

Good Farm Management?

A Summary of Resource Management Issues for Hill Country Farmland

Final

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1 Introduction

This is a summary of the report “Good Farm Management?”, written for Environment Waikato to review resource management issues in hill country farmland. **The review is not official Environment Waikato policy.** It is designed to stimulate discussion about the most appropriate responses to hill country issues.

Hill country farming is a complex and risky business, and MAF surveys indicate that a significant percentage of hill country farms in the King Country are currently not profitable. Hill country land use also affects downstream human use and ecosystems. This review focusses on these issues and their significance for the Waikato Region.

The method for this project included a literature review, consultation with researchers with relevant expertise, and discussions with staff in councils. As such, the views of hill country farmers and other affected parties are not fully represented, but where their interests and perspectives are documented elsewhere, they have been included. Recommendations are aimed primarily at Environment Waikato, but on-farm management options are also identified for each issue.

1.1 Scope Of The Issues Considered In This Review

Under current legislation, resource users and management agencies must consider the downstream and environmental effects of productive activity. The effects considered in this review include the impacts of erosion and run-off, biodiversity issues on land and in water, pests, landscape and climate effects. Some issues are not wholly the concern of regional councils, but they are included in the interests of building a comprehensive picture that will assist with more integrated management. Economic effects to farmers are considered as part of the decision-making context.

There are also spiritual associations that are affected when land and water are degraded. The concepts of kaitiakitanga and caring for mauri are clearly being applied to new situations, and it is not always easy to define their practical expression in a modern context. However, ecological health is a general indicator of how well land and water are being cared for. Also, water-based food resources have always been significant to Maori, and the ability to harvest and serve them to guests is vital to tangata whenua. Therefore, the measures described below to protect both ecological and human values are seen as positive for protecting Maori spiritual values, though not necessarily sufficient. Specific actions required for certain places are best defined by local kaitiaki.

2 Resource Management Issues And Practices To Minimise Effects

The following sections briefly review the main issues identified, assess their significance, and highlight some key practices for their management on farms.

2.1 Erosion And Run-off

Issues and Effects ¹	Critical On-Farm Management Factors	Suggested Environment Waikato Responses ²
Loss of soil productivity	<ul style="list-style-type: none"> • Tree cover (slips) • Pasture cover and soil health (sheetwash erosion) 	Publicise economic cost of slips; promote whole farm planning for pasture and soil health
Run-off of livestock faeces affecting <ul style="list-style-type: none"> • downstream food gathering • recreation 	<ul style="list-style-type: none"> • Area in grazing • Soil health and pasture cover (run-off rate) • Wetlands (trapping) • Track design (cut-offs) • Streamside management³ 	Identify contaminated areas with high recreation/ food gathering activity and promote these on-farm practices in upstream catchments
Run-off of sediment affecting: downstream flood-prone areas and caves (sedimentation) <ul style="list-style-type: none"> • aquatic life in streams, rivers, estuaries/harbours, lakes (ocean?⁴) (turbidity and sedimentation) • downstream users (clarity) 	<ul style="list-style-type: none"> • Tree cover (slips) • Streamside management (bank stability and filtering) • Wetlands (trapping) • Track design (cut-offs) 	Identify areas where silt is a limiting factor to native aquatic biota, caves, flood protection, or recreation and promote on-farm practices/ farm planning/ sub-catchment planning
Run-off of phosphorus, affecting: <ul style="list-style-type: none"> • downstream users of Waikato river (algae - clarity, pump blockage) • lakes (algae - clarity, oxygen status) • coastal shellfish (algae - toxins)? 	<ul style="list-style-type: none"> • Tree cover (slips) • Streamside management, pasture cover and soil health (sheetwash; run-off) • Track design (cut-offs) • Wetlands (trapping) 	Identify areas at risk of excessive algal growth, where phosphorus is a limiting factor and promote these on-farm management practices to upstream landholders
Nitrate leaching affecting Lake Taupo in particular	<ul style="list-style-type: none"> • Manage overall intensity of grazing 	Being addressed through the Taupo Variation process
Extreme peaks and lows in run-off causing: <ul style="list-style-type: none"> • increased flood flows, • costs to drainage schemes from silt build-up in low flow catchments • reduced habitat value in streams • disruptions to cave systems 	<ul style="list-style-type: none"> • Tree cover and wetlands (sponging) • Soil health (infiltration) 	Identify priority areas where these effects are most severe and promote these on-farm practices, farm and catchment planning

