it.

Erosion of farmland can have considerable effects downstream, which if left unchecked, can compromise water quality. Erosion increases sediment loads which cause silt build-up in waterways and the nutrients washed from the eroded soil particles affect the water's chemical balance. Cloudy water generally indicates soil in suspension, but clean-looking water may also carry contaminant nutrients and bacteria causing algae growth and other nuisance aquatic plants. Prioritise water protection work on the lower farm to reduce negative effects from farming on water quality further downstream (*refer to Chapter 5 for further information on managing nutrient run-off).* Check with your local council's Land Sustainability team to find out what the local rules are and for advice on management options.

Recommendations:

- Plant riparian plants to protect the waterway.
- Fence the waterway and riparian area.
- Use a settling area such as a duck pond or filtering wetland/swamp to improve water quality, particularly in areas of high conservation values.
- Plant winter crops such as brassicas well away from streams. If this is unavoidable, break fence the feed towards the stream, and leave a 3-5 m buffer filtration zone clear of the stream banks.

(d) Wetlands

TOP TIP: Introduce methods that keep deer away from wetland areas.

A wetland is the wet margins of streams, rivers, ponds, lakes, lagoons, estuaries, bogs and swamps. It can be permanently or intermittently wet (ephemeral), and is often just a low-lying, boggy area growing rushes or cutty-grass on the farm. A wetland can be man-made. Wetlands are valuable because they filter nutrients, control sediments, assist with flood control, provide a habitat for wildlife and native plants and may also have cultural or recreational values. They are particularly valuable for cleaning up diffuse nutrient losses within the farm – see Constructed Wetland Treatment of Tile Drainage at *www.niwa.co.nz*. Drainage of natural wetlands is not generally permitted by councils (*refer to Chapter 8, Biodiversity)*, and Resource Consents are required for altering wetlands. Contact your local council for advice on managing wetlands and information on funding to fence wetland areas. Your local native plant nursery can provide information on wetland plants suitable to your area.

Recommendations:

- Prevent deer access to wetlands to avoid damage such as pugging and wallowing.
- Plant appropriate native wetland species such as flax, toetoe, sedges and cabbage trees around the margins of a wetland to improve water quality and habitat.
- Consider permanently protecting a significant wetland through a QEII covenant (*refer to Chapter 8, Biodiversity)*.
- Do not take, use, dam or divert water from wetlands unless allowed by a resource consent or regional plan regulations.
- Do not discharge any contaminants where they may enter a water body, including a wetland.

4. SHELTER

Many deer farmers believe that deer are more content and pace less when they have shade, shelter, cover and screening along fence lines. Animal productivity is also likely to increase when abundant trees and shrubs are present, the shade and shelter helping livestock to limit energy use to regulate their temperature. Trees on farms provide shade, shelter, timber, stock food, help to control erosion, add appeal to the property, can be a legitimate economic use for land not suitable for grazing livestock (*Refer to Chapter 9, Landuse Capabilities*), and are valuable for maintaining biodiversity (*refer Chapter 8, Biodiversity)*.

In this section we will outline tree choices for different tree uses, tree planting, and tree management.

Contact your local council for information on vegetation species, weed and pest control, and regulations on growing trees. The New Zealand Farm Forestry Association has information on suitable species and management.

(a) Tree choice

TOP TIP: Seek good advice on what grows well in your area.

Conditions vary, not only from region to region, but also from site to site around each farm, and this will influence tree choice. Look around the neighbourhood to see which plants grow well, and if the tree types planned are the best choice for the intended purpose, then get advice from your local plant nursery. When choosing, also consider the value of flowering trees to benefit bees and nectar feeding birds.

Shelter

Effective shelter can be provided by planting a double row, one of a low dense species and one of larger shrubs or deciduous trees such as flax and poplar. All plantings can help provide cover for newborn fawns if a gap is provided at the bottom of fences to allow them through to shelter.

Suitable trees for shelter depending on your region include: Japanese Cedar, Lawsons Cypress, Leyland Cypress, Mexican Cypress, Douglas Fir (Oregon Pine), Pinus radiata, Eucalyptus sp., Cupressus macrocarpa, pohutakawa, manuka, pittosporum, flax, Silver Beech and Red Beech.

A range of species in a shelter belt meets a mix of shelter needs

When planting shelter belts it is important to select the best species for your farm system and climate.

Shade
Effective shade trees can be provided within paddocks as specimens or in small woodlots, or can be planted in corners and as shade belts.

Suitable shade trees include: oak, Japanese Cedar, Douglas Fir, alder, poplar, willow, silver birch, walnut, Mexican Cypress, eucalyptus, five finger, manuka, lacebark, cabbage tree and native beeches.

Fodder
Edible trees can be fed as cut branches, browsed through netting or electric fences, or eaten as leaf litter in autumn. Willows and poplars have a moderate nutritive value (9-13 MJ/kgDM) compared to pasture (9-10 MJ/kgDM). They may also reduce the need for anthelmintic drenches.

Trees that deer like to eat include: some native trees, tree lucerne, willow (e.g. Crack Willow, Japanese Willow), poplar (e.g. Tasman Poplar), walnut, ash, oak, hazelnut, maple, lacebark, and pohutakawa.

Less palatable trees are: larch, photinia, Mexican Cypress, Western Red Cedar, Lawson's Cypress, lime, hornbeam, birch, beech, plum, eucalyptus, manuka and pepper tree.

Coppicing
Willows and some Eucalypt species can be cut down to a low stump that sprouts new branches to be used for firewood (coppicing).

Woodlots
Woodlots provide a profitable alternative land use option in high erosion risk areas that are too difficult to graze. They are also a form of long-term investment, often a retirement fund. There are a large variety of trees available, but selection should be based on growing conditions and final objectives. Consider efficiency of the scale of planting – small scattered plantings may not be as economic as larger blocks of trees with good road access. Speciality timbers such as Cypress, redwoods and Tasmanian blackwood (warmer climates only) may be a valuable option in smaller areas where pine woodlots are less viable. When designing the woodlot also consider road access for harvesting. Check with the New Zealand Farm Forestry Association for information on suitable woodlot species and management information (r*efer to Chapter 8, Carbon for information on the Emissions Trading Scheme and credits for tree planting).*

Woodlots can provide sheltered areas for stock in winter particularly in conjunction with feedpads

Woodlots provide an economic alternative for rough areas.

(b) Tree planting

TOP TIP: Fence new areas for trees before planting takes place to keep stock out.

Some time should be taken to plan the planting of new trees, considering the aims and the suitable parts of the farm (*refer to Chapter 9, Land use capabilities*). It is important to plant the seedling correctly and to employ experienced contractors if you are not doing the planting yourself.

Recommendations:

- Cultivate the ground with a spade or by using a machine to loosen soil.
- Spot spray area for weeds to maintain a weed-free area of about 1m squared.
- Remove soil to create a hole large enough for the tree roots.
- Bury a short portion of the seedling's lower stem along with the planted roots to prevent excessive moisture loss.
- Replace the soil, lifting the seedling gradually to ensure roots are straightened.
- Firm the soil around the roots by treading while applying upwards pressure on the seedling.

(c) Tree maintenance

TOP TIP: Young trees survive best if kept clear of weeds for at least a year after planting.

Trees need to be protected from weeds and pests and from damage from deer, particularly during their establishment phase.

Weed and pest control

Animal pests, including rabbits, hares and possums, can destroy new tree planting on the farm. Use suitable predator-proof fencing or tree guards and pest control methods specific to the pests in your region if necessary (*refer to Chapter 8, Biodiversity for more information on pest control)*. Seek advice from your local council pest control staff.

Good weed control will ensure that seedlings will survive even during drought in the first year. Control pasture grasses as well as weeds around the seedling, as they suck up the available soil moisture. Check if herbicides can be used both pre and post tree planting, and ensure herbicides are suitable for the particular species being grown as some are sensitive to post planting sprays.

Planting native trees in gullies provides shelter, habitat and filtering of run off

Antler rubbing

Antler rubbing is a natural behaviour of stags thought to aid stripping of velvet and prepare the stag for the rut by sharpening the antlers and strengthening the neck muscles.

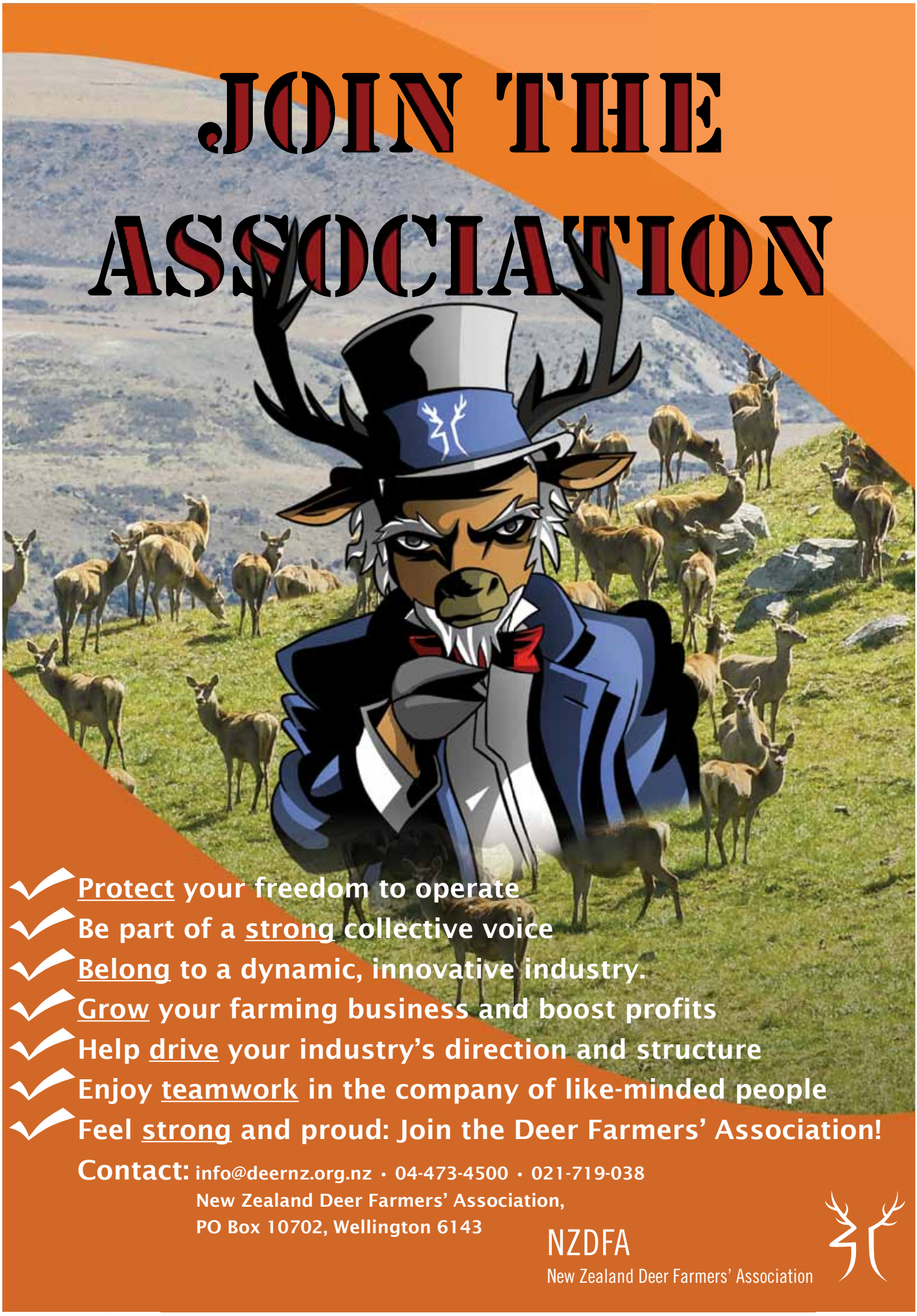
Recommendations:

- Provide stags with alternatives such as scrub, large branches, stumps, logs, posts or drums, or trees such as pine.
- Protect trees with fences, corrugated iron, netting, branches or concrete posts.
- Consider protecting trees with electric fences, but take care as fatalities can occur with electric outriggers. Some farmers move the hot wire in, by placing the insulators directly onto the posts.
- Avoid large mob sizes and high stocking densities.
- Use paddocks with fenceline screening and varied topography.
- Install rubbing posts mid-paddock, or old posts driven in just off the fence.
- Feed the deer well.
- Locate stags away from unprotected trees during the velvet growing period.

Pre-plant spraying and plant protectors aid in the establishment of trees

Woodlots provide economic alternatives in addition to shelter

JOIN THE ASSOCIATION



- Protect your freedom to operate
- Be part of a strong collective voice
- Belong to a dynamic, innovative industry.
- Grow your farming business and boost profits
- Help drive your industry's direction and structure
- Enjoy teamwork in the company of like-minded people
- Feel strong and proud: Join the Deer Farmers' Association!

Contact: info@deernz.org.nz • 04-473-4500 • 021-719-038
New Zealand Deer Farmers' Association,
PO Box 10702, Wellington 6143

NZDFA
New Zealand Deer Farmers' Association

5. NUTRIENT MANAGEMENT

New Zealand soils are generally naturally low in phosphate (P), sulphur and some trace elements. Applying fertilizer regularly supplements the soil's natural nutrient level and compensates for farm nutrients removed as produce. Without this pasture's production levels would be between half and a quarter of what it is today. However, fertiliser must be applied and managed carefully to avoid contaminating waterways.

This section will present recommendations on managing nutrient run-offs and on applying fertiliser to avoid environmental effects.

Soil testing, a nutrient budget (using OVERSEER®) and a nutrient management plan are all essential tools that should be included in the LEP. Develop soil testing and nutrient management plans with a qualified nutrient management consultant or your local fertiliser representative. Consultants should be proficient at using the OVERSEER® and qualified with the Advanced Sustainable Nutrient Management course run by Massey University *www.massey.ac.nz*. The Fertiliser Manufacturers' Research Association has a Code of Practice For Nutrient Management, and provides valuable information on nutrient management *www.fertresearch.org.nz/code-of-practice* for detailed information. Contact your local council for information and relevant regulations on nutrient run off and management, fertiliser application limits, and silage pit guidelines.

(a) Fertilisers

TOP TIP: Time nitrogen applications to match plant needs, and maintain P at optimal soil test levels.

The two major environmental challenges from fertiliser use, which deer farmers need to consider, are leaching to ground water and losses to open water.

The Fertiliser Manufacturers' Research Association has produced guidelines on "Best Management Practices And Considerations for Fertiliser" to optimise fertilizer use and avoid harmful effects on the environment. The Code has best practice recommendations on fertiliser handling, use and application and detailed information on nutrient management planning. This works well in conjunction with a Nutrient Management Plan. Councils regulate fertiliser applications that potentially discharge contaminants into the air, water and on to land. Farmers should check with their council on planning requirements.

Recommendation to minimise N-loss through fertiliser losses to waterways:

- Undertake regular soil tests and assess applications based on a Nutrient Budget via OVERSEER®
- Have a Nutrient Management Plan as an integral part of your LEP.
- Do not apply P fertiliser if Olsen P soil test readings already exceed optimum levels for plant growth in soil types.
- Identify Critical Source Areas for P-loss and fix them.
- Apply N fertiliser at a rate that the plant can use it, as nitrate leaching is minimised when there is rapid nitrogen uptake by actively growing pasture.
- Time N applications to match vigorous phases of plant growth. N application will achieve the most efficient results in spring/summer – 100% utilisation is possible. Application rates from 20-60 kg/ha are appropriate when applied onto actively regrowing pasture that is preferably 50mm high (1600-1800kg DM/ha).
- Split N applications into smaller amounts if possible (e.g. 30-45 kg N/ha at a time for grazed pasture) and apply more frequently over the growing season.
- Avoid application if heavy rain seems likely and especially if the ground is already saturated. Direct leaching from nitrogen fertiliser is greatest in winter.
- Avoid application of N in winter months (May, June, July in colder regions).
- Avoid application when soil temperature at 10cm depth is less than 6 degrees at 9am.
- Consider selecting less soluble and mobile forms of fertiliser.
- Check fertiliser recommendations for your area. Generally annual nitrogen applications should not exceed 200kg N /ha, but some councils enforce a lower limit.
- Consider the use of nitrification inhibitors, a technology that has shown significant promise in reducing nitrous oxide emissions and nitrate leaching, and in enhancing pasture growth by slowing down the conversion of ammonium in the soil to nitrate.

Recommendations to avoid P-loss through fertiliser contaminating open water:

- Leave an unfertilised strip as a buffer zone, generally 10m beside creeks, drains and storm water flood zones. Adjust this buffer width for slope.
- Develop permanent riparian strips, including dense ground-hugging species, to filter overland flow.

- Increase the buffer distance between intensively-used and fertilised pasture and open waterways.
- Avoid overgrazing of pasture prior to fertiliser application. Fertiliser uptake is better and there is less loss to the environment if the pasture is at least 25mm (preferably 50mm) long at the time of application (1600-1800 KgDM/ha).
- Avoid applications before heavy rain or on saturated ground when tile drains are already running. This will help avoid direct surface runoff of P-enriched water or particulate loss.
- Consider wind direction when applying fertiliser near water and be prepared to postpone application in adverse conditions.
- Keep fertiliser storage sites a good distance from any waterway.
- Use ground-based fertiliser spreading wherever possible for more placement control.
- Split high capital applications of P at rates of 100kg or higher of P/ha.
- Maintain Olsen P at optimal levels.
- Maintain soil structure and avoid soil compaction as this leads to increased soil and P loss
- Apply P in drier months.
- Use a Spreadmark™ registered operator where possible.

