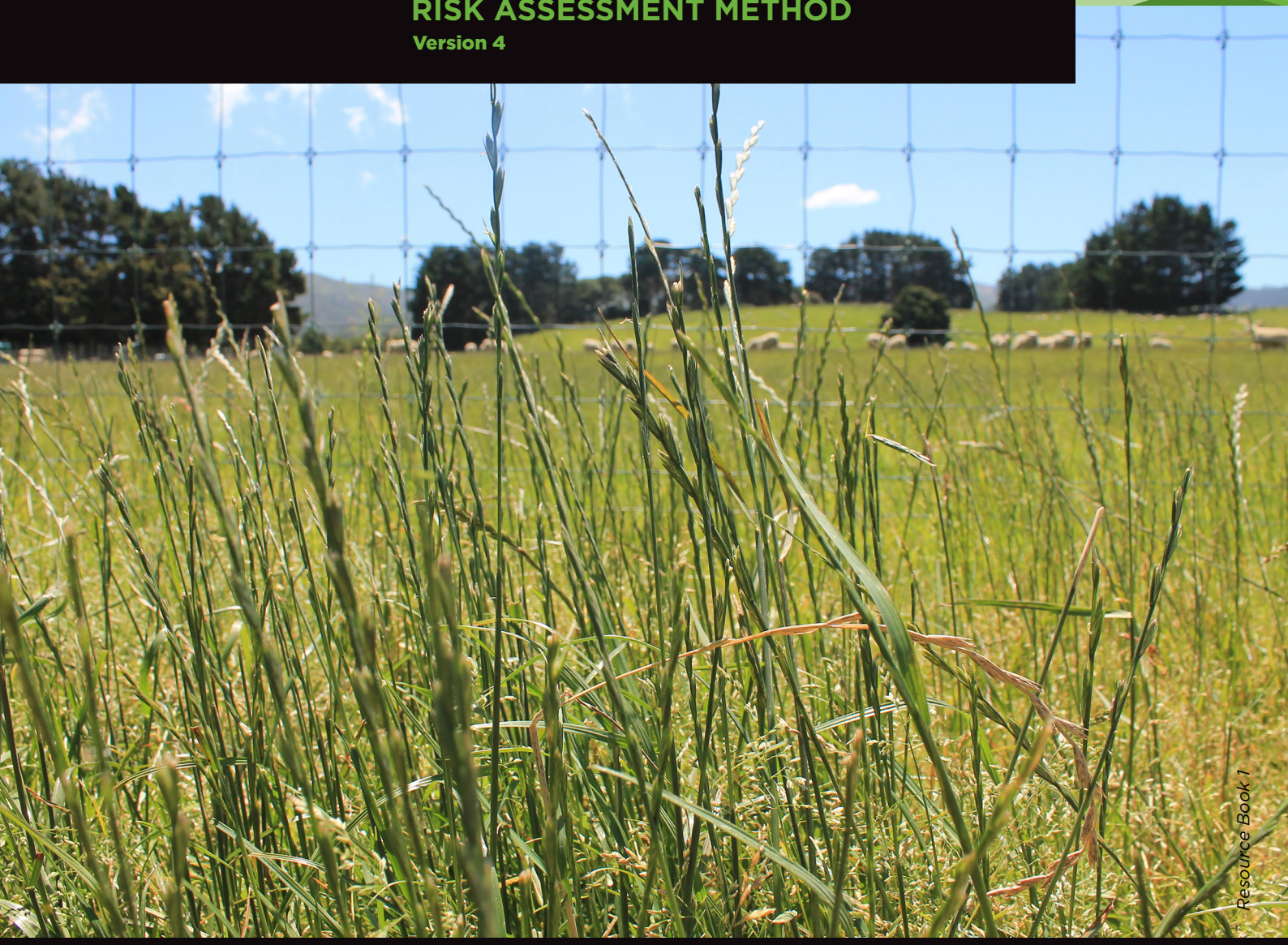
LEVEL 1

beef+lamb new zealand

LAND AND ENVIRONMENT PLAN GUIDELINES

FARM MAPPING AND RISK ASSESSMENT METHOD

Version 4



Resource Book 1

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BY FARMERS. FOR FARMERS

Introduction

These guidelines provide two methods of preparing an entry level Land and Environment Plan (LEP). These methods are best combined to develop a full picture of the farm, its resources and an ongoing plan. Completing both components provides an excellent platform upon which to develop a Level 2 LEP.

Part 1 is the Farm Mapping Method which emphasises the use of a farm map to identify areas where natural resources are protected or enhanced as well as identifying areas where actions need to be taken to address land and environmental challenges.

Part 2 is the Risk Assessment Method which provides a step-wise approach to risk assessment of land and environmental challenges commonly found on sheep, beef and deer farms. Challenges to be considered include phosphorus-loss, soil erosion, faecal bacteria, nitrogen-loss, productive capacity and the on-going health and sustainability of your farm's soil-plant system.

Also included are Response Plans; these are your personalised farm action plans outlining what you will do to address a challenge or priority.

By completing this entry level LEP you will be joining the growing number of farmers using tools to future-proof their farms.