2.1.1 Defining The Problem Of Erosion And Run-off

Erosion is a natural process in hill country, the rate of which is affected by land use and management. The risk of soil loss depends on some natural factors (e.g. slope,

¹In all cases, tangata whenua, wider society and future generations are affected. For the sake of clarity, only specific parties who are affected to a greater degree are included in this table. Wider effects on society include aesthetic and landscape values, stewardship values and ethics, and impacts on trade and tourism. Effects occur to current and future generations when the life-supporting capacity of land and water and biodiversity are lost. Tangata whenua are affected when kaitiakitanga, harvest of food and other resources, and values associated with the mauri of land, water and living things are impacted.

² Appropriate use of incentives, regulation and voluntary methods are addressed in a later section.

³Streamside management includes reducing stock access through fencing or providing alternative water or shade, allowing grassy buffer strips to establish beside water, and sensitive grazing near waterways.

⁴A question mark indicates insufficient knowledge at this stage to quantify the risk

soil type, rainfall), and some management factors, especially vegetation cover (Figure 1).

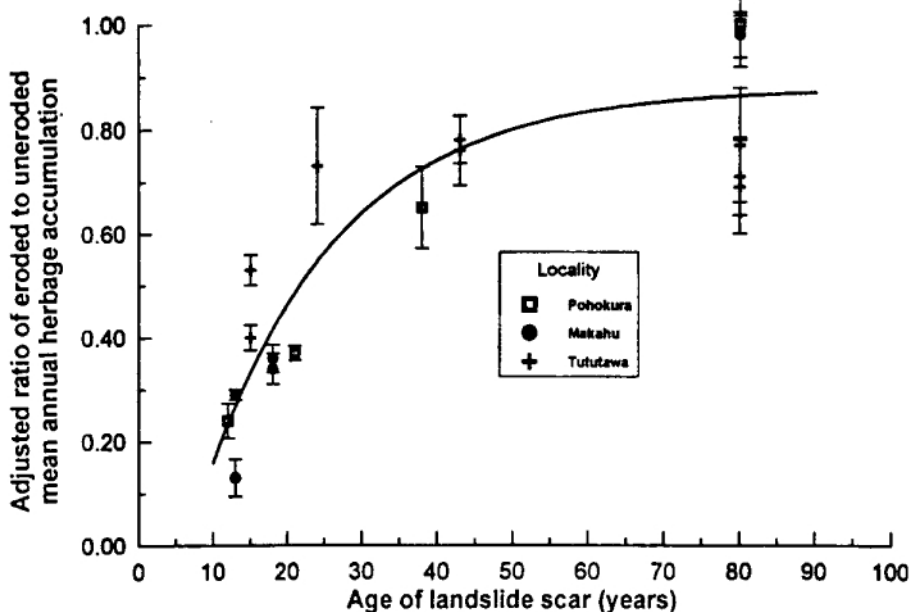


Source: Quinn, J. 1998 Results of a study on export of sediment from three catchments. Meeting notes, whatawhata Catchment Management Group 14/10/98

Figure 1: Soil loss under different land uses at Whatawhata

Slips produce far more sediment than either sheetwash (surface erosion from pasture) or streambank collapse, and are particularly damaging when they fall directly into a stream. Sheetwash from pasture is still a concern, however, as it contains higher concentrations of nutrients and faecal matter. Tracks and races can also channel run-off into streams.