(b) Nutrient run-off

TOP TIP: Look after grass cover on the riparian strip as this helps to filter run-off.

Excessive loss of nutrients such as nitrogen (N) and phosphate (P) from fertiliser, dung and urine, and silage can change the natural qualities of waterways and lakes. Even with care, some nutrients are likely to end up in the waterways from surface run-off after heavy rain or into the groundwater system by leaching. How much nutrient contaminates waterways is directly linked to fertilizer use planning and application, management of CSA's, silage pit leachate and poor deer management practices that lead to excessive pugging and soil erosion.

Critical Source Areas (CSA)

AgResearch trials have shown that small areas of disturbed ground on farms with connectivity to waterways during storm events can account for the majority of P-loss from a farm annually. Preventing stormwater from sluicing over these hot spots or relocating them to higher ground can reduce this loss significantly. Common Critical Source Areas include muddy gateways and troughs in water flow-path locations, winter crops in valley floors subject to storm ephemeral flows, poorly located silage pits, and winter self-feed structures located where stormwater flows through.

Deer faecal management

Dung and urine from farm animals affect water quality, either directly if animals have access to waterways, or via surface run off from pasture during heavy rain and by seeping into ground water which can enter waterways as springs. Unlike the large volumes of dung produced by cattle, deer generate low volume with less P and N in compacted pellet form. Deer droppings are generally deposited close to where they camp, on higher ground away from waterways. Deer behaviour near water is considerably different from other species in habit and effect – deer are 50 times less likely than dairy cattle to defecate in a crossing than on the raceway. However, while natural deer behaviour may mean less faecal material deposited directly into water, even a small amount will have negative effects on the natural water system. Good management systems are therefore crucial.

Recommendations to avoid deer faecal contamination:

- Avoid deer access to waterways wherever practical.
- Establish a filter of thick grass on the riparian strip to retain deer pellets before they enter waterways. This will expose them to the sun's rays, the UV light killing bacteria associated with dung.
- Maintain grass cover on the riparian area by occasional grazing by sheep in dry periods to promote short dense tiller growth.
- Consider planting shrubs and trees on the riparian strip to discourage access.
- Graze riparian areas with sheep if possible, as they are less likely to enter the water.

Silage leachate

Leachate is approximately 200 times stronger than raw sewage and 40 times stronger than dairy wastewater. It has high levels of nutrients and ammonia, is strongly acidic and will cause severe de-oxygenation, creating major adverse effects on water quality and stream organisms. Farmers need to take great care on farm to make sure silage leachate does not reach waterways. Check your council's regulations for silage pit location.

Recommendations to avoid silage leachate:

- Dry silage to 30 %DM or drier, to ensure considerably less leachate is produced.
- Avoid groundwater seepage into the pit.
- Consider lining pit with concrete, including drainage channels to a sump, and bunding.
- Locate silage pits well away from any watercourse and make sure leachate does not run into a stream.
- Locate silage pit some distance away from any well used for water supplies.
- Locate pit well away from farm boundaries.

6. WASTE MANAGEMENT

The most important principle in managing inorganic waste on farm, particularly plastics, is to minimise its accumulation in the first place. Consider using products like plastic containers that can be re-used or recycled. If accumulating inorganic material is unavoidable, then dispose of it in an environmentally safe way using your local official regional landfill or a suitable farm landfill. Your local regional council has regulations regarding safe chemical storage and disposal, leachate from landfill and offal pits, and options for recycling or landfill use.

This section outlines the methods for managing inorganic waste, safe agrichemical use and disposal, farm landfills and offal pits, and disposing of dead animals.

(a) Managing inorganic waste

TOP TIP: Recycling opportunities are increasing - have a fresh look at the options for your farm.

Plastic waste

Options for disposing of plastic waste, including silage wrap, are burying, recycling or storing. Plastics should not be burned. Your regional council will have advice on recycling and landfill options in your area.

Commercial recovery

One waste disposal option available to farmers is recycling. There are several programmes and commercial waste removal companies in New Zealand with recycling and recovery services. The AgRecovery rural recycling programme is specific to the primary sector and offer services that recycle or recover containers, silage wrap, crop protection net, unwanted chemicals and other farm waste, throughout New Zealand *www.agrecovery.co.nz*. Other recycling services may also be available in your area. Contact your local council for further information.

Access and feeding systems are important factors to consider when siting silage stacks

Recommendations:

- Separate silage wrap from bale net, shake and roll, put into the recycling bags or bins provided. Store under cover to await removal.
- Empty agrichemical and animal health plastic containers and triple rinse to be free from residue both inside and out. Take to the designated collection depot.

(b) Agrichemical use and disposal

TOP TIP: Always follow best practice for the use of agrichemical products.

Minimise chemical use through establishing a clear demonstrated need before use, and evaluate non-chemical alternatives. Accidental spills and leaks from agrichemicals can contaminate, so mix and store carefully to minimise risk. Left over chemicals must be stored or disposed of in a way that does not contaminate soil or water. All agrichemical users should follow best practice GROWSAFE *www.growsafe.co.nz* practices required for safe, responsible and effective use of agrichemicals, based on the Industry Standard, NZS8409 - Management of Agrichemicals. Check what regulations your council has on chemical use. Empty plastic agrichemical containers can be recycled.

Recommendations:

- Follow GROWSAFE guidelines when using chemicals and use correct safety gear.
- Attend a local GROWSAFE Introductory course.
- Store chemicals in a locked shed or cupboard solely for chemicals. Identify storage area with an appropriate Hazchem sign.
- Store and mix chemicals well away from waterways.
- Mix in an area where spills can be contained, such as with raised concrete edges.
- Keep a bag of inert absorbent material such as kitty litter handy in case of spills.
- Spray in calm conditions, to eliminate negative effects beyond your boundary.

- Triple rinse empty chemical containers into the mix being used.
- Dispose of empty Agchem containers as per label instructions and council recommendations.
- Avoid spraying near waterways unless the chemical is approved for this purpose.
- Use chemicals approved for purpose.
- Read labels. If uncertain, seek advice.
- Ensure your agricultural contractors are registered chemical applicators through GrowSafe.

Banned chemicals

The risk of banned chemicals contaminating farm produce is a threat to our markets. Consumers become exposed to organo-chlorides from eating food from farms where these chemicals were once used as insecticides. Banned persistent organochlorines include DDT Mirex, HCB, Endrin, Dieldrin, and Toxaphene. Other chemicals no longer allowed to be used include Endosulfan, Azinphos-methyl, and Trichlorfon (except for veterinary use). Many other chemicals are reassessed each year, so availability of other products may be affected in the future. Disposal of old chemicals is a specialist job and must be discussed with the local authority hazardous goods staff, or contact a commercial company specialising in hazardous goods disposal, such as AgRecovery *www.agrecovery.co.nz*.

(c) Farm landfill

TOP TIP: Check waste is appropriate for the landfill.

Avoid contamination of ground and surface water from leachate coming from landfills. Council consent will be required if there is any risk of landfill leachate. Local councils may also have specific distance regulations on landfill location.

Recommendations:

- Avoid disposing unwanted chemicals or hazardous material such as pesticides, weed sprays, velvetting needles or equipment.

??????????????????????????????????????

- Site landfill away from property boundaries. Consider screen plantings.
- Choose a site with less porous soils, such as clay soil types.
- Choose a site well clear of water courses and flood zones, or where ground water could enter.
- Avoid putting offal in farm landfills.

(d) Dead stock disposal and offal pits

TOP TIP: Consider waterways location and ground seepage potential before disposal.

Water can be contaminated if carcasses are not disposed of properly. Check council regulations for offal pits in your area.

Recommendations:

- Dispose of dead stock as soon as possible.
- Do not dump dead stock in waterways.
- Dig shallow graves that are clear of waterways (recommended disposal method).
- Dig offal pits where there will be no groundwater seepage in to or out of the pit.
- Consider using sawdust to compost the stock.

Collection of balage wrap reduces double handling.

7. CARBON

Production on all farms is part of a complex biological system. Understanding the role of carbon is important for farmers to allow them to play their part in managing the carbon emissions that are part of greenhouse gas production.

This chapter aims to outline what carbon is, provide some brief information on measuring and trading carbon and what it means for the deer farmer. Contact the Ministry for the Environment *www.mfe.govt.nz* and the Ministry of Primary Industries *www.mpi.govt.nz* for more detail.

Carbon cycling

Carbon cycling is the continuous process of exchanging carbon between organisms and the environment. The living plant absorbs carbon dioxide from the atmosphere, progresses it into the food chain, and returns it to the atmosphere via respiration and decay of animals, plants, and organisms. Plants and trees absorb carbon dioxide and are a common way of offsetting carbon emissions when in plantations and forestry blocks. Soil also contains carbon produced by organic matter like roots and plant litter, but the carbon dioxide it releases via soil bacteria remains relatively stable. However there will be subtle changes in soil carbon levels if there are changes in fertiliser policy, stocking rate and productivity on farm, and in cropping management practices.

Measuring carbon

All New Zealand businesses, including farmers, are being encouraged to identify their business's carbon

Retaining grass on areas that won't be drilled or worked is one way of reducing your carbon footprint

footprint, and create an emissions inventory. There are a good range of carbon calculators available from a variety of New Zealand organisations and businesses for farmers to calculate the scope of their emissions. Visit MfE for further information on carbon calculators *http://www.mfe.govt.nz/withyou/do/footprint/index.html*

Carbon trading

The New Zealand Emissions Trading Scheme (ETS) is a way for New Zealand to meet its international obligations for climate change. It puts a price on greenhouse gases to provide an incentive to reduce emissions and encourage tree planting, and trades on these emissions using New Zealand Units (NZU). Landowners can earn carbon credits from eligible forests in return for storing carbon. Farmers with scrubland, regenerating bush, or exotic forest should be banking credits and liabilities, and on-selling via carbon traders to generate cashflow, or offset emissions from energy use. *www.climatechange.govt.nz/emissions-trading-scheme*

Carbon and the New Zealand deer farm

Farmers should consider the net mitigation benefit of all farm practices, looking at efficiency in production and how to retain carbon through vegetation capture to offset against carbon loss through resource use. Increasing soil carbon benefits soil quality and functioning as well as meeting requirements for reducing emissions.

Emissions reductions can be made by:

- Improvements in farming efficiency, in energy and in reproductive efficiencies.
- Increased tree planting.
- More efficient use of nitrogen fertiliser.
- Increased use of nitrification inhibitors.
- More effective management of animal waste.
- Using other mitigation technology as it is developed.

TBfree New Zealand

The TBfree New Zealand programme, managed by the Animal Health Board, works on three fronts:

Wildlife operations

To control the wildlife species mostly responsible for spreading the disease to deer and cattle

Disease control

To control the spread of the disease within deer and cattle herds

Movement control

To control the spread of the disease between herds

Contact us on **0800 482 4636** for more information on:

- The national TB strategy
- Your next scheduled TB test
- Eligibility for the closed deer herd testing policy
- Assessing your risk when buying deer
- Ordering an Animal Status Declaration book
- Wildlife operations for TB in your local area
- Updating your herd or contact details

Let's make TB history

For more information
0800 482 4636

www.tbfree.org.nz

8. BIODIVERSITY

Maintaining and enhancing biodiversity is a national issue. The New Zealand Biodiversity Strategy, 2000 *www.biodiversity.govt.nz* has identified that safeguarding the biodiversity of New Zealand's indigenous heritage will ensure native plants and animals and unique ecosystems continue to survive and flourish. All landowners have a significant responsibility and role to assist in this protection strategy and plan accordingly.

Councils have information on managing biodiversity. Several have contestable funds specifically for biodiversity projects. Councils are also responsible for the protection of Significant Natural Areas. The Department of Conservation protects indigenous flora and fauna by administering large areas of publicly owned parks and reserves. It and the Ministry for the Environment *www.mfe.govt.nz* can advise on biodiversity priorities and provide funding assistance for managing biodiversity on private land.

There is information in this section on protecting indigenous vegetation and wetlands on farm, including pest control, and on conservation areas.

(a) Managing biodiversity on farm

TOP TIP: Use your Land Environment Plan to show planning and progress.

Many farmers are already actively conserving biodiversity on their land and have fenced or protected remnant bush areas or wetlands. Managing deer farms with areas of biodiversity, particularly if they are Significant Natural Areas, has implications for farmers. Developing a Land Environment Plan (*refer Chapter 11, Managing your environment*) will help identify risk features, and set priorities for protection in line with the national biodiversity objectives. Permanently excluding stock is essential.

Recommendations:

- Note existing bush areas and natural water features and their condition and extent.
- Consider biodiversity values when prioritising protection for bush, streams and wetlands.
- Plan riparian fencing as a first step to maintaining and enhancing waterways.
- Fence bush areas to exclude deer and protect the native bush ecosystems.

Biodiversity includes a variety of habitats from wetlands to forest

- Consider extending and recreating local biodiversity ecosystems.
- If you don't know about the biodiversity values on your property contact your local council or DoC office.

Indigenous vegetation protection

All remnant unfenced native bush areas on intensive deer farms will eventually die out if deer are not excluded as there is limited or no seedling regeneration. When deer graze native areas, they eat out the plants they prefer, changing the balance of the plants present. Deer can also damage trees by browsing, stripping bark and rubbing. Many native trees are readily eaten by deer, including: lancewood *(Pseudopanax spp.),* Large-leaved Coprosma spp, five finger *(Schefflera digitata),* broadleaf *(Griselinia littoralis*), marbleleaf *(Carpodetus serratus)*, mahoe *(Melicytus ramiflorus*), kamahi *(Weinmannia racemosa)*, miro *(Prumnopitys ferruginea)* and Aspenium bulbiferum *(spleenwort)*. Deer can also eat out grassland plants such as: large leaved herbs like buttercups *(Ranunculus spp.)* and *Apiaceae* wild carrots *(Anistome spp).* and some grasses such as snowgrass *(Chionochloa flavescens)* and narrow-leaved tussock *(C. pallens).*

Wetlands protection

Protecting existing wetlands or constructing new wetlands is an effective way to treat water before it leaves the farm, as well as creating significant aquatic habitat for native species (*refer to Chapter 3 (d), Water for more detailed information on managing and constructing wetlands*).

Pest control

An on-going pest control and monitoring programme is an essential part of farming sustainably. Protection of bush areas can actually improve habitat for pests, which are then a considerable risk for deer farms. Possums and ferrets in native bush areas can act as vectors for

QEII covenants provide long term protection for areas of biodiversity

Protecting biodiversity can also provide opportunities to establish filtering areas to reduce nutrients going off farm

harbouring and spreading Bovine Tb, as can feral deer and pigs. Rats and stoats are a major threat to the biodiversity of indigenous bush as they kill native birds and eat their eggs. Not only that, pests can destroy farm shelter plantings.

Tb outbreaks and vector numbers are linked, so reducing pest numbers will be needed in endemic and fringe areas. A control programme should accurately identify both the problem and the control solutions, be they poisoning, trapping or shooting, and include a long-term cost/benefit with in-built safeguards on control success and cost variations. The Animal Health Board controls the National Pest Management Strategy (NPMS) and specific Tb Control Programmes and has regional operational plans which may affect your area. See www.ahb.org.nz for detailed information. Pest poisoning is governed by the Hazardous Substances and New Organisms Act, 1996 (HSNO) and administered by councils which can offer advice on control options. Farmers with areas of significant native bush with permanent fencing may be eligible for financial assistance.

(b) Conservation areas

TOP TIP: Seek advice from different environmental agencies.

Some areas of the farm may have significant natural features such as riparian areas, wetlands, indigenous bush and scrub areas, significant landscape features, and historic or archaeological sites.

The Resource Management Act (RMA) stipulates the protection of recognised Significant Natural Areas (SNA) on private and productive land. Regional councils have responsibility under the RMA to identify and assist in

Retaining mature native trees provides shade and shelter for all livestock as well as habitat for native birds and insects.

preserving these areas, and most have funds available to help with their protection and restoration, whether they are historic sites, native bush blocks, wetlands or stream margins and re-vegetation projects.

Significant areas can be protected by covenant to safeguard special features forever – refer to the Queen Elizabeth II Trust *www.openspace.co.nz* for more detailed information and assistance.

Several other organisations can help with conservation projects on private land, including the Department of Conservation, NZ Landcare Trust, Nature Heritage Fund, Royal Forest and Bird Protection Society, Fish and Game Council, NZ Forest Restoration Trust, and Ducks Unlimited (*refer Chapter 11, Links*).

Wetlands aid as sediment traps as well as providing habitat for wildlife

9. LANDUSE CAPABILITIES

Integrated land management considers the natural character and capability of the land and the most appropriate land use options, matching them area-by-area and site-by-site. A well integrated property, on variable topography and soil types, will probably be diversified with several integrated land uses. These typically involve deer, sheep, cattle, cropping and trees and sometimes conservation areas such as bush remnants, wetlands and waterways.