This LEP should be reviewed annually to assess progress, carry over any incomplete activities, and to consider new issues if and when they arise.

Contact your local Beef + Lamb New Zealand Extension Manager for assistance or further information about land and environment planning (contacts are provided on back page).

steps

ASSESSMENT

What and where are the issues?

What has already been accomplished?

RESPONSE

What can be done?

PLAN

What, how, where, when, how much?

IMPLEMENT

Carry out activities, monitor and record.

REVIEW

Review progress annually.

Part 1
Farm mapping method

A farm map is needed for this section. This can be a copy of a farm aerial photo, a paddock map, or a digital map created with computer software. Many regional councils will help with sourcing an aerial photo or map for LEP purposes.

Overview

Creating an entry level LEP using the Farm Mapping Method involves:

- Developing an inventory of the farm resources
- Locating likely sites and areas with land or environmental challenges or opportunities.
- Recording existing progress towards land or environmental improvement.
- Generating responses to issues that need further attention.
- Summarising responses to inform your Response Plan (to be completed as part of the Risk Assessment Method).

Map out the issues

Start with a farm map

You will need a farm or paddock map. Make several copies of the original because you will be drawing on them.

A copy of an aerial photo (or equivalent) can be used to create a farm map. Draw fences onto the photo. Accuracy is not critical because Level 1 LEP does not require accurate measurement.

You can also use electronic mapping packages which let you create maps on your computer. If you cannot get a map, you can use the 'Risk Assessment Method' in conjunction with a printout image from Google Earth.

Map farm features and existing land and environmental works

Examples of features and works are provided on the map example. Use symbols, lines and hatching to mark the location of features and works on your map.

Start a list or key to describe what each map symbol represents (see map example).

Locate land and environment priorities

Most key land and environmental challenges will be well known. Mark them on your map. Coloured pens can be useful for highlighting differences.

A paddock-by-paddock approach can be useful to help you get started.

1. Identify key natural resources on your property —these are of value to your business and your environment e.g. high performing sheep flock, protected bush, existing erosion control, waterways where stock are excluded, a maimai! Draw them on the map.
2. Identify any of the natural resources that require maintenance and draw them on the map
3. Pick a paddock and focus on it
4. Think about priorities, and whether or not they relate to the paddock in question. Is the fertility optimum? Is pasture growth adequate? Does the paddock pug? Does stock enter the creek? Where is runoff going? What if I fenced off that wetland? Consider the examples provided to help locate possible issues. If an issue is worth attention, then draw it on your map.
5. Repeat the same exercise with the next paddock. The idea is to think about each paddock in detail, until the whole farm has been covered.

We recommend you plan to action no more than 10 issues per year for Level 1 LEP. Set aside the remaining issues so you can refer to these when you are reviewing and updating your plan and as your priorities change.

Examples of features, existing works, and priority locations

Existing works requiring maintenance

- Erosion control plantings e.g. poplars
- Fences along waterways to prevent stock entering
- Stock crossings, bridges and culverts
- Riparian zones
- Wetlands
- Fenced bush (e.g. QE II)
- Shelterbelts
- Woodlots/forestry
- Dams and other structures.