When slips occur, the productivity of the affected land declines dramatically, then slowly climbs back towards its original status (see Figure 2).



Source: DeRose et al. 1995 Effects of landslide erosion on Taranaki hill pasture production and composition. NZ Journal of Agricultural Research v38.

Figure 2: Decline and recovery of soil productivity following slips

However, some commentators suggest that this productivity loss is not critical, for two reasons:

1. Fertilising, drenching, and grazing management can compensate for lower fertility.
2. Rates of soil loss have naturally declined since the decades following the peak of forest clearance, assisted by catchment schemes, and removal of production subsidies.

Consequently, while impacts on soil productivity are occurring, downstream effects may be more far-reaching. (See above table for a summary of these). Different downstream areas have varying vulnerability to such problems. The section on recommendations gives some priorities for action, based on the observations below.

It is clear that human use in some downstream waters (especially gathering shellfish) is at risk from faecal contamination. While our understanding of the role of water quality in causing human disease is still far from complete, animal faecal material is likely to be a concern, (as is human waste discharged to water). Diffuse animal waste is now thought to be a greater problem than point sources like dairy ponds. Hill country farming and more intensive lowland farming are both contributors to diffuse animal faecal pollution, because while hill farms have lower stocking rates, they are steeper than lowland farms and therefore a greater percentage of their animal waste runs off into waterways.

Flow and run-off variability is currently raising the cost of flood control in the Piako river, and may well be altering cave systems, where water regimes are critical for both cave biota, and for formation building (karstification).

Lake Taupo is particularly sensitive to nitrogen (see Ritchie 1999 for detail on this).

The other major concern is sediment, especially for caves, silt-sensitive fauna such as certain stream invertebrates (which require a stony streambed for habitat), estuarine bottom-feeders (which can be smothered by silt), and some native fish like the banded kokopu, (which avoid turbid rivers and slow their migration rate, and may be unable to reach their adult habitat in the headwaters). More work is needed to identify where silt is particularly damaging aquatic ecosystems and threatening specific species, as other factors such as riparian cover or passage may be more critical limitations for aquatic life.

2.1.2 Farm Management Practices To Address Erosion And Run-off

Stopping sediment at source is best done by **reafforesting steep slopes** or establishing adequate **soil conservation plantings**. Predicting where slips are likely to occur is the key to making soil conservation plantings cost-effective.

A great deal of sediment from historic slips is stored in valley bottoms. **Streamside management is therefore critical** to prevent this potentially erodable material from entering waterways. Reducing storm flows also lowers the risk of streambank scour.

Ultimately, addressing **contaminants in run-off** and **flow variability** in the hill country requires **land use change** (retiring steep slopes to tree cover), but **streamside management** and **retaining wetlands** are a good start (creating buffers, filters and sponges in the landscape). **Pasture and grazing management** also help, by retaining cover, and avoiding compaction and pugging to maximise infiltration. **Track design** assists by redirecting run-off away from streams onto grassy areas where it can be filtered.

2.2 Other Aquatic Habitat Issues

Issues and Effects (see note, Table 1)	On-Farm Management	Suggested EW Responses
High water temperatures, lack of cover and food inputs and obstructed passage, affecting: <ul style="list-style-type: none"> • aquatic life • harvesters 	<ul style="list-style-type: none"> • Shade/ riparian vegetation • Culvert and dam design to allow fish passage • Retaining wetlands and natural stream channels • Stock exclusion 	Identify limiting factors for particular sites/species (i.e. is it passage, silt, temperature, or over-harvest?) and promote appropriate actions

2.2.1 Defining The Problem Of Aquatic Habitat Degradation

In addition to the silt and flow variability problems described above, land use affects aquatic life in other ways. For example:

- culverts can create impassable waterfalls, preventing upstream migration of some fish,
- wetland drainage removes habitat,
- stock in or near streams and estuaries trample bottom-dwellers and spawning areas,
- a lack of streamside trees reduces food inputs and logs to hide under for aquatic life
- some fish and invertebrates cannot tolerate the high temperatures in unshaded streams.