In this section, land use options are outlined, and information provided on Land Use Capability (LCU) mapping and Environmental Indicators. The benefits of integrated livestock management for deer farmers are also included.

(a) Risk identification and assessment

Most properties are a mosaic of land and soil types, each with a different capability to withstand intensive deer farming. Risks are apparent when the capability limits of the property are under stress or exceeded, needing appropriate management responses. A risk assessment helps to recognise the areas and natural features of the property most vulnerable to the effects of deer farming, and the conditions that may aggravate any problems. This can be developed by the farmer, by accessing help from experienced deer farmers via the NZDFA, or consulting the local council and land resource professionals.

Examples of risks areas may include:

- Natural features that are particularly vulnerable to damage, especially streams, ponds, wet areas, steep slopes, native bush, historic or archaeological features, and certain soil types such as shallow and volcanic soils and heavy soils with clay pans.
- Areas where damage is caused by deer unsettled by factors such as neighbouring activity from roads and houses, poor weather, lack of shelter and stock management factors including feeding, stocking density and social conditions.
- Weather conditions, especially heavy rain, which contribute to damage through loss of soil, nutrients and sediment to waterways.
- Farm layout, including fence and gate location and drainage areas, which affects how and where damage occurs.
- Water supply quality, which may be affected by nutrient leaching, faecal contamination or soil sedimentation.

(b) Environmental indicators

There are characteristic indicators that highlight farming practices not correctly integrated or best suited to the land's capability and will affect sustainability. Responding to these indicators and changing farming practice is an Integrated Land Management approach.

Negative effects include:

- Persistent fenceline erosion that recurs even after repairs.
- Persistent hillside erosion that does not easily grass over.
- Persistent erosion that is increasing in both depth and area.
- Dirty water flow in creeks when they are not in flood.
- Significant wetlands that are in a state of decline due to pressure from deer.
- Significant bush areas that are in a state of decline due to pressure from deer.
- Severe surface erosion or mass movement like slips, slumps and earthflows.

(c) Landuse options

The land owner's objective to farm deer has to be matched with the capability of the property, protection of its significant natural features and the farming regime and ratios of stock types best suited for it. Some deer farms surveyed have a large proportion of steep land that may not be suited for intensive deer farming. A dedicated deer unit that is intensively and sustainably farmed will tend to be on a land type that has the capability to withstand an intensive grazing regime, is relatively flat and sheltered with well drained soils.

Land use management options are to:

- Change stocking rate permanently or seasonally by changing the balance of deer classes such as young stock, breeding hinds, velvetting stags.
- Change proportions by integrating stock types and land uses to find the right sustainable balance for each capability zone. Manipulate deer, sheep and cattle ratio, and consider shelter, woodlots, riparian margins and indigenous bush areas.
- Change to occasional deer grazing of sensitive areas like steep slopes and fragile soil types when conditions are most favourable, such as during flush growth periods.
- Change to occasional grazing of areas surrounding waterways, preferably with sheep only, to maintain a

thick grass sword (if council rules allow).
- Convert particular issue areas into other land uses, integrating production trees with occasional grazing.
- Consider permanent retirement from grazing of some or all areas of sensitive or erosion prone land, by fencing off and integrating production trees.
- Develop a planned contingency for wet periods, with a runoff block or sacrifice areas that are well sheltered with good draining soils.
- Intensify land uses on the best soils (low risk zones) to reduce pressure on the sensitive areas (high risk zones).
- Avoid using stock types that play on bare soil on hillsides or rub bark off young trees.

(d) Integrated livestock management

Farming additional classes of stock is a very effective landcare tool to manage soil erosion, maintain pasture quality and seasonal balancing of feed demand and supply, and to spread income risks. A mixed livestock system adds some complexity, needing additional labour and a wider range of management skills. More information is needed on infection and parasite transmission. However, there are real advantages in sustainability and profitability to be gained from balanced management of other grazing livestock species within the deer farm area.

Benefits of a mixed livestock system:
- At risk, steep erosion prone areas are better managed by grazing stock like sheep.
- Fence pacing is reduced when mobs are separated by other stock grazing in paddocks between them.
- Vegetation is retained or recovered in areas worn by deer, as rotation time increases.
- Overall stocking rate of deer is reduced, providing for small mobs or more paddocks in the rotation. This has additional value during wet weather.
- Fertility is transferred by other classes of stock grazing areas that deer avoid, such as areas by the road.
- Pastures have lower parasite levels from alternate grazing of stock classes, meaning high performance at high stocking rates with less drench reliance.
- Pasture quality is fully utilised, such as beef cows using low quality feed in late autumn/early winter, while sheep utilise spring flush with lambs finished before they compete with hinds and fawns for quality feed.
- Feed pressure periods are reduced, with less stock requiring priority feed when nutritional demand is critical for profitability, such as breeding hinds and ewes.
- Weeds are better controlled, as sheep eat ragwort and winter cress that cause problems for deer-only systems and goats eat thistles, blackberry and brush weeds.
- Animal health outcomes can be enhanced, for example different stock classes have different risk profiles for Johne's disease.

When identifying Land Use capability identify risk areas that need to be retired to protect soils and water.

Electronic Identification

Gallagher Electronic Tag Readers, quick, simple and affordable. Call your local Gallagher stockist today for a great deal!

Electronic Tag Readers

www.gallagher.co

GALLAGHER™

10. CASE STUDIES

We have invited six New Zealand deer farmers to outline the environmental management practices they use on their own properties as practical examples of landcare in practice. The six represent a cross-section of farms across New Zealand which use a variety of sustainable land management strategies that suit their own environment and farm objectives. Our thanks to these farmers for sharing their stories:

Tim & Trish Smith	Mararoa Station, Te Anau
Brian & Jacqui Wellington	Te Awamutu Station, Te Awamutu
Richard & Sarah Burdon	Glen Dene Station, Lake Hawea
William Oliver	Motere, Lake Taupo
Paddy Boyd	Haldon Station, Lake Benmore
Sam and Mark Zino	Kanuka Downs & Flaxmere, North Canterbury

Case Study 1

Mararoa Station

Deer/Beef/Sheep

Landcorp Farming Ltd, Te Anau
Tim & Trish Smith

Dan Hall, Tim & Trish Smith at Mararoa Station.

Background Information

Mararoa Station is an extensive deer farming operation owned by Landcorp Farming, managed since 2007 by Tim and Trish Smith. Located in Southland in the Te Anau basin this 5,448 hectare property comprises rolling hill country within an altitude range of 340-620m. The effective farming area is 4,880ha of which 2,130ha is deer fenced. The balance of the land area is in riparian management areas, QE II covenants and wetlands.

The climate is challenging with warm dry summers and cold wet winters. Snow is common with two to three falls each year, causing problems for movement of stock and staff. Rainfall ranges from 800-1200mm each year. The Station is prone to flooding in low lying areas.

Overall Mararoa Station winters approximately 42,585su made up of approximately 48% sheep, 32% deer, 20% cattle.

Livestock Total for Mararoa Station

Stock	Numbers	Stock units[1]
Deer MA Hinds	3,767	7,534
R1/ Hinds	592	1,184
Weaners	2,503	4,505
Stags	140	352
Total	**7,002**	**13,575**
Breeding Ewes	16,500	16,500
Hoggets	4,900	3,920
Total	**21,400**	**20,420**
Breeding Cows	1,000	7,000
R1 Calves	300	1,350
Bulls	40	240
Total	**1,340**	**8,590**

Deer Enterprise

The current deer unit is breeding and finishing 2,500 deer annually, transferring 800 weaners to Lynmore, another local Landcorp property. Fawning takes place in native tussock blocks. The fawning percentage, to weaning, is running at 87%. Management is working to improve this rate. Mararoa Station annually produces 3,500 tonnes of pit silage and approximately 1,000 big bales of hay on farm, and grows 300 ha of winter crop. It imports from off farm approximately 70-100 tonnes of grain. The Station is seeking to provide improved feed balance to stock, which will include the use of lucerne. Growth rates are carefully monitored to meet the Landcorp contract obligations under which all deer are sold. Future planning includes a move toward finishing deer on the property to simplify deer management, including risks around transportation to other properties. A killing weight target of 95-100kg has been set.

There is a process of continuous development around animal health protocols. Good animal management techniques are in place with all animals being closely monitored. Overall health of the deer is very good, with Johnes disease only resulting in minimal losses this year. TB status is C10.

Cover Summary

The property provides a good range of cover including cultivated paddocks, good oversown and topdressed hill country and native tussock grassland. There are limited areas of steep gullies and faces, which are either scrub or bush covered. Many of these areas are protected by QE II covenant.

Soils

Being in the Te Anau basin soils are generally light glacial moraine soils. They are generally free draining and require a lot of maintenance fertiliser. Land to be cultivated is drained if required in spring before being put into crop.

[1] Stock unit figures from Lincoln University Farm Technical Manual

The Thomas Burn, a tributary to the Mararoa River is completely fenced from stock and provides an important means of protecting water quality.

Fertiliser
Mararoa Station has GPS-identified soil monitor lines which are monitored every year, spread over the whole property. This allows them to monitor trends over time. A nutrient management plan is in place aimed at maintaining nutrient levels. This also includes applying selenium aerially to the whole property, and from 2011 introducing molybdenum for improved clover growth. Management seeks to maintain Olsen P at 18-19 as an optimum but generally over 16 is acceptable.

Water
The property has several natural waterways. The Mararoa River runs adjacent to the south east boundary of the property. The Dale Creek tributary runs through the property north to south. The Thomas Burn also runs from approximately north to the south (parallel with Dale Creek) then heads south westerly parallel to the boundary exiting at the southern boundary. On the western part of the property there are several small water bodies and an area of wetland which are part of the Lagoon Creek catchment.

Environmental Considerations and Challenges

Water Management
Mararoa Station is well serviced with water. This has benefits for stock but provides environmental challenges, particularly with deer. The Station has invested environmental capital expenditure in riparian management including fencing, planting, and waterway management. Numerous wetlands and small water bodies occur across the property, which require careful management to maintain and enhance water quality. This is achieved through creating environmental protection covenants (QEII covenants), fencing, riparian planting and stock management. Extensive riparian planting and fencing has taken place, particularly alongside the Thomas Burn which has been effectively fenced out of the property. Riparian planting has included native plants such as flax. Where Douglas Fir and Radiata Pine are planted, a management plan is in place to control any spread of wilding trees.

Tim Smith in the Thomas Burn Covenant

The pelton wheel and pump are part of the 120km water system that reticulates throughout the station.

A key project to assist with waterway quality has been creating a reticulated stock water supply to keep stock away from waterways. As noted this is important when farming deer. There is no irrigation on the property.

Tim and Trish's commitment to environmental sustainability is evidenced by their receipt of the Southland BFEA (Ballance Farm Environment Awards) for water quality 2010.

Erosion
Heavy rain can cause erosion damage on steep faces. It can also get very dry and there can be wind erosion. There has been extensive shelter belt planting to mitigate and reduce the effects of wind erosion. These shelter belts will attract carbon credits although this is a secondary benefit, rather than the primary objective. Retaining native scrub and trees in gullies and their protection through (QEII) covenants also prevents slipping due to rain.

Sustainability Challenges
Management seeks to utilise the natural property attributes efficiently and therefore sustainably. This allows planning for increased deer numbers, with emphasis on maintaining good genetics and improving the efficiency of feed inputs, resulting in good body weight gain. Improved use of feed inputs makes better use of feed in the system and therefore the natural property attributes.

Environmental Capital Expenditure
Environmental expenditure on riparian fencing over the past seven years amounts to approximately $450,000, or $1.50su per year. There is an ongoing yearly capital investment to improve sustainability and enhance environmental outcomes.

Tim would like to see environmental work and expenditure formalised in its planning and execution and the separate reporting of costs. Currently environmental capital expenditure is recorded in standard budget ledger codes and not noted separately or accurately identified. This could be linked to environmental outcomes achieved e.g. areas (ha) fenced, areas covenanted, areas planted, water quality rating, fish species found.

In particular, production weight gain as a result of feed efficiency is undergoing continual development and planning to achieve successful and sustainable outcomes in the deer unit.

Planned future or current development programmes:
It is planned to add and or replace a further 30km of shelter belts over the next three to four years. More waterway fencing, including Dale Creek, is scheduled to take place, which has the numerous purposes of improving land management and enhancing water quality while at the same time providing for better stock management, resulting in mitigation of stock losses to fresh's and floods. As part of a further development programme there is continued involvement with other parties in production trial works.

Conservation and Environmental Issues
Although there are no immediate environmental concerns, environmental conditions are nevertheless constantly monitored, particularly water management and wind erosion.

It is noted that re-alignment [i.e. straightening] of some waterways and clearing of vegetation, off the property could result in scouring of waterways on Mararoa Station itself due to increased water velocity.

Issues for the future for Landcorp Farming Ltd in Te Anau would include securing reliable and sustainable long term water supplies and water rights. This could

Hinds and fawns thrive in tussock country

Developed flats with hind fawning blocks provide good opportunities for deer management

be by using on farm storage areas to sustainably harvest water in times of higher supply for use during dry periods.

Production Planning
Production targets and Key Performance Indicator's [KPI's] are set and reviewed annually and include stock mix, weaning rates and body weights. Tim and Trish set some personal KPI's around farm management. There is a five year plan currently in place but this is being revised to a three year plan to provide more timely and realistic reviews.

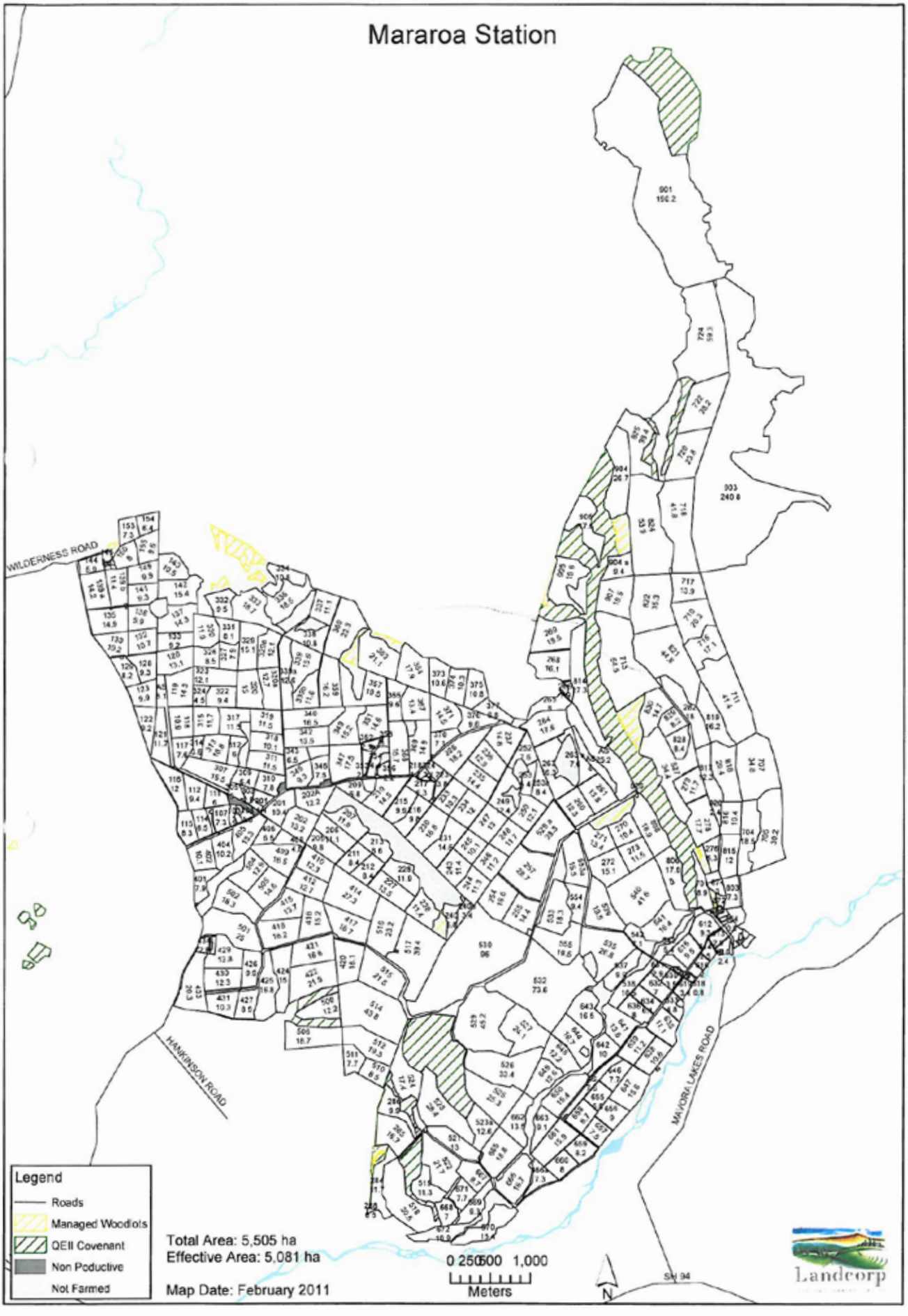
Community Involvement
Mararoa Station places high reliance on the use of local knowledge for its development programmes. It considers interaction with local farmers, key agencies and the community is essential to achieving ongoing success to the running of an environmentally and financially sustainable farming operation. It is some of these other activities that assist to attract and retain staff. Mararoa also works actively with the community by providing appropriate access to the public for recreational activities such as hunting, fishing and mountain biking.