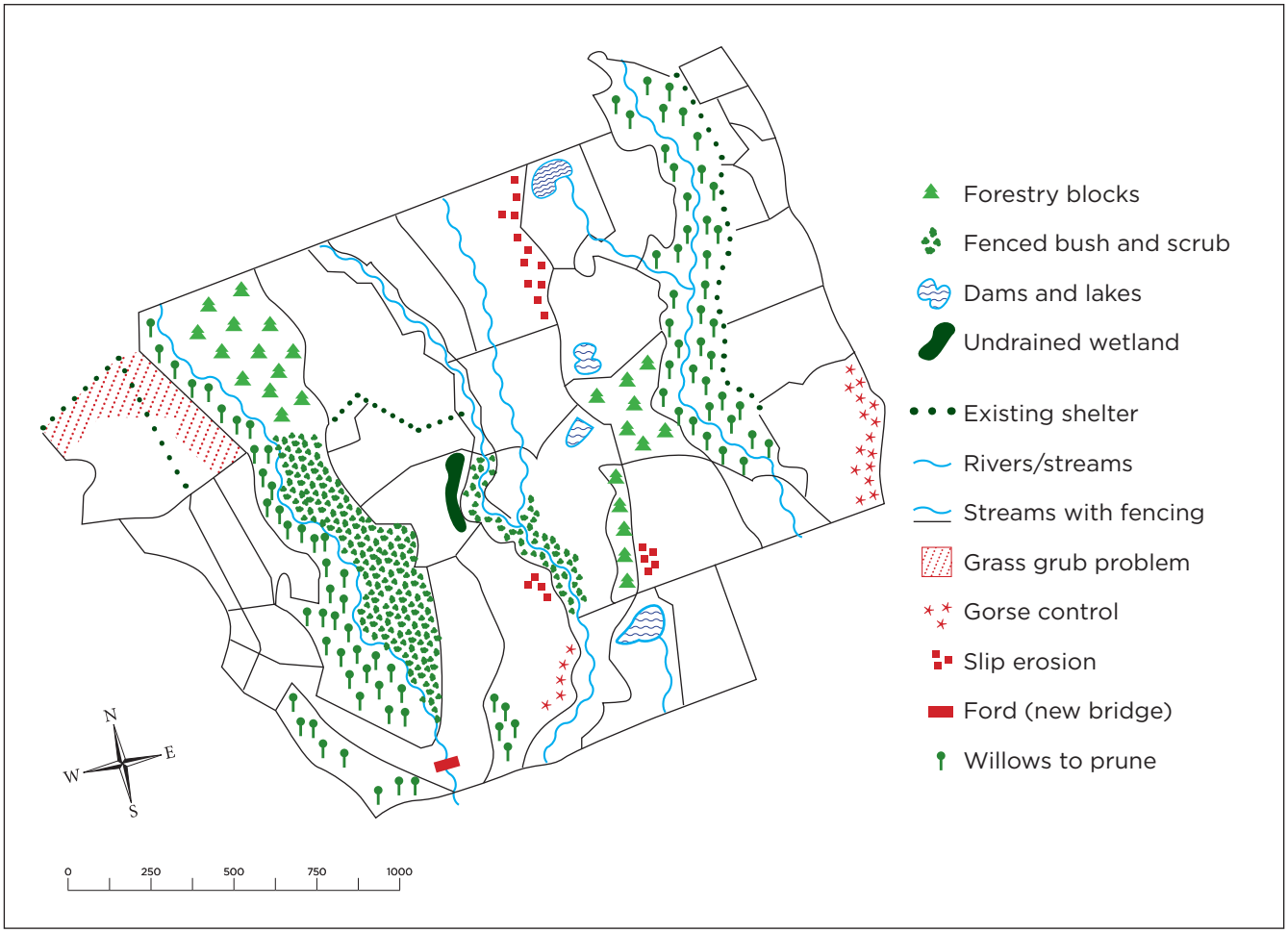
Target areas

- Waterways and unprotected riparian areas
- Erosion prone slopes
- Pugging and compacted areas
- Fragile soils
- Marginal production areas
- Unprotected wetlands
- Pest areas (e.g. scrub, gorse, ragwort, possums)
- Unprotected bush remnants.

Hotspots

- Stock fords
- Slips
- Dumps
- Offal holes
- Chemical storage sheds
- Areas where surface runoff, which could carry high contaminant loads (dips, yards, tracks, stock camps), can enter waterways.

Example of a Level 1 LEP map



Part 2
Risk assessment method

This section will assess the risks of specific environmental challenges including nitrogen, phosphorus, faecal bacteria, erosion, and the on-going productive capability and health of your farming system.

Overview

Successfully building a risk-based LEP involves:

- Answering questions to identify key challenges and their degree of risk
- Coming up with responses to any issues identified as having an elevated risk
- Summarising responses as a plan, including a ranking of priority, cost estimate, and an activity timetable.

Develop responses

Consider the risks, issues and opportunities you have covered. Summarise your responses to each risk or issue on the response plan templates located throughout these guidelines. Rank each in terms of priority. Ensure your responses are SMART. SMART stands for **S**pecific, **M**easurable, **A**ssignable, **R**ealistic, and **T**ime-bound. An example response is given below for erosion.

What are responses?

Responses set out what you will do to address the issue or priority. They can be management activities (e.g. use conservation tillage), building works or structures (e.g. a sediment retention dam), or simply getting more information or advice before making a decision.

Specific—target a specific area, quantity and frequency of response.

Measurable—quantify or give an indication of how progress will be measured.

Assignable—state who will take responsibility for the action.

Realistic—consider what can realistically be achieved given available resources.

Time-bound—specify a time frame when the response should be achieved.

Specific responses

Develop specific responses for each priority issue you have identified during the mapping exercise or the risk assessment. Be specific:

- A non-specific response:
  "Plant some poplar poles" ✗
- A specific response:
  "Plant 90 Kawa poplar poles with protector sleeves on the steeper faces of Lower Gorge paddock" ✓

Examples for a range of possible responses are provided on the next page.

Examples of possible specific responses

Maintenance of existing works

- Replace 10 missing space-planted poplars on slip-prone slope in Big Hill Paddock.
- Annual silviculture for the conservation tree block and two forestry blocks.
- Check fences and repair if necessary on two wetlands, the bush block and the river fences every six months.
- Annual check on the silt build up in the drains, four dams and the six silt traps. Bi-annually clear silt out and distribute back on to paddocks—rotate which paddocks receive it.
- In late summer, early autumn check all tracks and repair as necessary. Also check the two runoff diversion walls and repair any damage.
- Other...

Hill country erosion

- Retire shady face reverting to scrub in Flax Paddock. Afforest slip on Rough Paddock to prevent further erosion.
- Space plant 50 poplars and 30 willows to stabilise hill faces above Main River.
- Space plant 20 poplars above Main Access Track in Paddock 1 to protect it from future erosion. Plant a woodlot behind woolshed to stabilise bank and prevent damage to shed.
- Assess all tracks and other infrastructure in next 12 months to determine if any additional planting is required to protect it.
- Ensure all new infrastructures (e.g. tracks), including the new fence in the Back Paddock, are not going to cause any extra erosion by considering contour and soil type.
- Explore opportunities for drainage in the spring of Number 3 Paddock.
- Other...