The relative importance of each of these factors is species- and site-specific. For example, riparian vegetation in mid-catchment rivers and streams may well be the most critical limiting factor to increasing populations of some whitebait species (banded kokopu and koaro). Harvest issues are also impacting upon some species (e.g. eels).

2.2.2 Farm Management Practices To Retain And Improve Aquatic Habitat

Fortunately, most of these problems can be addressed by attention to the **land beside water** (e.g. by fencing and establishing shade), and the **stream channel** itself (including pipes and culverts). **Preserving (i.e. not draining) wetlands** is also critical.

2.3 Biodiversity On The Land

Issues and Effects (see notes, Table 1)	On-Farm Management	Suggested EW Responses
Reduced areas, fragmentation and pest damage in forests, scrub and wetlands, affecting: <ul style="list-style-type: none"> • indigenous life forms found in hill country habitat, especially threatened species 	<ul style="list-style-type: none"> • Pest control • Fencing • Retaining bush, scrub and wetlands • Legal protection 	Extend Key Ecological Sites work and regional funding. Identify strategic sites and pool resources with DoC and QEII. Lobby for greater regional council role in supporting biodiversity management on private land.

2.3.1 Defining The Problem Of Biodiversity Decline On The Land

Hill country indigenous ecosystems are far less depleted than lowland, coastal, and wetland areas and farmers have retained and protected many areas. This also means that hill country sites are often the last areas left for threatened species (such as kokako and kiwi). They are also worth protecting because they are often more sustainable and resilient than more modified habitat areas. The continuing decline in New Zealand's biodiversity is a major public concern, given that we have such a

high number of species that are found nowhere else. New Zealanders identify strongly with our natural heritage, and some of our icon species like the kiwi are now threatened. Maori have expressed concern that the particular relationships they have built up over time with the natural world are threatened by biodiversity decline.

Legislation has now restricted the logging of native trees to sites with a sustainable management plan. Often, clearing the remaining bush (which is mainly on steep slopes) is economically marginal. Pests and isolation of remnants are now the major concerns.

Environment Waikato has identified Key Ecological Sites in the Thames-Coromandel, Franklin and Waikato Districts and aims to progressively undertake integrated pest control and fencing in these sites, often in conjunction with community-based schemes. Large areas of the hill country undergo possum control funded by the Animal Health Board for Tb control. Other pests are not managed in this way, though there are key bird habitats which have had intensive control (e.g. for kokako).

2.3.2 Farm Management Practices To Retain And Improve Biodiversity On Land

Pest control is now the key management factor for our indigenous vegetation and fauna. Plant pests compete with native plants. Possums, rats, mustelids, cats, deer, goats and pigs browse, predate and compete with indigenous species. **Stock exclusion** is also required in many areas. **Key linkages and corridors** can be established to restore ecosystem processes, and improve the viability of species and habitats.

2.4 Other Issues

Issues and Effects (see notes, Table 1)	On-Farm Management	Suggested EW Responses
Pests and weeds, affecting: <ul style="list-style-type: none"> farmers terrestrial biodiversity 	<ul style="list-style-type: none"> Pest control Habitat manipulation 	Extend Key Ecological Sites work and regional funding. Look for win-win solutions for environment and production.
Climate change, affecting: <ul style="list-style-type: none"> regional, national and global biodiversity, and people 	<ul style="list-style-type: none"> Forest cover Pest control Stocking rates 	Work with central government. Lobby for carbon credits for small forests
Landscape values, affecting: <ul style="list-style-type: none"> residents and visitors 	<ul style="list-style-type: none"> All practices affecting state of land, water & vegetation 	Include in sub-catchment and group farm planning processes

3 Key Opportunities For Change On Farms

Given the above issues, some key opportunities can be identified for managing change in farming systems while minimising environmental and downstream impacts. Because hill country farms are complex, changes need to be tailored to each farm in order to be sustainable within the farm system. But complex systems also offer a wide range of adjustments to current practices, as well as opportunities for more substantial change to alternative land uses. Those which will give multiple benefits are described below.