The Smith's efforts have been recognised through the Deer Industry Environmental Award Elworthy Environmental Award 2010, the Ballance Farm Environmental Awards Massey University Discovery Award for Innovation 2010, and the Southland BFEA Water Quality Award.

Vision for the future
Tim and Trish's vision is to continue to manage the property efficiently and therefore sustainably. This will be achieved through the use of continuous productivity improvements, including recognising and managing the input and environmental costs of production to ensure optimum results. They are looking to ensure that environmental capital improvements are recognised and recorded separately and maintained under the farm budget planning. Landcorp is a supportive organisation enabling them to formulate and express ideas to seek or provide alternative but effective and sustainable outcomes to deer industry challenges. This can be through traditional and non-traditional farming methods.

Succession for Tim and Trish is the handover of this Landcorp property, as a successful and environmentally sustainable business, to a motivated and ambitious manager attracted by the quality and scope of the Mararoa business model. They have a desire to see their efforts recognised by way of a noted, attractive and high performing farm.

Conclusion
The Smiths' believe it is important to reflect on what has been achieved, how it was achieved and where it is going. Along the way it is important to them to keep lines of communication open by listening to others and imparting their own knowledge. It is important to them to formalise, protect as required and improve on what has been achieved over the past seven years. This includes the provision of an efficient, economic and environmentally sustainable property that Tim and Trish, the immediate staff and the wider Landcorp business can be proud of.


Mararoa Station
WILDERNESS ROAD
HANKINSON ROAD
MAVORA LAKES ROAD
Legend
Roads
Managed Woodlots
QEII Covenant
Non Poductive
Not Farmed
Total Area: 5,505 ha
Effective Area: 5,081 ha
Map Date: February 2011
0 250 500 1,000
Meters
N
SH 94
Landcorp

Case Study 2

Te Awamutu Station

Deer/Beef/Sheep

Deer Industry Focus Farm Project Farm 2011-2013
Brian & Jacqui Wellington

Background Information

Te Awamutu Station is a Deer Industry Focus Farm (2011-2013) located approximately 17km south east of the Te Awamutu township, in the Waikato region. Currently farmed by Brian & Jacqui Wellington, it has been in the Wellington family for the past 35 years. The property is 620 hectares with an effective farming area of 600ha, comprising rolling hill country. It has an altitude range of 150-200m. Annual rainfall is 1,500mm.

Te Awamutu Station winters approximately 10,600su comprised of primarily deer, with cattle and sheep making up a smaller component of the overall farming operation.

Livestock Total for Te Awamutu Station

Stock	Numbers	Stock units[2]
Deer MA Hinds	1,276	2,552
R1/R2 Hinds	1,529	3,058
Stags	497	1,044
R2 Stags	246	517
Total	**3,548**	**7,171**
Breeding Ewes	460	460
Hoggets	210	147
Wethers	50	35
Rams	7	5
Total	**727**	**647**
Breeding Cows		
R2 Heifers	480	2,160
R1 Heifers	140	630
Bulls		
Total	**620**	**2,790**

Deer Enterprise

The current deer business is breeding, finishing and velveting a total of 3,548 deer. The fawning percentage is running at 88% for mixed aged hinds, with first year fawners performing at 75%. The deer farming enterprise initially started as a velvet production unit and is currently producing 3,000kg/annum. Deer production now is represented by two thirds venison, producing 50% of the total farm income.

Jacqui and Brian Wellington run Te Awamutu Station south east of Te Kuiti.

The deer run over the majority of the property, with hinds wintering in a pine plantation in the south eastern corner of the property.

Supplementary feed is sometimes used to improve weaner weights or to compensate for inadequate grass growth. This amounts to 10 tonne of wholegrain maize and 50 tonne of palm kernel expeller per year.

The majority of the property is deer fenced. This is constantly reviewed as the positive effects of pasture management allow changes to the infrastructure. Riparian management is ongoing in the form of fencing and riparian planting, which also assists with stock control.

The Wellingtons' currently winter 1,000 hinds in 12ha of pine plantation in two groups and feeding systems. They are fed off two self-feeding silage stacks. Although this is beneficial for the pasture management programme and feed efficiencies, it requires close monitoring of mob behaviour and water quality. A sediment pond was constructed to assist with water quality and further measures under discussion will ensure the benefits of this wintering scheme are captured without adverse costs or environmental damage. The key management advantages are the ability to save pasture for weaner growth and production over winter and into early spring, which reduces labour, mechanical costs and pasture damage associated with feeding out in traditional ways, and the enhanced adult stock health and well-being in an ad lib situation protected by trees.

Animal Health systems

The Station has systems for monitoring animal health. A continuous review records the methods used and

[2] Stock unit figures from Lincoln University Farm Technical Manual

The property is a mix of rolling hill country with willow and poplars providing shelter on the river flats.

results obtained to maintain positive good health outcomes within the herd. A control programme is in place to manage and reduce a facial eczema issue. TB status is C10. Drench resistance is monitored to develop an optimal parasite control programme.

Cover summary
A pasture management programme is in place with 170ha in recent pasture and the balance in good established pasture. The Station is primarily north facing comprising predominantly warm, gentle rolling country. The south western boundary is a mix of rolling to steep hill country with some gullies.

Soils
Soil types on Te Awamutu Station are Mararoa Ash, with heavy clay soil in places. In general the soils are good and there is reasonable rainfall throughout the property.

Fertiliser
The fertiliser programme is monitored for potential environmental effects. This includes identifying the level of leaching and adjusting application rates to ensure efficient use of fertiliser and environmental outcomes. Soil tests are carried out every second year with Ballance, and a nutrient budget is carried out at the same time. The majority of the property receives 350kg/year of Superten, with an area of approximately 140ha silage country receiving 370kg of Superten in addition to 130kg Muriate of Potash annually.

Water
The southern part of the property is in the Punui River catchment and the northern half is in the Owairaka Stream catchment. Water on the property is sourced from springs on the hillsides, with the springs close to the outer boundaries fenced off to prevent deer access. There is no significant risk of flooding on the property.

Environmental Considerations and Challenges

Water Management
Te Awamutu Station has a reliable water supply from springs on the property which benefits stock but provides environmental challenges, particularly with deer.

Water monitoring is carried out at the major catchment outflow from the farm. This catchment includes the

stream flowing out of the pine plantation hinds where are wintered. This is being carefully monitored to manage its potential impact on water runoff and water quality. A small sediment pond has been built as part of ongoing development and to provide some mitigation. Initial testing shows this is having some benefit in preventing sediment entering natural waterways, but these tests also indicate the need for additional mitigation. Monitoring indicates significant loss of phosphorus and contamination with faecal coliforms in water outflows from the wintering area, and also from other stream outflows. Water flow and water quality will continue to be monitored and discussions around future planning will be held with the Waikato Regional Council, especially around developing specific catchment protection plans.

Riparian Planting
Current and future programmes include riparian management in the form of fencing and riparian planting. Approximately 6ha of riparian area has been planted, mainly with native species but some exotic species are also included.

Forms of Shelter
The property has a wide range of shelter for the deer to use. As noted 1000 hinds are being wintered in a pine plantation. In addition there are shelter belts and other forms of natural or topographical shelter. Native bush is fenced off but can provide wind break shelter. There is also some scrub in paddocks.

Erosion
Fence lines have been placed to assist with reducing fence line erosion, limiting play areas and discouraging pacing. Careful pasture management and planting assists with reducing soil erosion.

Sustainability Challenges
Continuing to develop the business, achieve efficiencies and maintaining and improving water quality through good management are seen as the main sustainability challenges. Creating a management structure that recognises water quality and all other environmental challenges while maintaining production increases is considered a high priority.

Environmental Capital Expenditure
Expenditure is on riparian fencing, sediment traps and continuous environmental monitoring.

Planned future or current development programmes:
An objective of the "Making the DIFFerence project" (Deer Industry Focus Farm) is to work toward best practice environmental management. One of the means to achieve this is by working alongside the Waikato Regional Council to ensure non-contamination of natural waterways from water leaving the property.

Conservation and Environmental Issues
Wintering hinds in the trees removes them from the pasture throughout the winter months, providing pasture protection and increased efficiency of

Hinds are wintered in a pine plantation and have access to the self feed silage pit.

A sediment pond within the forest traps any runoff from the wintering system.

production of dry matter. Environmental management issues arising from this are closely monitored and appropriate mitigation measures are undertaken. while future improvements are also being investigated.

Brian and Jacqui feel that they have achieved the right balance of stock on the property and it is being farmed to its strengths.

Planning
All aspects of the farming enterprise are planned. Collaboration with the Waikato Regional Council ensures best use of resources while maintaining ongoing environmental planning and management. Production planning is set, reviewed and discussed regularly. Improvements around body weight gain, feed efficiencies and genetics are all carefully monitored, discussed and planned.

Production
Grass production on the farm is very good. The level of fertiliser use is being closely monitored with a plan to maintain or increase grass performance to reduce supplementary feed requirements.

Overall performance improvement is a key objective for the whole property. The emphasis is on key aspects of the deer enterprise improving both viability and productivity across increased deer numbers. Improved stock weight gain and higher weaning percentages are important business objectives.

Community Involvement
As a Deer Industry Focus Farm, the Station's strengths are reflected in its ability to perform well in all aspects of its farming enterprise. Maintaining continued interaction between the deer industry, other farmers and other agencies is proof of the Station's ability to engage constructively and critically and deliver successful outcomes. Working closely with the Waikato Regional Council, it strives to ensure environmental issues are addressed.

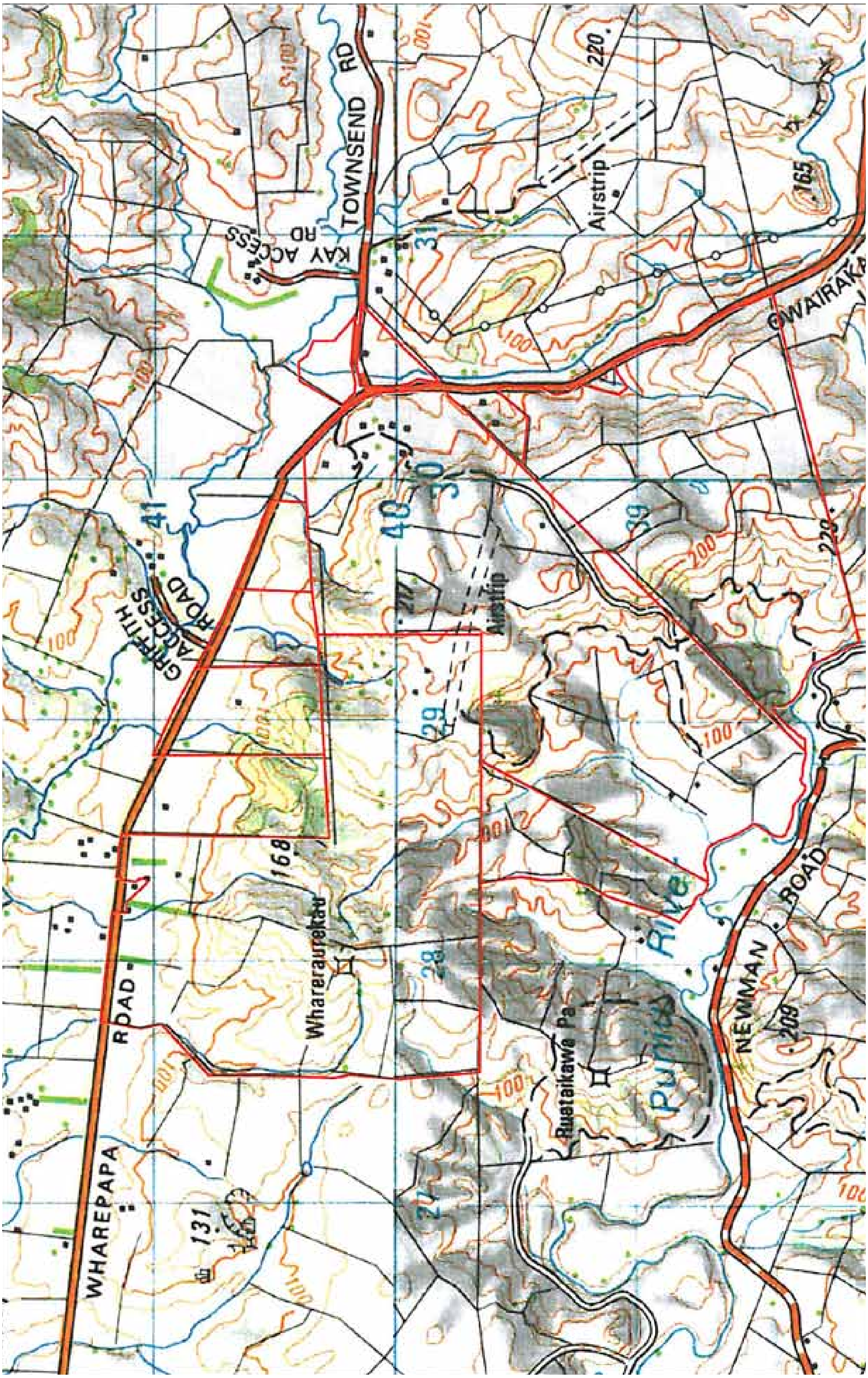
Vision for the future
The Wellingtons' are working towards establishing a successful and leading deer farm enterprise which embraces positive production, financial and environmental outcomes.

Conclusion
The successful management of Te Awamutu Station can be attributed to a team approach within the family and an ability to interpret the workings of the Station as one unit. Achieving the correct balance of stock on the property has been key and contributes to maintaining a

Riparian areas have been fenced and planted mainly in native species.

The deer shed effluent pond is fenced off from stock.

high level of sustainability**.** Management maintain high expectations of standards set from both a personal level and as a result of being a Focus Farm.


TOWNSEND RD
KAY ACCESS RD
Airstrip
OWAIRAKA
GRIFFITH ACCESS ROAD
WHAREPAPA ROAD
NEWMAN ROAD
Puniu River
Ruataikawa Pa
Whareraurekau
220
165
168
131
200
100

Case Study 3

Glen Dene Station

Deer/Beef/Sheep

Lake Hawea
Richard & Sarah Burdon

Background Information

Glen Dene Station is home to Richard and Sarah Burdon. This 5,974ha freehold high country station is situated between Lakes Hawea and Wanaka, occupying the narrow ridge system between the two lakes, with Lake Wanaka on the western boundary and Lake Hawea forming the eastern boundary. State Highway 6, the Wanaka to Haast Road, runs through Glen Dene along the shores of Lake Hawea. The property ranges in altitude from 280m asl on Lake Wanaka to 1,386m at the top of Isthmus Peak which overlooks "The Neck". A further 1,400ha is leased and run in conjunction with the farming business. The homestead is on the western shore of Lake Hawea five kilometres north of the Lake Hawea township. Richard and Sarah have managed Glen Dene Station since 2001.

The deer farm is run as two units on Glen Dene Station. Glen Dene Deer has 60ha, established in 1980 on the south east faces between State Highway 6 and Lake Hawea immediately north of the homestead. Dinner Flat Deer was established in 1996 and run in conjunction with two major hill blocks established in 2000. Dinner Flat and the hill blocks lie to the north of Glen Dene Deer on the east facing slopes above Lake Hawea. This unit is 772ha, making the total deer farming area 832ha.

Owners of Glen Dene Station, Richard and Sarah Burdon with their children, Georgie and Charlie.

Glen Dene is typical of the Lakes/Central Otago region, experiencing warm dry summers with strong northwest winds and long cold winters. There can be intermittent snow on the lower parts of the property, and snow can lie for up to four months at higher altitudes. The property can also experience extended dry periods, but typically annual rainfall at the homestead is about 950mm. The Wanaka faces receive higher rainfall due to the west coast weather patterns but are also exposed to the strong northwest weather patterns typical of the area.

The total number of deer run over the whole deer enterprise is approximately 3,737 out of 11,171 total Glen Dene su. The property also runs approximately 5,077su sheep and 2,357su cattle.

Livestock Total for Glen Dene Station

Stock	Numbers	Stock units[3]
Deer MA Hinds	745	1,490
R1/R2 Hinds	402	804
Stags	297	624
R1/R2 Stags	390	819
Total	**1,834**	**3,737**
Breeding Ewes	4,105	4,105
Hoggets	1,217	852
Rams	120	120
Total	**5,442**	**5,077**
Breeding Cows	264	1584
R2 Heifers	52	260
R1 Heifers	68	340
Heifer Calves	45	45
Bulls	16	128
Total	**445**	**2,357**

Deer Enterprise

The deer operation covers breeding, finishing, velvet and trophy stags. Weaning occurs in late May when the stags are also separated from the mob. The weaners are sent to lease blocks for finishing, the Ry2 hinds return as in calf hinds and the Ry2 stags are returned to the velvet herd. In addition 60-70 MA stags are grown out each year as trophy animals.