Wind erosion

- Assess cultivation practices and where possible move to conservation tillage on Back Flats where crop is used.
- Plant a shelter belt on River-Flat Paddock. Carry out an annual check in autumn and repair any damage as required.
- Investigate plant species to stablise the sand country in Paddocks 7, 8 and 9. Consider if there are containment structures that may also help. Implement if suitable.
- Other...

Water quality

- Over the next 12 months, put up a one-wire electric along Main Creek to keep cattle out. In the next three months, put up a stock-proof fence around the wetland area.
- In next six months scope out a water reticulation system for the five back paddocks. Implement over following six months.
- Complete 10km of fencing in riparian areas on either side of Main River.
- Fence the two runoff convergence zones (e.g. headwaters) on Main Creek and Dog Burn.
- Ensure the fertiliser company and farm manager understand the avoidance of superphosphate applications if rain is forecast.
- Install four dams in Number 4 paddock and three in Number 6 paddock for trapping sediment.
- Investigate low solubility types of P-fertiliser before next application due and determine if this will work for the farm. If it will, work out if it is an affordable option.
- Install culvert in Bog Paddock and a bridge over Dog Burn to prevent stock accessing waterways.
- Look at soil test results and determine if Olsen-P levels are at or below the biological optimum – maintain them.
- Speak to top-dressing pilot to ensure he is not applying fertiliser directly to water bodies.
- Adjust super phosphate plan to apply in April rather than June, July, August or September.
- Adjust fertiliser plan to reduce N-application rates from 170 kg N/ha/year to below 150 kg N/ha/year*.
- Ensure the annual N-based fertiliser is applied in autumn and spring if necessary, but not winter.
- Site offal holes, dumps, septic tanks, dips away from water and leaching-sensitive areas.
- Other...

** NB. Urine patches rather than N-fertiliser are the key source of N-leaching in most pastoral systems.*

Pugging and compaction

- Identify the high-risk paddocks when wet, and the low-risk paddocks when wet. Outline a policy to move stock prior to the high-risk paddocks getting wet and inform all staff of the policy.
- Install drainage in Number 2 and Boggy Paddocks. Check drainage is functioning annually and repair any damage if necessary.
- Establish policy on soil conditions for cultivation. Policy will outline no cultivation when at-risk soils are wet and shiny (i.e. plastic).
- Develop and outline grazing policy residuals to all staff to ensure over-grazing is not occurring.
- Other...

Seek local or expert advice

- Regional council officers
- Farm consultants/advisors
- B+LNZ Extension Manager
- Workshop facilitator
- Fertiliser reps
- Universities and research
- Neighbours
- Other...

Seek additional information

- www.beeflambnz.com
- www.landcare.org.nz
- Regional councils
- Rural newspapers
- Field days, conferences or workshops
- Libraries

Response plan example

RESPONSE PLAN				**Year:**	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME FRAME** Time-frame to be completed within	**PROGRESS** Tick when completed. Carry over if not
2	Erosion in far corner of Sam's Paddock	Plant 120 poles @ 10 metre spacings. Use Kawa poplar because of disease resistance	120 poles @ $4/pole 120 sleeves @ $3.80 per sleeve	50 poles this year 70 poles the following year	
1	Steers pugging the wet part of the flats in winter	Test using the lane as a stand off area when really wet. Check the tile drain outfalls and make sure they're clear.	nil	This winter	
1	Offal hole fills with water. Must be getting into the water table	Fill in current hole and have a new one excavated near the pine shelterbelt on the top terrace. Find out cost	$800?	Cost estimate by January Excavate in February and March	
3	Unfenced wetland	A) Fence off the wetland from the main paddock (70 metres) B) Plant some native trees and flaxes C) Find out if Ducks Unlimited would be interested D) Find out if your regional council can help	Approx $700 for fencing. Need to find other costs from DU or local council.	Look to fence late February Plant natives in winter Contact DU & local council in January	

Water quality (phosphorus)

'Phosphorus (P) can lead to algal blooms and eutrophication (excess nutrients) when P is limiting. These can cause problems for the health of waterways, humans and animals that drink the water or use it for recreation. P binds to soil particles, therefore P mainly enters waterways via erosion and farm runoff or direct application (from animals or fertiliser). The risk of P-loss increases when soils are bare, P concentrations are high, and runoff is significant.

1) P-loss

- **Do current Olsen-P levels exceed optimum levels on any part of the farm? YES / NO**

- Optimum levels for sheep and beef are 20–25 (sedimentary soils), 20–30 (ash soils), and 35–45 (pumice soils).

- **Is there evidence of pugging/erosion of stream banks? YES / NO**

- P can enter waterways with sediment lost from the stream bank into the waterway.

- **Do you practice conventional cultivation or intense strip grazing? YES / NO**

- Both practices can expose large areas of bare soil. P-loss risk is highest on sloping and hilly land.

- **Is more than half of the farm rolling, hilly or steep? YES / NO**

- Steeper slopes tend to generate higher rates of runoff.

- **Are dominant soils poorly drained, clayey, hydrophobic or slowly permeable? YES / NO**

- There is a greater chance that these soil types will create higher runoff rates. Hydrophobic soils are coarse-textured soils that dry out and become water repellent (some sandy and pumice soils).

- **Do you farm in a high rainfall area, or an area subject to high rainfall intensities? YES / NO**

- Runoff is strongly related to rainfall amount and/or intensity. High rainfall is >1500 mm/yr.

If you answered YES to one or more questions, then your farm may have an elevated level of risk.

2) Responses

Now you can write down how you will manage P-loss risk on the response plan template provided on the following page. Some suggestions include:

SUGGESTIONS:

- Exclude stock from at-risk streams with fences or other methods
- Consider installing culverts or bridges at stock crossings
- Provide alternative sources of stock water in each paddock (e.g. reticulated water in troughs)
- Consider strategic vegetated-buffer areas where runoff converges
- Consider riparian buffer strips around waterways (intensely farmed areas)
- Maintain Olsen-P at optimum levels
- Avoid direct P-fertiliser application to open water or water channels
- Avoid strip grazing and cultivation of steeper slopes
- Use slow release P-fertiliser (e.g. RPR)
- Avoid super-phosphate application when heavy rainfall is forecast (June–Sept)
- Avoid over-grazing pastures prone to drying out.

LAND AND ENVIRONMENT PLAN

WATER QUALITY: PHOSPHORUS - How will you manage P-loss issues on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Erosion and sediment

Common erosion types include wind, slip, slump, earthflow, gully, tunnel gully, stream bank, and silt deposition associated with flooding. Sediment can disrupt ecosystems in waterways and significantly impact on freshwater life.

1) Farm erosion risk

- **Negligible (no risk)** YES / NO

- Visual evidence of any erosion is hard to find
- Only a very small area of the farm is affected
- Highly unlikely to have a major erosion event even in the worst of storms
- Heavy stock are excluded from waterways with good buffer zones
- Wind erosion is not an issue.

- **Slight risk** YES / NO

- There is visual evidence of past erosion (scars, slumps, exposed soil)
- The area affected is reasonably noticeable, or it represents a small area of hard to manage erosion
- A major erosion event could impact on production and/or threaten infrastructure, but it would be rare and recovery would be quick
- Wind erosion happens occasionally.

- **Moderate risk** YES / NO

- Evidence of erosion is obvious
- A sizeable portion of the farm is potentially at risk (e.g. several large hill slopes)
- A major erosion event is a definite threat to production and/or infrastructure, and recovery time would be significant
- Heavy stock have ready access to waterways.
- Wind erosion happens regularly.

- **Severe risk** YES / NO

- Ongoing erosion is a characteristic of the farm
- Evidence of erosion is extensive
- A major erosion event would threaten production and infrastructure, to the point where it could threaten long-term business viability
- Wind erosion requires active management.

If you answered YES to any risk other than NEGLIGIBLE, then you should consider protecting your farm from future erosion events.

2) Responses

You can write down how you will minimise erosion risk on your farm on the response plan template provided on the following page. Some suggestions include:

SUGGESTIONS:

- Space planted poplar poles on hill slopes at appropriate densities
- Retirement from grazing of the worst affected areas, particularly those with marginal production value
- Afforestation of worst areas provided access for harvesting will be feasible
- Construct containment structures for certain erosion types (e.g. debris dams)
- Strategic tree planting to protect key infrastructure (fences, tracks, buildings, public roads)
- Design or locate tracks, fences, etc. in a way that minimises the risk of erosion damage
- Engage a regional council advisor/officer or similar specialist for advice
- Stabilisation planting such as flaxes, small trees, willows to prevent stream bank erosion. (Not grey willow or crack willow as these are unwanted organisms and are pest plants)
- Contour fencing
- Reducing weight of stock on at-risk country (e.g. replacing cattle with sheep or moving to a younger stock class of cattle)
- Identify critical source areas where sediment collects before leaving the paddock as runoff. Strategically graze towards these areas, rather than starting at them and working away (most commonly at the bottom of hills above waterways) to use remaining crop/pasture as a filter
- Exclude cattle and deer from waterways
- Consider direct drill or minimum tillage and timing of cultivation to avoid wind erosion at high risk times of the year
- Consider buffer strips around areas of land exposed to wind erosion particularly where wind-blown sediment reaches waterways.

LAND AND ENVIRONMENT PLAN

EROSION – How will you manage erosion and sediment on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Water quality (nitrogen)

'Nitrogen (N) becomes highly mobile within soil systems and can be easily leached beyond the root-zone into groundwater. The more free-draining the soil, and the higher the rainfall, the greater the risk. Elevated N concentrations can cause water quality problems such as algal blooms, eutrophication (excess nutrients), and nitrate toxicity (worst case). All of which can cause problems for the health of waterways, humans and animals, who drink the water or use it for recreation.