Trophy stags receive four tonnes of deer nuts as supplementary feed. Overall 50-80 tonnes of barley is purchased per year with 100 large bales of lucerne hay imported from the lease blocks.

[3] Stock unit figures from Lincoln University Farm Technical Manual

Glen Dene includes steep faces covered in native beech forest and bracken on mountains that separate Lakes Wanaka and Hawea.

The average weight of the mixed aged hinds is 105kg with the Ry2 hinds reaching 89-92kg. The Station aims to sell approximately 600 deer each year, with an average weight of 58kg for weaner fawns and 54kg carcass weight for Ry2 animals. Fawning percentage on the Station is 87%, with the aim to increase this to 95%. On the velveting side of the deer operation Ry1 stags produce 0.3kg, Ry2 stags 1.4kg and MA stags 4.0 kgs of velvet per year, while surplus velvet stags are bred to achieve a killing weight of 200kg plus.

Approximately 850 hinds are run over 600ha. On target, paddock stock can run at 6su/ha, but on the hill country this falls to 3su/ha. The hind country is also utilised for stocks units such as sheep and cattle at some times of the year.

Animal Health systems plans

Glen Dene Station's management plan includes a comprehensive animal welfare programme. This involves weekly visual monitoring of deer health, all general vaccinations and standard testing and recording of results. Johnes disease is tested for and is recorded. Leptospirosis has been identified as a risk amongst the herd and vaccination is given at weaning. Vaccinating weaners for Yersiniosis is not deemed necessary during post rut weaning. All Ry2 are tested before being included into the adult herd and the TB status is C10.

Cover Summary & Land Use

The property has a good balance of cultivated paddocks, some highly developed rolling country and a large proportion of steep, undeveloped, predominantly native country.

The Glen Dene deer unit is approximately 60ha and subdivided into eight paddocks, while Dinner Flat deer unit comprises approximately 112ha subdivided into paddocks on the eastern faces with a further 660ha subdivided into two large native tussock blocks. Of the 832ha of deer farm, 172ha is cultivated and sown in winter crop or pasture, with the rest mainly oversown and topdressed hill country.

Both deer units occupy the most modified and developed area on the property with extensive pasture and bracken fern. The Glen Dene unit is deer fenced with shelter belts and planting associated with the farm buildings.

Forms of shelter

A variety of shelter is available to stock. On the steeper hill country there is considerable natural or

Native beech forest is fenced off from stoch anf has a conservation covenant and provides good shelter

topographical shelter as well as extensive native scrub belts. The lower rolling hill country has both natural shelter and shelter belts.

Soils
Soil types found on Glen Dene Station are Dunstan Steepland, Arrow Steepland, Maude Hill and Maude. These soils are all free draining and generally respond moderately well to topdressing.

Fertiliser
Fertiliser is applied annually in the autumn in the form of 200kg of 20% Sulphur Super to the cultivated paddocks by truck. Lime is applied to all new cultivation and development work with the hill country receiving 125kg on a two yearly rotation. Winter feed paddocks receive 250kg of DAP. A lucerne fertiliser mix is used on lucerne paddocks. Annual soils tests are performed which are recorded along with historical data from 1980. A nutrient management plan is in place.

Water
There are numerous small streams running all year round across the property, providing good stock water and irrigation supply throughout the year. Numerous water take consents are held for the property including water takes for irrigation from Dinner Creek, Ewe Creek and Stewart Creek. The property falls within the Upper Clutha catchment.

Environmental Considerations and Challenges

Water management
Glen Dene works closely with the Otago Regional Council to monitor water quality. Wherever possible it aims to de-stock water courses, with a long term plan to monitor water quality and implement more stock water systems. All irrigation on the property, approximately 50ha, is by K-line.

The National Standards affect Glen Dene more than the average irrigator because of the use of small mountain streams as water takes to supply the gravity irrigation systems.
Richard notes that it is important when obtaining consents that consent conditions are realistic and practical and therefore can be complied with in a practical and efficient manner. Historically conditions have at times been impractical and unworkable.

Lake Hawea is a controlled lake operated by Contact Energy for power generation. There is an ongoing risk of lake shore erosion during times of high lake

levels, which can cause instability along the lake shore boundaries.

Visual Considerations
Given the Station's location, visual and landscape management is important. Large parts of the Station are visible from both Lakes Wanaka and Hawea, and the main tourist route from the West Coast to Central Otago (State Highway 6) runs through the Station for many kilometres.

Riparian planting
Most of the Lake Hawea margin has been fenced off, or access is not available to stock due to topography. The Craigburn Stream is unfenced but there is very low grazing pressure in this location. It would be impractical to fence off all streams, but with low stock pressure and no winter pad feeding this can be sustainably managed. Beech forest margins, streams and waterways have been fenced off where stock grazing is more intensive.

Erosion
Aside from the potential for lake shore erosion on Lake Hawea, erosion risk from farming activity is not an issue on Glen Dene. The small amount of erosion that is present is largely naturally occurring as a consequence of topography and underlying geology.

Velvet and trophy stags provide options for animal management.

Fencing
Careful thought is given to paddock and block design to maximise effectiveness and mitigate potential risks from poor fence placement. Achieving a balance of good contour, water and shelter is essential. Fencing is monitored and altered if necessary to mitigate environmental impact. Size of blocks is not necessarily the issue, it is more to achieve the balance and type of country.

Large parts of the station are visible from Lake Hawea and the Hawea –Haast Road.

Deer thrive in the Central Otago climate and enjoy a mix of developed pastures and larger native oversown blocks.

Sustainability Challenges
Maintaining an economically viable and competitive business while achieving personal environmental goals and compliance with district and regional council regulatory controls can be challenging.

Planned Environmental Capital Expenditure
Ongoing development includes additional fencing around wetlands, forests and other areas. Further planting of native trees in the form of shelter belts is also planned.

Conservation and environmental issues
The community, including Glen Dene, has strong feelings towards protecting the landscape's flora and fauna. One of the higher profile issues is bracken fern control, which has to be controlled to sustainably farm. Glen Dene has bracken fern management challenges due to the climate. It is currently sprayed and/or burned, but alternative means of control are being investigated, not just on Glen Dene but within the wider Upper Clutha Area.

Trophy stags are an important element of the deer enterprise.

Walking tracks within beech forests provide opportunities for conservation, recreation and farming to interact successfully.

Community Involvement

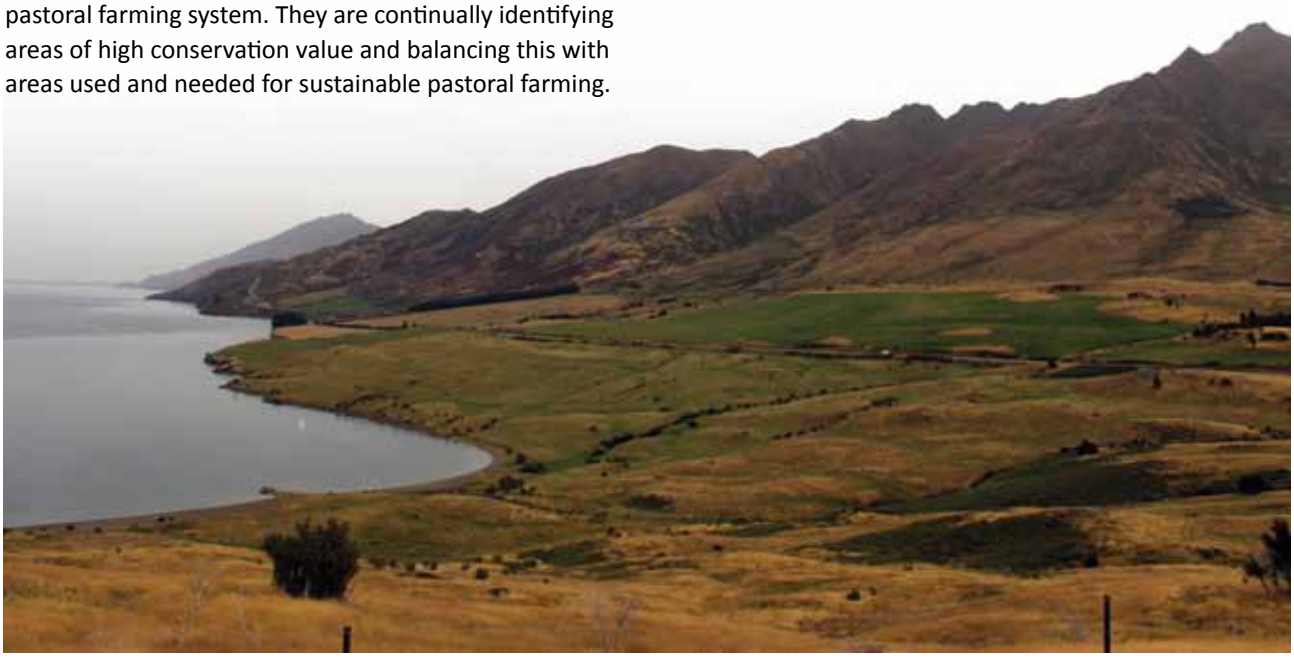
Richard is a member of the New Zealand Deer Farmers Association (NZDFA) and Otago Branch DFA chairman (2011), along with being involved in Focus Farms, Landcare Group (Wanaka) and Federated Farmers. He works closely with the Department of Conservation and Regional and District Councils in relation to permits and consents that have or are to be granted. Richard and Sarah's two children attend the local school and the family is involved in community and sports activities.

Vision for the Future

Richard and Sarah are aiming for a truly integrated pastoral farming system. They are continually identifying areas of high conservation value and balancing this with areas used and needed for sustainable pastoral farming.

Conclusion

Being located in an area of acknowledged natural beauty, it is inevitable that managing the farming of Glen Dene goes hand in hand with exercising strong environmental values. For Glen Dene it is important that the farm continues to implement production efficiencies, sensitive development and improve and sustain returns. With support, encouragement and financial stability Glen Dene Station will be in a position of re-investing in its success by continued careful management of its major assets, the land and the environment it farms in.



Developed pastures that border Lake Hawea are irrigated with K-line systems.


MEADS
ROAD
Lake
Hawea
HAWEA
ROAD
anaka
Kidds Bush
Dinner Creek

Case Study 4

Motere Land Limited

Deer/Beef/Sheep

Te Kuiti, Lake Taupo
William, Karen & Mark Oliver

Background Information

Motere Land Ltd is located on the western shores of Lake Taupo. It is a freehold property, farmed for the past 4 years by William, Karen and Mark Oliver. Motere is one of seven farming properties owned and managed by the Oliver Family Trust. It is bordered by the Pureora State Forest Park on the west and Lake Taupo on the east. The Station comprises 3,640 ha with 2,600 of this effective pasture. An area of 820ha is covenanted by Lake Taupo Protection Trust which places farming restrictions on the land. These 820ha form part of a 50/50 joint venture carbon production forest. The Station is in the Taupo District Council district and the Waikato Region. Currently the property is running between 31,000-33,000su.

The Station is in an altitude range of 550m-670m (asl), with rainfall measuring 2100mm on the back higher altitude western country to 1300mm on the lower country. The property experiences very cold, wet, damp winters.

Livestock Total for Motere Land Ltd

Stock	Numbers	Stock units[4]
Deer MA Hinds	2,400	4,800
R1/R2 Hinds	2,100	3,780
R1/R2 Stags	1,400	2,520
Stags	260	546
Total	**6,160**	**11,646**
Breeding Ewes	7,000	7,000
Hoggets	3,500	2,450
Wethers	1,700	1,190
Rams	70	70
Total	**12,270**	**10,710**
Breeding Cows	470	2,820
R1/R2 Heifers	1,030	4,635
Calves	280	560
R2 Steers	260	1,300
Bulls	22	121
Total	**2,062**	**9,436**
Total	**20,492**	**31,792**

[4] Stock unit figures from Lincoln University Farm Technical Manual

Brothers Mark & William Oliver run Waerenga Station.

Deer Enterprise

The deer on Motere are a third of the overall farming business, with sheep and beef accounting for approximately one third each also. This stock mix fluctuates depending on market demands. The Olivers' are satisfied that the current mix of stock classes in equal third parts complements the running of the property. Deer numbers have risen over the past few years with Motere currently running 6,160 animals (see table). Fawning percentages are 93% to the stag for mixed age hinds, which is outstanding given the altitude and climate.

Selling Regime

Weaner deer are sold in late October through to February achieving an average carcass weight of 55-56kgs. The objective is that 95% of weaner deer and stags are sold by the end of February. Smaller weight hinds are sold with the early spring market in September.

Animal Health

The monthly monitoring of all stock provides a good opportunity to assess animal health for the usual animal health issues, and condition and stock are regularly checked for early identification of any additional issues. TB status is C4.

Feed

Winter feed crops include swedes, kale, plantain and rape with between 200ha and 300ha grown annually. Approximately 1,000 bales of baleage is used as supplementary feed annually across the Station. Feed management is flexible and varies according to needs and demand.

Cover Summary

Of the developed pasture 700ha is flat to rolling hill country with 1,700ha rolling to steeper hill country and 200ha being steeper hill country. The balance of

Waerenga Station is situated in the Lake Taupo Protection Zone, placing farming restrictions on the land.

Winter feed crops include swedes, kale, plantain and rape.

the property is in wetlands, steep gullies and fenced off watercourses. An ongoing pasture development programme is in place with 150ha of new pasture being developed currently and a further 300-400ha of future development planned. The property has existing brown top pastures which are gradually being removed by cropping over 3-4 years, then introducing new pasture types.

Soils & Erosion
Soils are predominantly pumice based ash soils. These soils are typically sandy or gravely and are free draining. These are often trace element deficient in copper and cobalt for example. These soils have low strength when disturbed but are generally resistant to livestock hoof damage.

Waterways are 95% fenced with 100% of waterways programmed to be completed in three to four year's time. Riparian vegetation is keeping stream banks stable, and trees have been planted on erosion prone areas to improve land stability wherever possible. Good stock management assists with erosion management.

Fertiliser
Super phosphate at 250kgs/ha is applied annually to pasture, and DAP is used on crops. These are generally applied in spring with the goal being to apply 80% by truck and the remaining 20% by plane, depending on topography. The pH is in the 5.4-5.8 range and P levels are at 12/14–35. All land has previously been monitored when being cropped during the pasture development programme. The Station is aiming for P levels in the range of 30-35 and pH levels of 5.8-5.9.

Water
The stock water supply is from the Taupo District Council District Scheme. This is gravity reticulated with the exception of approximately 140ha which is supplied by pump. No water consents are held. Water quality is managed through fencing, suspension dams/ traps, good fertiliser use and sound and sensitive stock management.

There is no irrigation on the property.

Environmental Considerations and Challenges
Motere Land Ltd is in the Lake Taupo catchment area which has been subject to RMA controls on farming activities (Waikato Regional Council Variation 5) to mitigate nitrogen leaching into the Lake. Mitigation is covered in the form of monitoring by the Waikato Regional Council and on-farm by the increasing the number of deer on the property to produce a lower nitrate leaching footprint than breeding cows.

The Station is also surrounded by Department of Conservation and Maori Trust Land plus waterways which all influence the farming operation, and any potential cross boundary issues are carefully considered. The Station works closely with neighbours to ensure all interests are protected.

Environmental Capital Expenditure
Capital expenditure on environmental management initiatives has not been accounted for separately in financial records, but annually 1.5% of budgeted gross profit is allocated to environmental capital control work. The property is ongoing, and covers stream protection

Waterways are fenced from winter crop paddocks providing a buffer for filtering any overland flow of sediments in wet conditions.

Wetlands are fenced and provide a valuable filtering system.

Riparian areas are fenced and provide natural shelter.

work, including fencing and planting of areas prone to erosion.

Planned future or current development programmes
The pasture replacement and management programme in place enables further development of pasture suited to deer. The Station aims to finish all deer on newly developed pastures. There is an ongoing cropping, fencing and infrastructure development programme taking place over the whole property which is constantly reviewed.

Sustainability Challenges
Climate has a big impact on the farming operation. Winters are very cold, lengthy and wet which is hard on stock. Stock are monitored to ensure they receive a balanced diet with added nutritional requirements. The pasture replacement programme will eventually improve pasture quality and yield and, with the rotational cropping process, assist in dietary balance.

The Lake Taupo catchment controls places requirements on farming activities that limit development. However, the sustainability of the Station as a business is strongly linked to the environment it operates in. The challenge for Motere is to meet the environmental challenges in full and any associated costs from revenue while maintaining financial stability.

Fencing and Paddock Design
Two thirds of the property is deer fenced now with planned spending up to $100,000pa on new fencing. Replacement fencing and maintenance is completed for waterway and native bush protection and Department of Conservation boundaries, following Waikato Regional Council advice. Deer fencing is suited to all stock types, which provides flexibility in grazing management. Because of frequent heavy rainfalls fences are at risk of flood damage. This is mitigated, in part, through careful placement of fence lines and through building flexibility into fence design.

Paddocks and blocks are designed to minimise or eliminate fence line pacing, provide shelter away from fences and protect waterways and wetlands. Design also considers such matters as suitable environment for fawning and the overall animal management issues as stock move through the production system.

The Station is continually striving to make infrastructure friendlier both for staff and stock. This aids with the logistics of the business and provides efficiency in management.