1) Nitrogen loss risk

- **Is your farm's stocking rate higher than 18 su/ha? YES / NO**

- Higher stocking rates mean more urine patches, which are the key source of N-leaching in pastoral grazing systems. Appendix 2 shows a stock unit conversion table.

- **Do cattle make up more than 20% of total stock units? YES / NO**

- Compared with sheep, cattle urinate in greater amounts, and they are more likely to urinate a number of times in the same general area.

- **Is your farm located in a high rainfall area (>1500 mm/yr)? YES / NO**

- Leaching generally occurs when rainfall exceeds evapotranspiration and soil-water storage capacity is full (saturated).

- **Are N-fertilisers used? YES / NO**

- N-fertiliser has little adverse impact unless applied excessively (>50 kg N/ha/application or >150 kg N/ha/yr) or during winter. However, more feed grown and being eaten will result in higher urine concentrations of N.

- **Are supplements used? YES / NO**

- The use of supplements often means an increase in stocking rate. Some supplements have high N concentrations (e.g. PKE or maize silage). The N concentration in the urine is directly related to the N concentration of the feed, so a higher stocking rate and higher N feed concentration can increase N output.

- **Is soil type shallow and/or very porous (e.g. sands, gravelly soils)? YES / NO**

- Water and dissolved N drains more quickly through shallow or very porous soils.

- **Is cropping a significant enterprise (e.g. a mixed cropping farm)? YES / NO**

- Cropping can result in extreme N-leaching depending on cultivation methods and fertiliser policies.

If you answered YES to the first question, or YES to two or more of the other questions, then your farm may have an elevated risk.

2) Responses

Now you can write down how you will manage N-loss for your farm on the response plan template provided on the next page. Some suggestions include:

SUGGESTIONS:

- Avoid winter applications of nitrogen-based fertilisers
- Avoid applications when heavy rain is forecast.
- Avoid excessive N-fertiliser rates (>50 kg N/ application or >150 kg N/ha/yr)
- Ensure other nutrients are non-limiting (maximise N-uptake opportunity)
- Undertake a comprehensive nutrient analysis using Overseer® Nutrient Budgets
- Ensure runoff from areas of high animal concentration (e.g. yards, frequently used tracks and stock camps) is discharged onto land rather than into waterways.

LAND AND ENVIRONMENT PLAN

WATER QUALITY: NITROGEN – How will you manage N-loss on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Water quality (faecal bacteria)

Faecal matter and its associated pathogens (e.g. bacteria) present a risk to human an animal health through waterborne infections and diseases. The extent of this risk is often assessed by measuring water concentrations of the indicator organism, *E.coli.* Sources include stock defecation into water, and faecal material being washed from pasture to streams via runoff.

1) Faecal bacteria risk

- **Do stock have open access to streams or other natural waterbodies? YES / NO**
- Direct deposition to water is a key source of faecal bacteria. Cattle, in particular, may show a defecation reflex triggered by standing in water. Deer are also attracted to water for wallows.
- **Do cattle make up more than 20% of total stock units? YES / NO**
- Sheep and goats are less attracted to waterbodies and do not tend to stand in, or wade through waterbodies and streams.

2) Responses

Now you can write down how you will manage faecal bacteria on the response plan template provided on the following page. Some suggestions include:

SUGGESTIONS:

- Exclude stock from at-risk streams with fences or other methods
- Consider installing culverts or bridges at stock crossings
- Provide alternative sources of stock water in each paddock (e.g. troughs)
- Consider strategic vegetated buffer areas where runoff converges
- Consider riparian buffer strips around waterways.

LAND AND ENVIRONMENT PLAN

WATER QUALITY: FAECAL BACTERIA – How will you manage faecal bacteria and other water quality issues on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Productive capability

Protecting the soil-plant ecosystem is an important component of Land and Environment Planning. In general, good farming practice is also good environmental practice.

1) Productive capability

- **Are current nutrient levels (P, K, S, Mg) below optimal for any part of the farm? YES / NO**

- Full pasture production potential cannot be realised if nutrient status is limiting. Appendix 1 shows target soil test ranges.

- **Do you undertake soil testing every 2-3 years using the same transect lines? YES / NO**

- Monitoring soil fertility consistently is important for optimal and sustained production. Guessing nutrient requirements increases the risk of under- or over-fertilising, both of which can represent a substantial cost.

- **Do you graze significant numbers of cattle on wet soils, or practice intensive grazing methods when soils are wet (e.g. strip grazing)? YES / NO**

- Pugging is the silent saboteur. It can result in a 50% drop in pasture yield and an 80% drop in N-fixation by clovers. Recovery can take more than a year.

- **Are invasive pasture weeds (e.g. gorse, thistles, broom, ragwort, etc) established on the farm? YES / NO**

- Pasture weeds can be toxic, physically dangerous, disease-related (scabby mouth), or just an outright nuisance. Significant infestations replace pasture and reduce stock carrying capacity and production.

- **Do you have a particular problem with pasture pests? YES / NO**

- Porina, grass grub, clover root weevil, rabbits and other pasture pests can consume or damage tonnes of potential pasture yield, often at critical times.

The full scope of productive capability cannot be covered in this entry level LEP. However, it is a useful starting point for considering how well these concerns are being managed. What can be done to avoid these problems (particularly seasonal weeds and pests)?

2) Responses

You may already know how best to respond to these concerns. But if there is room for improvement, then you can write down how you will manage productive capability on the response plan template provided on the following page.

SUGGESTIONS:

- **Direct response such as:**

- Managing stock off wet soils in winter
- Developing a weed control strategy
- Developing a soil testing strategy
- Using cattle to manage grass grub
- Have an immediate and aggressive response policy to any new weed.

- **Engage the help of someone with special experience or expertise such as:**

- Farm advisor/consultant
- Special experience or expertise
- Local or neighbouring farmer
- Fertiliser rep
- Regional council officer or advisor.

- **Search for ideas. Many excellent resources are available as books, fact sheets or internet resources:**

- www.beeflambnz.com
- www.fertresearch.org.nz
- www.lgnz/lg-sector/maps/index
- www.landcare.org.nz
- Your regional council.

LAND AND ENVIRONMENT PLAN

PRODUCTIVE CAPABILITY – How will you improve your productive capability?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Biodiversity

New Zealand's biodiversity (short for biological diversity: the variety of all biological life —plants, animals, fungi, and micro-organisms) is in serious decline. Today, about 1,000 of our known animal, plant and fungi species are considered threatened, and probably many species we don't yet know about. Our most threatened habitats are in lowland areas, with only small, isolated patches remaining within or on the edge of farm or forestry land. Because many of the remaining areas of threatened habitats and their residents are found on private farm land, farmers as land owners and managers have the opportunity to make a real difference in slowing the decline in our iconic New Zealand biodiversity.

1. Biodiversity

- **Do stock have access to native bush blocks on your farm? YES / NO**

- Stock grazing in native bush prevents regeneration by eating new growth, and will eventually lead to loss of the bush altogether as older trees die and are not replaced. Stock can also degrade soils (e.g. compaction) and disperse weed species into bush remnants.

- **Do stock have access to streams and wetlands on your farm? YES / NO**

- Stock accessing the waterway beds and margins damages the in-stream habitat for fish and insects, as well as increasing bank erosion and faecal contamination. Check with your Regional Council as there may be rules about stock access and stream and wetland protection.

- **Do you have a regular pest animal control programme in place for possums, rats, mustelids, pigs and goats? YES / NO**

- These introduced mammals are of some of the biggest threats to our native biodiversity. Possums decimate tree foliage, goats and pigs browse the regrowth/understory and prevent regeneration, rats and mustelids eat bird eggs and chicks as well as lizards and insects.

- **Do you undertake weed control on your property (in both pastoral and natural areas?) Yes/No**

- Weeds will readily invade natural areas (especially when areas are retired from grazing) and can quickly out-compete the regenerating plants and/or restoration plantings by choking and overgrowing them. Weeds can also invade bush remnants and wetlands an can displace native species (e.g. climbing weeds smothering native tree canopies).

- **Do you routinely drain wetlands? YES / NO**

- Wetlands are like the kidneys of the farm and are one of New Zealand's rarest habitats with only 6% of their original extent left. They are key for removing sediment and nutrients from farm run-off, and can also help attenuate flooding by 'soaking up' excess water and releasing it slowly. Wetlands also support an array of wildlife (including 22% of our native bird species and 30% of native freshwater fish).

- **Do you have 'hung/perched' culverts (where the outlet is elevated above the downstream water surface)? YES / NO**

- Hung culverts prevent native fish from moving upstream and significantly reduce the available area for them to live and breed. Many of our native freshwater fish are now in serious decline, especially in lowland habitats.

2. Responses

Now you can write down how you will protect and/or enhance native biodiversity on your farm using the response form provided on page 21. Some suggestions include:

- Retire and fence permanently wet areas rather than draining them

- Fence any existing bush blocks on the property and let them regenerate

- Fence streams to prevent stock access, leaving a good (e.g. 3-5m) riparian strip (buffer) either side

- Consider planting natives (e.g. cabbage trees and flax are easy to establish) in the riparian strips to shade the water and provide in-stream habitat for fish, as well as food sources for native birds

- Undertake targeted weed control (both of existing bush blocks and wetlands and in the first few years post retirement/fencing) to ensure that native regeneration and plantings get off to a good start
- Have a regular pest animal control programme in place to ensure healthy trees and flourishing bird life. If time is short, target your efforts to key times —such as baiting/trapping in winter when pests are more likely to be hungry and therefore ingest the bait, and in early spring just prior to when birds will be nesting
- Install protection around newly installed culverts (to prevent scouring beneath the culvert outfall which will lead to hung culverts), or for existing culverts retrofit rock riprap in the outfall area as a 'ramp' from the streambed to the culvert lip
- Contact your regional council—often grants are available for undertaking biodiversity enhancement works
- Biodiversity doesn't recognise property boundaries – consider joining up with adjacent landowners and tackling a project together, sharing skills and resources. Community groups and/or several landowners jointly undertaking a project are more likely to be successful in gaining funding, and completing the project
- Protect you biodiversity for the future—consider setting up a covenant on areas which should include financial support to do so. This could be done as a Nga Whenua Rahui, QEII covenant, local council covenant or others.