Forms of Shelter
There is natural shelter available in the form of rocky

Waerenga deer shed is sheltered from the worst winds reducing impacts on stock and staff.

outcrops, gullies, some native bush and scrub. For example, deer are fawned in paddocks with natural shelter in various forms. A small number of shelterbelts provide extra shelter.

Community Involvement

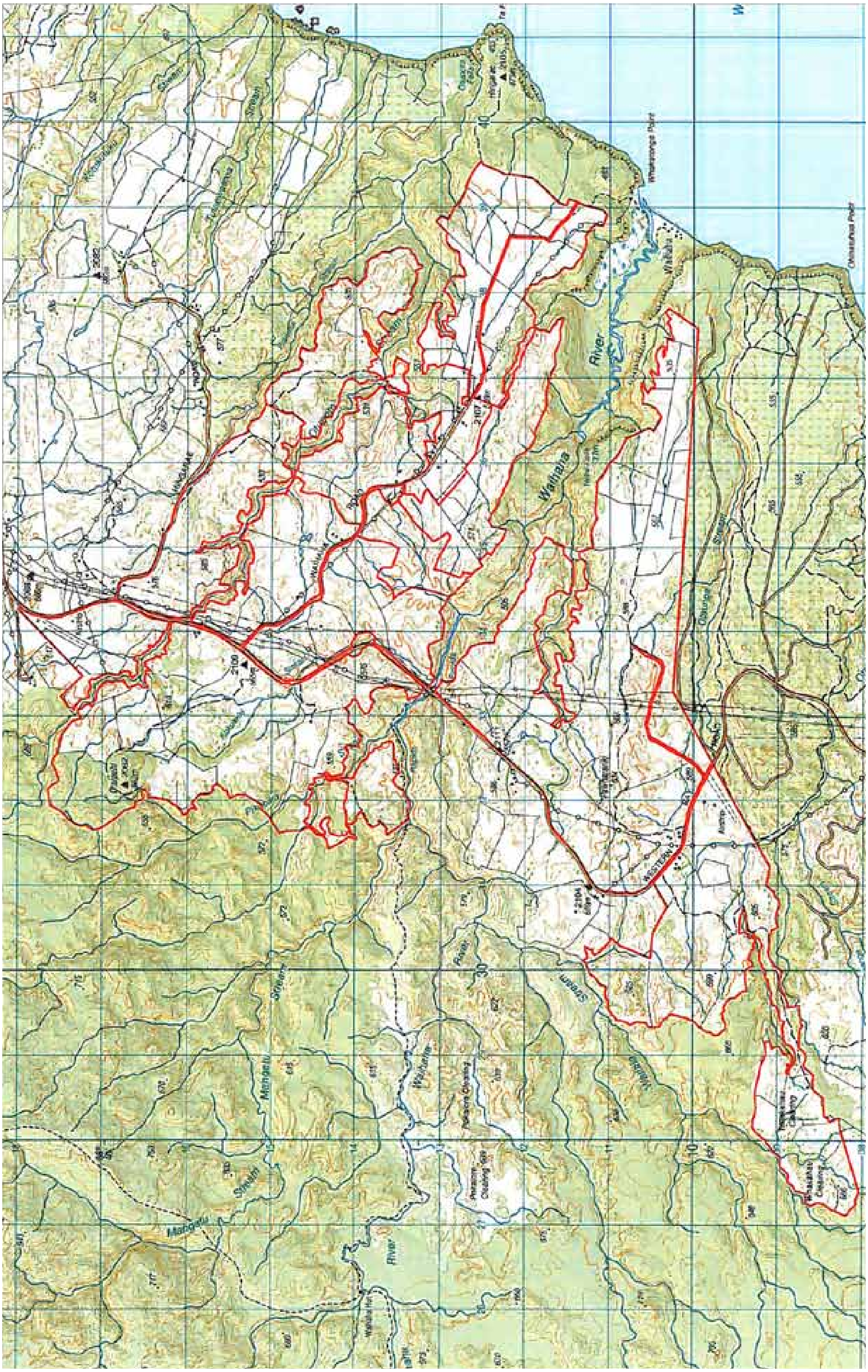
Mark is a trustee of the Taupo Lake Care group. William is Chairman of Northern Regions Deer Industry Focus Farm Project and is also on the Taupo Catchment Committee and the Waikato Regional Council Variation 5 working group. He speaks to interest groups on the awareness of water quality, leaching issues and nutrient budgeting. In addition, he is pro-active with discussions around Variation 5 and how it will affect farmers, trying to allay fears and negativity through cultivating a positive approach to dealing with the change. This Variation 5 recently won a Resource Management Law Association award.

Vision for the future

The Olivers' operate a large family business with all the complexities that brings. The vision for the future is to grow a financially and environmentally sustainable farming operation around a sound business model that provides for innovation in operation and fair and transparent mechanisms for succession.

Conclusion

Motere Land Ltd has been developed with the clear objective of a succession strategy that works for the Oliver Family and was designed to allow all family members to farm a large and economic business. The strategy allows for all family members to participate to an agreed level. The Oliver family has fully engaged with its neighbours and at district and regional council level when developing the farming business, and has displayed a high level of commitment to the community and to catchment management in developing this large and growing business.



Case Study 5

Haldon Station

Deer/Beef/Sheep

Lake Benmore
Paddy & Barbara Boyd - Managers

Background Information
Haldon Station is an extensive deer farming operation owned by Hans and Jenny Klisser. It is managed by Paddy Boyd who has worked on the property for the past 30 years. Located on the northern shores of Lake Benmore, Haldon Station is made up of three properties, 'Haldon' 'Stony' and 'Kirkliston'. These properties are all adjoining and run from the north east shores of Lake Benmore to the farthest south eastern point of the property boundary on the Kirkliston Range. The whole station comprises 23,000 hectares. Haldon is home to the 1500 ha deer farm.

Haldon Station is a pioneer in deer farming. The Station started with the capture of live deer in the late 1970's and early 1980's, providing stock for other start-up deer enterprises.
In 1987 the deer farm became a closed herd and only bought in the occasional sire stag.

The Haldon deer block is made up of 280ha of dry flat land which is under border dyke and pivot irrigation, and 1,220ha of rolling hill country within an altitude range of 360-670m. The whole Station has an altitude range of 360-1,830m at Mt Sutton. The deer farm block receives an annual rainfall in the 350-400mm range.

Located in the Mackenzie country, the Station faces harsh climatic challenges from hot dry summers reaching temperatures of 40^{0}C or higher and is prone to drought. Cold, harsh winters are experienced averaging -10^{0}C but in extreme conditions dropping to -20^{0}C.

Overall Haldon Station winters approximately 29,255su made up of approximately 12,000su sheep, 12,755su deer, 4,500su cattle.

Livestock Total for Haldon Station

Stock	Numbers	Stock units[5]
Deer MA Hinds	3,000	6,000
R1/R2 Hinds	2,800	5,600
Stags	550	1,155
Total	6,350	12,755
Breeding Ewes	12,000	12,000
Breeding Cows	1,000	6,000

[5] Stock unit figures from Lincoln University Farm Technical Manual

Barbara & Paddy Boyd

Deer Enterprise
The current deer unit is breeding and finishing 5,800 pure red deer, velveting 500 stags and running 50 sire stags annually. These are all finished to the works. The fawning percentage, to weaning, is running at 90-95% and all fawning takes place on hill country in oversown tussock.

Haldon Station produces all its winter feed on the cultivated paddocks. Supplementary feed for weaners and stags is barley fed to the weaners at 0.7kgs per day and 1.5kgs per day to the stags. Hinds get a weekly feed of meadow silage and lucerne hay. Hay and grain supplements are generally only offered in the very cold winter months. Feed placement is carefully planned to ensure good utilisation of dry matter.

The Station is using its cultivated paddocks to provide a good source of winter feed. Haldon Station has a consent from Environment Canterbury to use additional water to allow cultivation of a further 190ha to secure additional winter feed supply.

Shelter and shade on the flats is provided with rows of poplar and pine shelter belts. On the hill country shelter is provided by tussock, matagouri and briar. This gives good cover for fawning. Stock is moved up into hill country in November until February where there is good shade.

The yearling stags, at approximately 12-15 months old, reach an average kill weight of 60kgs. The yearling hinds range between 48-54kgs with an average of 52kgs.

Animal Health
An encompassing formal animal health plan for the whole property is in place to ensure prime health of livestock. Culling of breeding hinds at 6-7 years old is standard. The deer farm is singularly stocked,

Haldon Station nestled in the MacKenzie Basin copes with climatic extremes.

which alleviates concerns for issues such as Malignant Catarrhal Fever. There are no major health issues with deer. The TB status is C3.

Cover Summary

Haldon, the site of the deer farm, has a range of cover varying from arid flats in the north-west to good cultivated pasture and pivot and border dyke irrigated pasture in the north east. Approximately 150ha of dry flat land is in brome grasses and lucerne. The hill country has a significant amount of briar. Both the 200ha of border dyke irrigation and 80ha of pivot irrigation land is intensively farmed and sown in ryegrasses. There are wetlands in the central and north western area.

Future planning

Approximately 3,000ha of the Haldon block is deer fenced. This is a continuing development programme based on close monitoring of stock movement and paddock maintenance. Deer on the hill country are used as a form of weed control, reducing the amount of briar seed that can be spread. Once they have successfully cleared one area the deer are moved by careful use of fencing to another. As development of pasture continues the plan is to work towards hill blocks of between 100-200ha.

Roading across the property is heavy shingle and fenced out of surrounding paddocks. This improves access for staff and helps with stock management. Tracks are continually being fenced and soft spots on the tracks are dug out and shingled. This enables access for machinery such diggers to be used for on-farm development activities.

Continual development around water use efficiency is in place. Currently the Station is collecting water run-off from current irrigation and re-distributing water from the reticulated stock water system.

Soils

Soils comprise very light Mackenzie loams susceptible to wind erosion. Irrigation and careful shelter plantings is helping to establish and grow better pasture cover, which in turn is reducing the loss of soil to wind erosion. This irrigation helps build soil organic matter.

Fertiliser

An oversowing and topdressing [OSTD] management plan is in place. Fertiliser is applied as Sulphur Super in the border dyke areas at 250kgs per ha per annum, with 150ha of lucerne receiving 150kgs/ha of fertiliser annually. Selective fertilising takes place in the higher country with 100kg of Sulphur Super to all valleys on a three year rotation.

Weaners and stags are fed barley during winter.

Water

Haldon Station is contained within the Stony River catchment. From the highest point at Mt Sutton water flows from the southern boundary in a northerly direction until entering the flats, then heads due west to exit Haldon Station on the northwest boundary into Lake Benmore. Stony River is the main water source for the irrigated area across the flats and the reticulated stock water supply.

Environmental Considerations and Challenges

Water Management

In a drought prone environment, water management is the key to the success of Haldon Station. Historically the Station developed a comprehensive irrigation system for the home flats. A water take consent is in place providing water to the home flat faces and ensuring the cultivated paddocks are well serviced for irrigation and stock. All head races in the border dykes have been fenced off.

The hill blocks retain water via selective ponding developed from naturally occurring springs on the particularly rough and rocky ground. The waterways that deer can access are lined with shingle. The location of the ponds, along with the shingle lining, provides enough of a deterrent to prevent and reduce deer wallowing.

Water quality management has been carried out in consultation with Environment Canterbury and is ongoing.

Erosion

As a result of very low rainfall and exposure to north westerly winds, the light soils can be very dry and prone to wind erosion. Erosion risks are mitigated in the form of planting shelter belts and good pasture management retaining vegetation cover. There is an oversown and topdressing (OSTD) plan in place over both the flats and the lower hill country. Parts of the flats are intensively farmed and are planted in ryegrasses, lucerne and fescues. The hill country is being developed into grasses and trees are being planted.

Erosion is being reduced by the shelter belts and the planned placement of fencing to eliminate fenceline pacing. There is continual overview of pasture management and sub-division. This along with careful management of mob sizes should result in less soil erosion.

Sustainability Challenges

The location of the Station, including its topography, climate and soils provides constant challenges. Station management aims to maximise production and achieve economic sustainability while recognising and addressing environmental challenges. The farming system has developed methods to conserve

Supplementary feed is made on the property and fed to the hinds in the very cold winter months.

Pine and poplar shelter belts provide shade and shelter for deer on the flats.

Matagouri, briar and tussock provide cover for hinds.

and enhance soil, water and cover to improve environmental sustainability.

Environmental Capital Expenditure
Rabbits and ferrets are the major pest concerns on Haldon Station. Although Rabbit Haemorrhagic Disease (RHD) is still reducing rabbit numbers, the Station spends approximately $80,000 per annum on rabbit control. Additional expenditure goes into rabbit proof fence maintenance and upgrading. Measures are also in place for controlling ferrets by trapping. Approximately $50,000 per year is spent on water quality protection initiatives.

Planned future or current development programmes:
Haldon is seeking to create additional blocks on hill country to progressively move the deer away from the flat. This is more of a continuous process of improvement rather than an intensive development programme.

A centre pivot provides an efficient irrigation system for cultivated paddocks.

Conservation and Environmental Issues
A good understanding of environmental factors and conservation issues is necessary for using best practice methods for development. For example, good rotation of deer around grazing blocks improves environmental outcomes on the flats and provides control of briar on hillsides. All planning includes an objective of improving environmental outcomes.

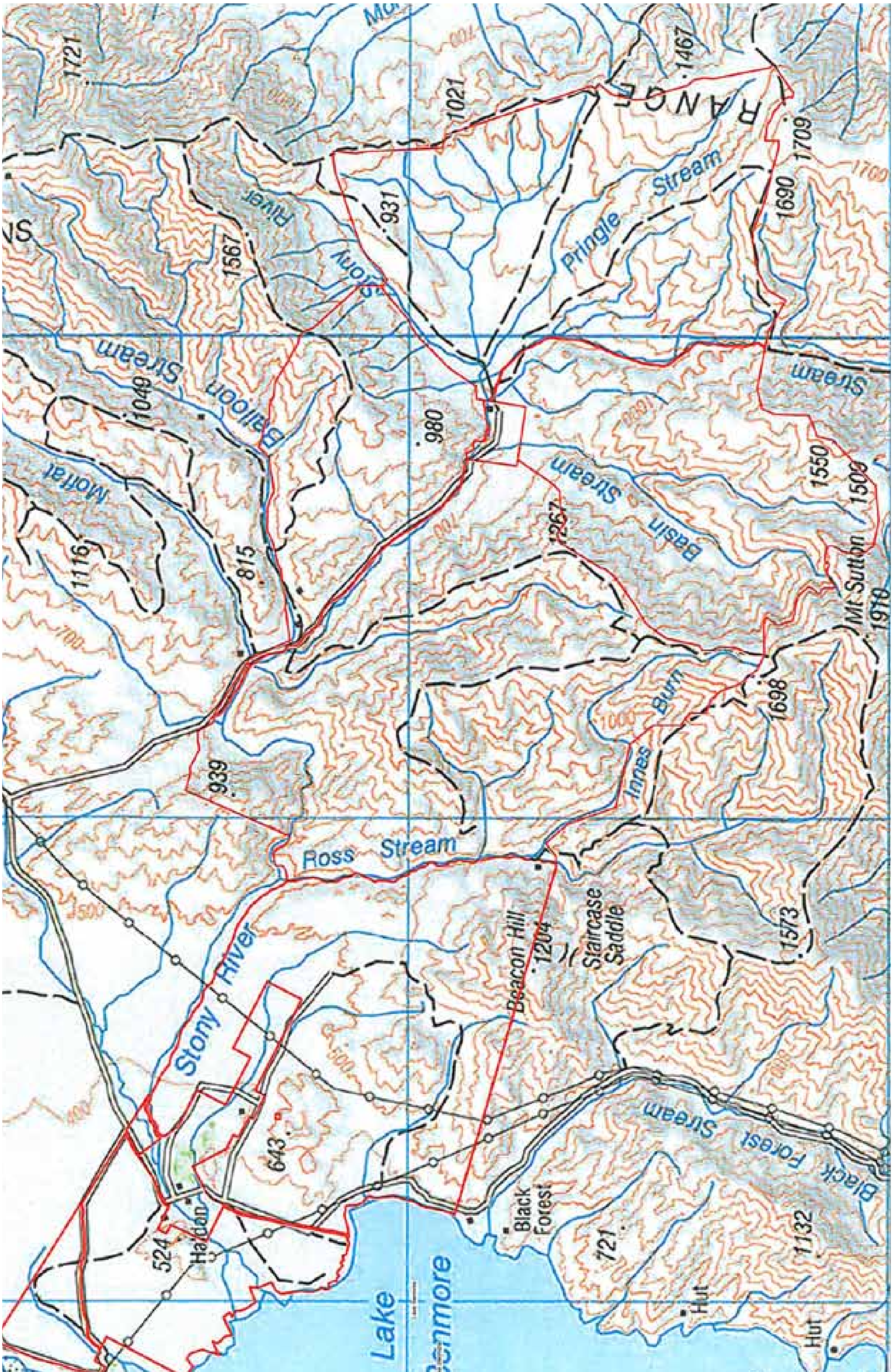
The Station is proactive in farming the flats and moving deer. Lake Benmore holds the status as the most fished lake in New Zealand and public access is via a legal road which runs adjacent to the deer farm. Haldon maintains a generous gap between the road and the deer paddocks to assist with managing stress in the deer, and also to reduce the visual impact of the deer farm to the public.