LAND AND ENVIRONMENT PLAN

BIODIVERSITY – How will you manage biodiversity on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Other issues

Your farm may have other important environmental issues not covered in this entry level LEP. A response plan is provided on the following three pages if you would like to include these. Some examples include:

SUGGESTIONS:

- Protecting indigenous forest remnants
- Soil contamination (DDT, old dips, old dosing strips)
- Wetland protection or restoration
- Flood prone areas
- Other pests (possums, wildfowl, etc.)
- Chemical storage, use and disposal
- Protecting or enhancing stream, river or lake areas
- Shade and shelter for stock
- Managing farm waste (e.g. recycling silage wrap)
- Irrigation and water use efficiency
- Greenhouse gases
- Historic and cultural sites
- Offal pits and farm dumps
- Tree planting for amenity value.

LAND AND ENVIRONMENT PLAN

OTHER CONSIDERATIONS – How will you manage other issues on your farm?

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

LAND AND ENVIRONMENT PLAN

RESPONSE PLAN CONTINUED

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

LAND AND ENVIRONMENT PLAN

RESPONSE PLAN CONTINUED

RESPONSE PLAN FOR:				YEAR:	
PRIORITY Rank each response in order of priority	**ISSUE** Detail the issue of concern	**RESPONSE** Specify your response to minimise or manage the issue	**COST** Estimate cost	**TIME-FRAME** Time-frame to be completed in	**PROGRESS** Tick when completed. Carry over if not.

Farm mapping land and environment priorities

List the land and environment priorities you have identified from highest priority to lowest priority.

Land and environment priorities	Priority
	1
	2
	3
	4
	5
	6
	7
	8
	9
	10

Notes:

Implement, monitor, review and register

- Implement each response according to your priority and timeline
- Monitor and record all your achievements
- Remember to review and reassess each year

Congratulations on designing a Land and Environment Plan specifically for your farm.

For full integration with farm business planning you can refer to this LEP when making decisions about farm development and financial planning.

Other LEPs

Level 2 LEPs

The Level 2 Land and Environment Plan looks at your farm's land and soil resources, develops Land Management Units (LMU), and uses LMUs as the basis for nutrient budgeting, strengths and weaknesses analysis, and yield gap appraisal. LEP 2 summarises opportunities for more sustainable farming as a three year response plan.

Level 3 LEPs

The Level 3 Land and Environment Plan draws on standards and methods used by professional farm planners. The aim is to continuously improve your management performance and produce an LEP you can audit (e.g. Audited Self-Management) or someone else (2nd or 3rd Party Auditing). This enables you to provide demonstrable evidence of Good Management Practices in action on your farm.

Appendix 1

Target soil test ranges for New Zealand sheep and beef farms (New Zealand Manufacturers' Research Association Inc. and New Zealand Pastoral Agriculture Research Institute Ltd, 1994)

Soil Test	Ash	Sedimentary	Pumice	Peat
Target Olsen-P	20-30	20-30	35-45	35-45
Target soil test K	7-10	5-8	7-10	5-7
Sulphate-S	10-12	10-12	10-12	10-12
Organic-S	15-20	15-20	15-20	15-20
Target soil test Mg (pasture)	8-10	8-10	8-10	8-10
Ideal soil test Mg (animal)	25-30	25-30	25-30	25-30
pH	5.8-6.0	5.8-6.0	5.8-6.0	5.0-5.5 (0-75mm)
				undeveloped 4.5-5.0 (75-150mm)

Appendix 2

Stock Unit table (Lincoln University Farm Technical Manual, 2011)

A "stock unit" is an animal that requires 6000MJME per annum. If pasture has an average annual ME of 10.8 then 555kgsDM are required to produce 6000MJME. This is roughly equivalent to a 55kg ewe bearing one lamb on 1 July.

Stock class			Stock unit
Ewe	Flat land 115% (lambs weaned/ewe lambing)		1.0
	Hard hill 100% (lambs weaned/ewe lambing)		0.86
Ram			1.0
Hogget	30kg, slow growth rate		0.7
	40kg, medium growth rate		1.0
	50kg, rapid growth rate		1.2
Beef cow	350kg, 68% calves weaned		3.7
	400kg, 83% calves weaned		4.4
	450kg, 88% calves weaned		5.3
	500kg, 90% calves weaned		6.3
Beef weaners	135-270kg		3.5
Beef	200-400kg, slow growing		3.7
	200-465kg, rapid growing		4.6
	350-500kg		4.7
Bull	500kg		6.0
Red deer	Weaning to 15 months	*Males*	1.4
		Females	1.2
	15 to 27 months	*Males*	1.8
		Females	1.8
	Adults	*Males*	2.1
		Females	1.9
Wapiti	Add 0.1 to red deer values		
Fallow deer	Weaner buck		0.55
	Yearling buck		0.65
	Yearling doe		0.55
	Mature doe		0.9
Jersey heifer			3.0
Friesian heifer			3.4
Dairy cow	400kg liveweight, 350kg Milk Solids		7.8

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