Community Involvement
Haldon Station is a focal point for the local community with a conference centre and school on the property. Isolation limits wider community involvement opportunities. However staff are encouraged to maintain industry involvement where practical.

Vision for the future
Paddy and Barbara wish to establish Haldon as an industry leader in environmental and economic sustainability.

Conclusion
The vision is to establish Haldon as an example of best farming practice in all areas. Haldon Station has received a Ballance Farm Environmental Award for both water efficiency and overall top farming practice. The Station also won the Deer Industry Award sponsored by Duncan & Co for excellence and innovation in a demanding environment in 2006. Haldon Station is committed to continuous improvement of the standards of its farming operation.

Lake Benmore is the most fished lake in NZ with public access via a legal road adjacent to the deer farm.


Stony River
Balloon Stream
Moffat
Pringle Stream
Basin Stream
Innes Burn
Ross Stream
Beacon Hill
Staircase Saddle
Mt Sutton
Black Forest Stream
Black Forest
Haldon
Lake Benmore
Hut
Hut

Case Study 6

Kanuka Downs & Flaxmere

Deer/Beef/Sheep/Dairy Grazing

Canterbury Region
Sam and Mark Zino

Background Information

Kanuka Downs and Flaxmere are farmed by Zino Holdings Ltd, a company structure owned by brothers Sam & Mark Zino. The properties are approximately 40kms south of Hanmer Springs in the Waitohi River catchment. The Zino family have been farming Flaxmere since 1967 when it was run as a sheep and beef enterprise. The deer finishing unit on Flaxmere was developed in 2003, and further grazing of dairy cows was introduced in 2009. Kanuka Downs was purchased in 1999 as a sheep and beef operation with very limited deer numbers. The company has since removed all sheep and Kanuka Downs now runs a mix of deer and beef cattle. Flaxmere runs deer, sheep and a mix of replacement dairy heifers and winters dairy cows. The deer breeding and finishing operations and the cattle breeding are managed by Sam, and the sheep breeding and finishing, beef finishing and dairy grazing are managed by Mark.

Kanuka Downs, managed by Sam, is 4kms north west of Flaxmere and comprises 313ha of hill and down country with 90ha, soon to be 122ha, operated as a deer breeding unit. Kanuka Downs has an altitude range of 360-770m asl with annual rainfall of 880mm. Effective farming area is estimated at 300ha.

Flaxmere, managed by Mark, comprises 535ha of flats of which 40ha is a deer finishing unit and 93ha is irrigated, including 20ha of the deer finishing unit. Flaxmere is on down land and river flats at 300m asl more or less, with annual rainfall of 730mm. Effective farming area is estimated at 505ha.

Brothers Sam and Mark Zino operate Kanuka Downs and Flaxmere properties south of Hamner Springs.

Both properties are subject to the strong north westerly weather pattern and can experience both snowfalls and droughts.

Overall the properties are carrying about 6,700su, made up of approximately 1,600su deer, 2,400su sheep, 2,700su beef and dairy cattle. Kanuka runs breeding cows and hinds with all progeny weaned to Flaxmere. MA Cows used for a grazing management tool on both properties.

Livestock Total for Zino Holdings Ltd (Kanuka Downs & Flaxmere)

Stock	Numbers	Stock units[6]
Deer MA Hinds	400	800
R1/R2 Hinds	156	280
R2 Stags	7	16
MS Fawns	437	437
Stags	15	36
Total	**1,015**	**1,569**
Breeding Ewes	1,350	1,350
TT Ewes	750	525
Ewe Hoggets	735	515
Ram Hoggets	39	27
Total	**2,874**	**2,417**
Breeding Cows	131	786
R2 Heifers	45	203
MA. Bulls	6	27
Total	182	1,016
Milking Cows (Wintered)	650	975
R2 Heifer	105	472
R1yr Heifer	80	240
Total	**835**	**1,687**

Deer Enterprise

The two properties are complementary in their deer operations. Kanuka has a 90ha breeding unit which is currently being expanded to approximately 122ha. Sam Zino also operates a self-fed silage system which assists greatly with feed utilisation. Fawning percentage including first fawners is presently 84.5%, the target across all hinds is 95%. At weaning deer are relocated to Flaxmere including replacement breeding deer.

[6] Stock unit figures from Lincoln University Farm Technical Manual

Approximately 100kg of velvet is produced annually although this is not a significant part of the operation.

Flaxmere operates as a 40ha finishing unit, of which half is irrigated. A target slaughter date of December 1 is planned when average carcass weight should be around 54kgs. Weaners are fed a good balanced diet including rape, fodder beet and some supplement for deer being prepared for the spring market. Deer are all on contract to Silver Fern Farms.

Feed

No stock are grazed off farm. Barley grain in the form of 40 to 80 tonnes is utilised annually to flush ewes and hinds and in the deer finishing unit to maximise growth of weaners in autumn. The only supplements bought in are hay (150 medium squares) and straw (2-300 medium squares) for dairy grazing to balance the diet. During the winter grass and lucerne silage/baleage hay and straw is used to supplement crop. The balance of hay, silage and straw is grown on the farms. Feed is required to finish off animals for the spring market.

Animal health

Zino Holdings operate a carefully considered and executed animal health and management plan for all stock with emphasis on parasite control and Johnes disease. Stock health is considered good and the company continues to seek improvement in animal health and welfare. The whole deer herd was tested for Johnes disease, as part of a four year testing programme. Of the 520 hinds tested, 65 tested positive (12.5%) to the screening test Paralisa (Disease Research Laboratory, Otago University) and were culled. The herd was tested in 2011 and again in February 2012. Replacement stock was tested at 12 months old and retested as two, three and four year animals. In 2008 replacements tested at 14 months of age resulted in 25% testing positive. In 2012 replacements tested resulted in 8% testing positive with the rising year three and rising year four year olds resulting in 7% testing positive. TB status is C10 for deer and cattle. The properties are in a TB stock movement control area.

Cover Summary

Kanuka Downs comprises hill and down country with the lower areas in improved pasture. The back part of the property is dominated by two gullies and is oversown and topdressed. This country comprises steep to medium hill, tussock country, with some regenerating native shrubs most notably Kowhai stands and small pockets of matagouri. Cover is about 15ha of pine plantations, 180ha of good pasture and 115ha of older pasture and about 3ha of kale and swedes.

Wetlands are fenced from stock.

Poplar shelterbelts will provide good shelter and screening between paddocks

Flaxmere is a river flat property with 25ha in pine plantation, 16ha in feed crop and 34ha in lucerne, Wairau, Supersonic and more recently Force4, which is used for both cut and carry and grazing. Approximately 26ha of rape/kale and 18ha of fodder beet is grown for winter feed and a further 16ha of summer rape for lamb finishing. Dryland Flaxmere species rely heavily on subclover production so pastures are managed accordingly and sown with species such as prairie grass, cocksfoot, OCR old Canterbury ryegrass, white clover, plantain and chicory. There is little evidence of older pastures across the properties; Flaxmere has some but this is reducing thanks to good pasture management.

Soils

Kanuka Downs comprises Haldon soils on the higher country, Waikari in the lower hill country and Domett and Waipara on the downs. These soils have a medium nutrient status although can be dry in summer.

Flaxmere soils, being a river flat property, are predominantly loams and range from gravely, sandy loams through to silt loams. Soil types include Glasneven, Eyre, Waimakariri and Weka loams. These soils respond well to fertilizer inputs. Areas under irrigation have 350kg Sul super and 160kg urea applied annually. Dryland receives 150kg Sul super. Lime is applied to both when needed.

Fertiliser

Transec lines are done annually and an annual autumn (Kanuka) and spring (Flaxmere) maintenance application of Sulphur Super at a rate of 125-200kg/ha is budgeted for. Lime is used on cultivated, re-grassed and irrigated areas. Urea is also applied at a rate of 160kgs/ha on irrigated pasture in two different applications each year, one in early spring and one in early autumn. Target for the lucerne is a ph of 6.5 for which sulphur super is applied.

Shelter

Both properties have extensive shelter belts and plantings for protection from drying nor-west winds, soil erosion and animal shelter. The shelter design consists of 2-5 rows made up of either pinus, macrocarpas, eucalyptus, Cedrus Deodara and Atlantica, poplar species and oaks. Being flat Flaxmere relies on introduced shelter more than Kanuka Downs, which benefits from natural shelter due to its topographical features as well as shelter belts.

Water & Water Management

Kanuka Downs is serviced by several streams and springs. It draws its stock water from the Hurunui Rural Water Scheme and reticulates this on farm from header tanks on the property. Flood risk on either property is low, but Kanuka Downs is the wetter winter property of the two.

Flaxmere is bordered by the Waitohi River and Washpen Stream. There are two water rights, each of 30lt/sec (litres/second) for 16 hours per day. This provides water to irrigate 93ha plus provide stock and house water.

Environmental Considerations, Issues and Challenges
As a family company, Zino Holdings fully recognises its success is closely bound to working with the environment and using farming inputs wisely. It accepts this challenge as a farming objective and is actively engaged in establishing an environmental and financially sustainable farming business. For example management of water quality issues is ongoing on both properties. Kanuka Downs has more challenges with managing water quality because of more streams and springs. Currently stock has access to a number of the waterways and any issues this raises are actively managed with use of temporary fencing where possible. Fencing out of waterways has commenced, and the programme proceeds as finances allow and development dictates. The next stage of fencing off of waterways is now being considered. Fencing has been completed on Flaxmere as the different, more intensive farming system it operates requires closer subdivision.

Riparian management is important on both properties. Progress is being made towards planting, using flax, natural rushes, mixed native species and exotics.

Existing fences are kept stock proof at all times and an annual fence maintenance programme is in place. Riparian management also extends to pest plant issues for the Flaxmere operation on the Waitohi River boundary due to gorse, willows and nodding thistle. Nodding thistle is managed by hand grubbing, gorse and broom with spray and land development whilst willows are removed by digger when needed.

Environmental Capital Expenditure
Zino Holdings budgets for environmental capital expenditure and makes regular investment in environmental initiatives including riparian management, fencing and protection of natural values.

Sustainability Challenges
Sustainability challenges are both environmental and economic. Zino Holdings is minimising economic challenges by drawing income revenue from deer, beef, dairy and sheep. This mitigates exposure to one market, and the economic sustainability assists with achieving environmental sustainability. Mark and Sam are very aware that farming outside of financial or environmental limits is not sustainable. Consequently the business is structured to withstand normal market shocks and to deal with critical public perceptions. It does this by being environmentally sustainable and maintaining production margins and efficient use of

Silage is made on farm and fed during winter.

inputs to improve profitability on farm and generate cash flow for land procurement and development.

Fencing
Flaxmere is fully fenced and no further capital fencing is anticipated. Kanuka Downs is undergoing development and careful thought is given to block and paddock design to make best use of natural features including shelter, water management and sediment ponds and mitigating fence line pacing. Paddock and block design are finalised after observing stock behaviour and optimum stock management flows. This will ultimately see the Station's old fences replaced. A ridge behind the homestead being used as a control block, has been fenced off and allowed to rest and recover. There has been some bush and shrub re-generation and it also has outstanding rocky topographical features. The directors are keeping a record and considering how the block could enhance the property.

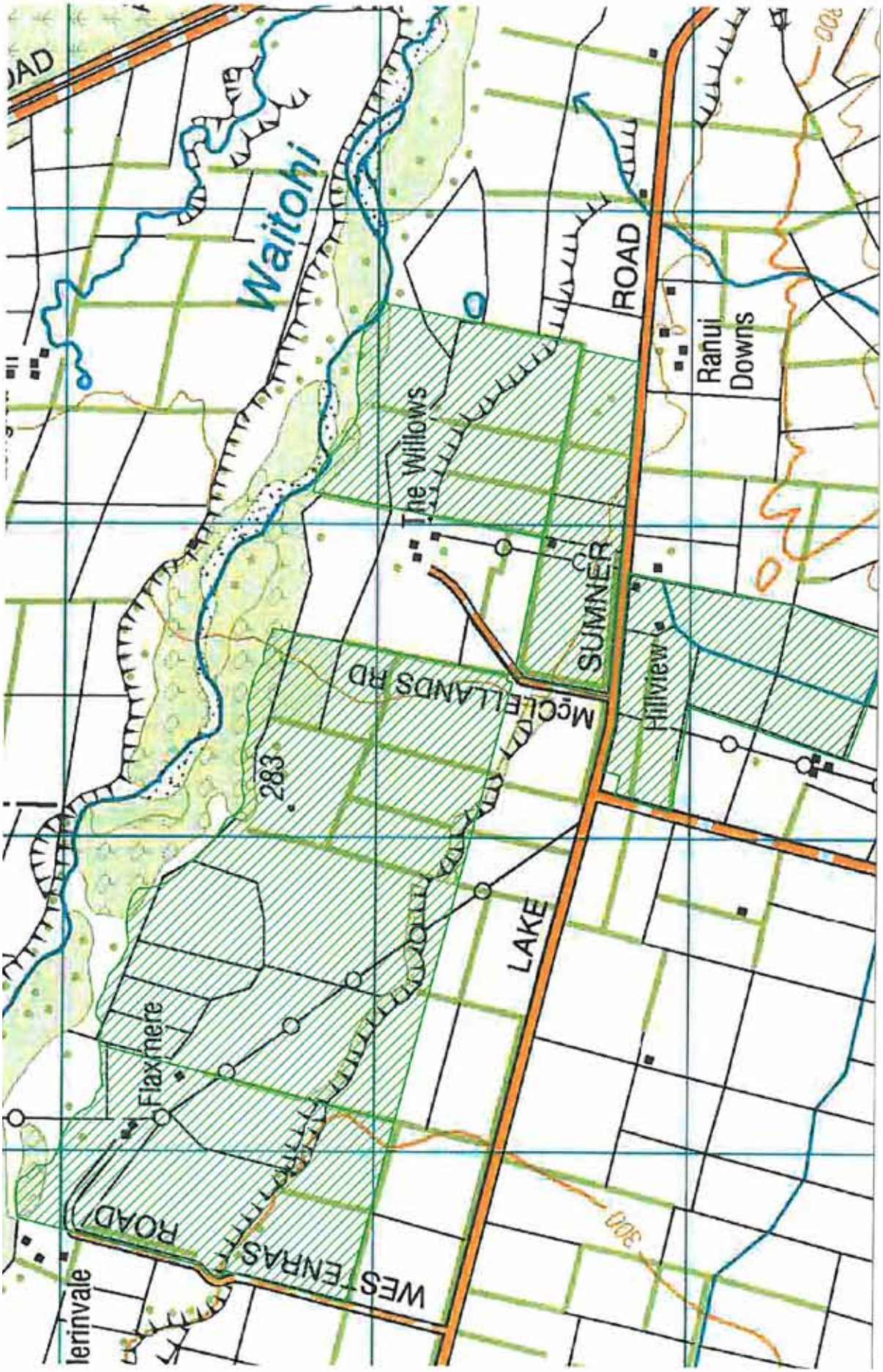
Future plans and development
The company is budgeting to complete fencing of waterways, especially around entry and exit points on streams, native shrubbery, rocky outcrops and other features to enhance water quality and management and to maintain ecological points of interest. This work is ongoing as finances allow and as development work proceeds. In the interim the company maintains an active stock management process to ensure good animal performance and sustainable environmental practices. A particular strength of this process is strong communication between the brothers, a shared family vision and careful formal planning and recording of those plans and the related activity and progress over time.

There are plans for the expansion of the deer unit on Kanuka and for corresponding improved capacity and efficiency of the finishing unit on Flaxmere. This development work is targeting better use of inputs, improved feed and animal performance, increased capacity and improved economics. There is capacity to fully irrigate Flaxmere, although there are resource management issues concerning LUC (Land Use Classification) matters.

Community Involvement
The Zino families are active in the North Canterbury community, supporting local sport and community and farming initiatives. The company farms are the 2011-2013 Deer Industry focus farms for Canterbury, are members of the local farm machinery syndicate, and Mark is a representative for the Hurunui Water Project.

Vision for the future
The Zino families want to continue living and farming in the district, and will achieve this through a robust farming business capable of riding out tough market conditions and climatic events such as prolonged drought or wet conditions. The vision is to grow the business through efficient and sustainable business and farm management practices. The next step is increasing the irrigatable area on Flaxmere.

Conclusion
Zino Holdings and the Zino families have identified several goals for their farming business, alongside personal or family goals. There is a clear objective of creating a business asset that will suit the modern world and contribute to coming generations whether they elect to actively farm or take an investment role.


Waitohi
ROAD
Ranui Downs
The Willows
SUMNER
McCLELLANDS RD
Hillview
283
LAKE
Flaxmere
WESTERNAS ROAD
Ierinvale

11. MANAGING YOUR ENVIRONMENT

No two farms are alike; each farm has unique landscapes, natural resources, farming practices and goals. How each farmer manages their land and environment is also individual, but developing a system or plan with achievable timeframes is a practical and helpful way of identifying those needs and tracking progress. An Environment Management System (EMS) recommended for deer farmers, which is also being used on New Zealand sheep and beef properties is the Land and Environment Plan (LEP), developed by Beef + Lamb New Zealand *www.beefandlambnz.co.nz* 0800 BEEFLAMB (0800-233-352).

The previous formal environment management system in the first edition of the Deer Farmers' Landcare Manual was known as the Sustainable Management Plan (SMP). As many deer farmers are also beef and sheep farmers it makes sense to adopt a unified approach. Developing a LEP is an effective way of demonstrating continuous improvement, on-going sustainability and complying with the Deer QA Systems.

Land Environment Plans and Land Use Capability mapping are outlined in more detail in this section. Nutrient budget plans are available via OVERSEER®.

Land and Environment Plans

Land and Environment Plans are a useful tool for identifying key sustainability factors, and putting detail around how to manage them into the future. The plan is essentially a stock-take of land, soil and water resources, an assessment of opportunities and environmental risks, and a map of what, when and where the actions will be undertaken. It identifies improvements in farming practice that will enhance production and where resources are not being fully utilised. This provides a systematic approach to managing environmental impacts, to preserve the potential of soil and water resources and significant natural landscape features, within a farm's economic limitations.

The key to a good plan is to keep it simple, focused, and relevant to your farm – "by you and for you." While many farmers already do this informally, a LEP uses a clearly defined and recorded process of planning, implementation and review, providing clear evidence that measurable actions are being taken to address environmental concerns. The essential elements are:

- Identifying and assessing the risks of your farming activity.
- Developing a framework to manage this.
- Implementing the plan in practical and affordable stages.
- Demonstrating progress by recording against original intentions.
- Reviewing and adjusting the plan over time to improve farm sustainability.

The LEP system successfully tailors environment planning to individual farming situations across various stock classes. Farmers initially identify the key sustainability issues with a brief "do it yourself" property stocktake that includes resource care assessment and shelter plans, and a basic farm plan. They can then grow and develop the detail in stages over time to allow for successive improvements in quality. Contact Beef + Lamb New Zealand *http://www.beeflambnz.com/farm/tools-resources/land-and-environment-planning-toolkit/* for detail on the LEP system and to download an LEP template.

Land Use Capability mapping

A useful tool in land risk management is a standards system that formally categorises and maps the different land types across the farm, to identify and assess levels of risk. Land Use Capability (LUC) is a nationally accepted classification system that groups land into eight classes for consistency in describing physical attributes of the land and provides a systematic way of classifying land based on the type of rock, soil, slope, erosion and vegetation cover. LUC mapping identifies land and soil types and options for each area of the farm, maps the strengths and weaknesses and defines appropriate land management options. This information can provide additional detail for the property's Land Environment Plan and enable various Land Management Units or Risk Zones (low, medium, high) to be designated on the LEP farm map. A Land Use Capability survey handbook on the methods and standards is available from Landcare Research *www.landcareresearch.co.nz*

Nutrient Budgeting

Fertiliser is a major expense on farms, so applying the correct amount reduces costs, while reducing the risk of adverse environmental impacts. The best way to do this

is nutrient budgeting, which is farm specific, soil type specific and land use objectives specific and accounts for nutrient inputs and outputs from all sources in the farming system. It is recommended that each deer farm use nutrient budgeting procedures for calculating fertiliser requirements. A Nutrient Budget Plan (NBP) accounts for nutrient inputs to the farm such as fertiliser, purchased feed, clover N fixation and effluent. It also accounts for outputs from the farm in the form of venison and velvet products, transfer to non-productive areas, leaching losses to waterways, gaseous losses to the air and nutrients retained in the soil. OVERSEER® *www.overseer.org.nz* is recommended for deer farmers to calculate nutrient flows. The Fertiliser Manufacturers' Research Association *www.fertresearch.org.nz* also has a NMP template available which may help farmers with planning.

OVERSEER® is an agricultural management tool that assists in examining nutrient use and movements within a farm to optimise production and environmental outcomes. It calculates and estimates the nutrient flows in a productive farming system and identifies potential for risk of environmental impacts through calculation of nutrient loss as run-off and leaching and greenhouse gas emissions. Its current uses are in the development of on-farm nutrient budgets, whole-of-farm nutrient management plans and, through the use of additional proprietary software, the development of farm specific fertiliser recommendations. It also calculates potential greenhouse gas emissions.

Regulations

New Zealand has statutory requirements that regulate how deer farmers mange their farming environment. The Resource Management Act 1991 (RMA) is New Zealand's fundamental legislation that sets out how we should manage our environment. Management of farm chemicals is governed by the HSNO Act. The Animal Welfare Code sets standards for animal care farm. A full copy of these Acts is available from the New Zealand legislation site *www.legislation.govt.nz*

Resource Management Act 1991 (RMA)
The purpose of the Act is to promote the sustainable management of natural and physical resources. The Act has implications for any activity that uses or impacts in some way on natural resources. A key intention is that every person has a duty to avoid, remedy or mitigate any adverse effect on the environment arising from an activity carried on by, or on behalf of, that person.

New Zealand's councils are responsible for environmental sustainability and resource management, with the statutory function of managing resource consents under the Resource Management Act 1991. Responsibilities include climate change, natural hazards, pest management, waste management, air quality and water management. Farmers will need to contact their council for specific information on land management issues for their area (*refer Chapter 12, Links for your local council*).

Hazardous Substances and New Organisms Act (HSNO) 2004
This Act controls the import, manufacture, use, handling and storage of hazardous substances in New Zealand. The Environmental Protection Authority (EPA) *www.epa.govt.nz* administers the rules and qualifications needed to transport, use and store hazardous substances safely, and issues handling certification for chemical use.

Animal Welfare (Deer) Code of Welfare 2004
The Ministry of Primary Industries *www.mpi.govt.nz* administers this code, intended to encourage all those responsible for deer welfare to equal or exceed the minimum standards of husbandry, care and handling.

Industry codes

The New Zealand pastoral industry also has Industry Standards, Quality Assurance Processes and Codes of Practice to provide guidelines and best practice on specific farm topics. These include the Code of Practice for Nutrient Management, *www.fertresearch.org.nz/code-of-practice* produced by the Fertiliser Manufacturers' Research Association. The deer industry is an active participant of the Sustainable Agriculture Management Systems Network *www.samsn.org.nz* an information hub on sustainable management systems (SMS) in the agriculture and horticulture sectors in New Zealand. More information on the Deer Industry's QA System is available through Deer Industry New Zealand *www.deernz.org*

Land and Water Forum
Is there an alternative to the RMA? It is generally acknowledged that New Zealand needs a less confrontational, more collaborative, and more effective way to manage water. The Land and Water Forum, initiated and supported by government, brings together industry groups, environmental and recreational NGOs, Iwi, scientists, and other organisations with a stake in freshwater and land management to develop a shared vision and a common way forward through a stakeholder-led collaborative process. It has developed the report "A Fresh Start for Freshwater" which identifies a set of outcomes and goals for freshwater management in New Zealand and recommends policy changes. Recommendations on the methods, tools and governance processes required for setting and managing limits on water quality and quantity are being developed. *www.landandwater.org.nz*.

12. LINKS

AgRecovery
www.agrecovery.co.nz
Phone: 0800 247 326
PO Box 1216, Hastings 4156
Provides a rural recycling programme.

AgResearch
www.agresearch.co.nz
Phone: 07 834 6600
Private Bag 3123, Hamilton 3240
Undertakes research into pastoral farming, including deer.

Animal Health Board (TB free New Zealand)
www.ahb.org.nz
Phone: 0800 4 824 636
PO Box 3412, Wellington 6140
Runs the National Tb Control Programme.

Auckland Council
www.aucklandcouncil.govt.nz
Phone: 09 301 0101
Private Bag 92300, Auckland 1142
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Bay of Plenty Regional Council
www.boprc.govt.nz
Phone: 0800 884 880
PO Box 364, WHAKATANE 3158
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Beef + Lamb New Zealand
www.beeflambnz.com
Phone: 04 473 9150
PO Box 121, Wellington 6140
Provides Land Environment Plan information and template.

Climate Change NZ
www.climatechange.govt.nz
Phone: 04 439 7400
PO Box 10362, Wellington 6143
Offers information about climate change impacts and implications.

Department of Conservation
www.doc.govt.nz
Phone: 04 471 0726
PO Box 10420, Wellington
Responsible for managing natural and historic heritage. Administers the Natural Heritage Fund and Biofunds.

Deer Industry Environmental Awards
www.deernz.org
Phone: 04 473 4500
PO Box 10702 WELLINGTON 6143
NZDFA and DINZ award to recognise deer farmers who are farming productively and in harmony with their local environment.

Deer Industry New Zealand
www.deernz.org
Phone: 04 473 4500
PO Box 10702 WELLINGTON 6143
Responsible for promoting and assisting the development of the New Zealand deer industry. Maintains Deer QA Systems.

Ducks Unlimited
www.ducks.org
Assists with conservation projects.

Environment Canterbury Regional Council (ECan)
www.crc.govt.nz
Phone: 0800 324 636
PO Box 345, Christchurch 8140
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Environmental Protection Authority (EPA)
www.epa.govt.nz
Phone: 04 916 2426
PO Box 131, Wellington 6140
Administers the rules and qualifications needed to transport, use and store hazardous substances safely, and issues handling certification for chemical use.

Environment Southland
www.es.govt.nz
Phone: 0800 76 88 45
Private Bag 90116, Invercargill 9840
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Federated Farmers of New Zealand
www.fedfarm.org.nz
Phone: 04 473 7269
PO Box 715, Wellington 6140
Farmer lobby group

Fert Research
www.fertresearch.org.nz
Phone: 04 473 6552
PO Box 11519, Manners Street Central, Wellington 6142
Maintains a Code of Practice For Nutrient Management.

Fish and Game Council
www.fishandgame.org.nz
Phone: 04 499 4767
PO Box 13-141, Wellington 6440
Assists with conservation projects.

Gisborne District Council
www.gdc.govt.nz
Phone: 0800 653 800
PO Box 747, Gisborne 4010
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Greater Wellington Regional Council
www.gw.govt.nz
Phone: 04 384 5708
PO Box 11646, Wellington 6142
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

GROWSAFE
www.growsafe.co.nz
Phone: 0508 476 972
Provides Agrichemical use training to meet the Industry Standard, NZS8409 – Management of Agrichemicals.

Hawke's Bay Regional Council
www.hbrc.govt.nz
Phone: 06 835 9200
Private Bag 6006, Napier 4142
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Horizons Regional Council
www.horizons.govt.nz
Phone: 06 952 2800
Private Bag 11025, Palmerston North 4442
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Land and Water Forum
www.landandwater.org.nz
Phone: 04 471 0341
PO Box 10822, Wellington 6143
A collaborative process looking at managing water in New Zealand into the future.

Landcare Research
www.landcareresearch.co.nz
Phone: 03 321 9999
PO Box 40, Lincoln 7640
Provides the Land Use Capability (LUC) survey handbook.

Marlborough District Council
www.marlborough.govt.nz
Phone: 03 520 7400
PO Box 443, Blenheim 7240
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Massey University
www.massey.ac.nz
Phone: 06 350 5701
Private Bag 11 222, Palmerston North 4442
Offers an Advanced Sustainable Nutrient Management Course.

Ministry for the Environment
www.mfe.govt.nz
Phone: 0800 499 700
PO Box 10362, Wellington 6143
Is responsible for the Resource Management Act www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html

Ministry of Primary Industries
www.mpi.govt.nz
Phone: 0800-008-333
PO Box 2526, Wellington 6140
Administers Animal Code of Welfare. Offers information on carbon. Manages the Sustainable Farming Fund.

Nelson City Council
www.nelsoncitycouncil.co.nz
Phone: 03 546 0200
PO Box 645, Nelson 7040
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

New Zealand Biodiversity
www.biodiversity.govt.nz
Is responsible for the New Zealand Biodiversity Strategy, 2000.

New Zealand Deer Farmers Association
www.deernz.org
Phone: 04 473 4500
PO Box 10702 WELLINGTON 6143
Assists in maximising sustainable benefits for all deer farmers and links agricultural industry and the public.

New Zealand Farm Environment Trust (NZFET)
www.nzfeatrust.org.nz
PO BOX 693, Waikato 3240
Promotes sustainable farm management and administers environment awards, including the Ballance Farm Environment Award (BFEA).

New Zealand Farm Forestry Association
www.nzffa.org.nz
Phone: 04 472 0432
PO Box 1122, Wellington
Provides guidelines on tree choice & establishment for New Zealand farms.

NZ Forests Restoration Trust
www.nznfrt.org.nz
PO Box 80-007, Green Bay, Auckland
Assists with conservation projects.

NZ Landcare Trust
www.landcare.org.nz
Phone: 0800 526 322
PO Box 4305, Hamilton, 3247
Provides information on landcare management practice.

NIWA
www.niwa.co.nz
Phone: 09 375 2050
Private Bag 99940, Newmarket, Auckland 1149
Produced report on How clean are our rivers? Provides detail on constructed wetlands.

Northland Regional Council
www.nrc.govt.nz
Phone: 0800 002 004
Private Bag 9021, WHANGAREI 0148
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Otago Regional Council
www.orc.govt.nz
Phone: 03 474 0827
Private Bag 1954, Dunedin 9054
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

OVERSEER®
www.overseer.org.nz
A software model that provides a Nutrient Budget Plan template and software.

QEII National Trust
www.openspace.org.nz
Phone: 04 472 6626
PO Box 3341, Wellington 6140
Administers open space covenants to protect significant natural and cultural features.

Royal Forest and Bird Protection Society
www.forestandbird.org.nz
Phone: 04 385 7374
PO Box 27420, Marion Square, Wellington 6141
Assists with conservation projects.

Sustainable Agriculture Management Systems Network (SAMsn)
www.samsn.org.nz
Information hub on sustainable management systems (SMS) in agriculture.

Taranaki Regional Council
www.trc.govt.nz
Phone: 06 765 7127
Private Bag 713, Stratford 4352
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Tasman District Council
www.tasman.govt.nz
Phone: 03 543 8400
Private Bag 4, Richmond, Nelson 7050
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

Waikato Regional Council
www.waikatoregion.govt.nz
Phone: 0800 800 401
Private Bag 3038, Hamilton 3240
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

West Coast Regional Council
www.wcrc.govt.nz
Phone: 0508 800 118
P.O. Box 66, Greymouth, 7805
Provides technical assistance and advice on sustainable land management. May have funding assistance for environmental works.

13. GLOSSARY

BFEA	Ballance Farm Environment Award, administered by the NZ Farm Environment Trust.
Biodiversity	The number and variety of organisms found within a specified geographic region.
Constructed wetland	A man-made wetland area made to improve water quality on-farm.
CSA	Critical Source Areas for phosphorus loss. Run-off during storm events results in significant phosphorus loss from CSA's.
% DM	Percentage of dry matter in stock feed.
Deer Industry Environmental Awards	Biennial Award to recognise deer farmers who are farming productively and in harmony with their local environment, funded by the NZ Deer Farmers Association and Deer Industry New Zealand.
Demeter	A worldwide certification system used to verify production by biodynamic methods.
EMS	Environmental Management System - an internationally recognised system for implementing sustainable management on farm.
Ephemeral	A waterway that only flows on occasion, not permanent.
Erosion	Physical removal of soil through surface detachment of individual particles by wind, rain and frost, gullying by surface and subsurface runoff, deep-seated mass movement by earthflows and slumps, shallow mass movements by slips as channelized mass movement by debris flow.
EurepGAP	Fresh produce food standard set by Europe food retailers to give their customers more assurance on food safety, through Good Agricultural Practices (GAP).
GPS	Global Positioning System.
Growsafe	A training programme to promote the safe use of agrichemicals.
Geotextiles	Fabric used for the construction of porous sediment traps.
HACCP	Hazards Analysis Critical Control Point. A system for assuring food safety, documenting organisational structures and procedures and design and construction requirements for food handling premises.
HSNO	Hazardous Substances and New Organisms Act, 2004.
ISO	International Standards Organisation.
ISO 14001	International Environment Standard.
Land and Water Forum	A government supported stakeholder group to consider new ways to manage water issues in New Zealand
LEP	Land and Environment Plan - a planning process for implementing sustainable farm management.
LUC	Land Use Capability - the types of uses land is capable of sustaining.

New Zealand Biodiversity Strategy	Refers to the New Zealand Biodiversity Strategy to halt the decline of indigenous flora and fauna at risk.
Riparian	Land surrounding waterways often retired from grazing.
RMA	Resource Management Act.
SAMsn	Sustainable Agriculture Management Systems Network Information hub on sustainable management systems in agriculture.
SMP	Sustainable Management Plans - a form of planning for implementing sustainable farm management.
SNA	Significant Natural Area - protection of 'significant indigenous vegetation and significant habitats of indigenous fauna' as a matter of national importance.
Mitigating	To make good damage that has occurred.
NMP	Nutrient Management Plan - a planning process that monitors nutrient inputs and outputs.
Waterways	The course that naturally occurring water takes in defined channels, creeks or streams or across pasture on its way through the catchment. Waterways may be ephemeral (occasional) during rain events or wet periods of the year, or perennial/permanent.
Wetland	Permanent or intermittent wet areas, shallow water and land water margins supporting a natural ecosystem of plants and animals adapted to wet conditions.