Identifying Land That Is Better Suited For Tree Cover

Spaced plantings allow continued grazing while giving control over erosion. Timber crops may be the most profitable land use for some areas in the long term, will

retain soil productivity, and also have multiple benefits for water quality and flow and greenhouse emissions. While capital for investing in plantation forestry on farms is often a constraint, joint venture arrangements, for example with family members or friends, may overcome these. Allowing gullies, unproductive areas and key corridors or linkages to regenerate into native vegetation will have additional biodiversity benefits.

Managing Intensification Carefully, Especially In Streamside Areas

Many farmers are intensifying their use of flatter land, and grazing more cattle (beef or dairy grazers). This creates challenges as well as opportunities. Greater intensification on flatter land may provide more scope for retiring the more marginal slopes (see above). Farm planning can help match intensification to soil capability, improving feed regimes and avoiding pugging and run-off. Grazing practices that retain pasture cover and minimise compaction and pugging bring productivity benefits in the long and short term. The shift to intensive cattle grazing has also required many farmers to install reticulated water systems, making fencing of waterways more feasible. The widespread use of electric fencing helps, as one wire along a stream bank will exclude cattle, which have the greatest impact. Planting trees in these areas is usually not necessary, since rank grass can shade small streams adequately, and native vegetation will often regenerate unassisted. Pest control may be needed (see below).

Streamside Protection, And Provision Of Alternative Water Supply

Streamside protection gives the multiple benefits of:

- reducing land loss from streambank collapse,
- reducing stock losses in steep gullies and wet areas,
- animal health benefits from clean water; opportunity to dispense remedies in troughs
- shade and cover for stream life,
- excluding stock which deposit faeces and trample banks into streams, and
- establishing buffer strips which trap sediment, faeces and nutrients in farm run-off.

Where fencing is not feasible, alternative water and shade for stock, sited away from the waterway, will minimise damage to streams.

Track Design

On tracks, creating cut-offs to grassy areas filters farm run-off, giving water quality benefits and also lowering maintenance costs if water running on the track is reduced.

Retaining Wetlands

Wetland protection may require restraint as operations intensify and there is pressure to drain damp areas. Even small seeps and swamps act as sponges and filters, resulting in better water quality, less flood peaks, and less extreme low summer flows. They provide habitat for a range of wildlife and can also be attractive features on the farm.

Pest Control

Pest control is the key factor for bush and birdlife, which are often features on hill country farms. Pest control is a win-win if pests affect both the bush and the farm (e.g. possums). Community funding should be considered due to the wider public benefits.

4 Constraints On Hill Country Farms

Hill country farming, like all farming, is susceptible to fluctuations in the weather, the domestic economy, and international markets. Hill country farms occupy the most marginal land for farming, and the size of unit which is required to be economically sustainable has been steadily increasing. This places smaller farms and those with high debt in a difficult position. In response, farm families may have to:

- bring in more off-farm income (this is already occurring in many cases)
- borrow and expand
- intensify production where possible, to generate more income
- seek more profitable farm enterprises, including value-adding through processing or alternative products and markets, and non-land based activity like rural tourism
- cut costs, by working longer, hiring less staff, and/or buying less inputs
- sell the farm, often with a loss of equity.

The capacity of farmers to manage these changes depends on a number of factors such as location, support in the community and from government, skills of people on the farm, family members with time available, and the other goals that they have. In many cases, these changes mean people have less time and money for non-income earning activity. There may also be low morale and social and psychological stress. Hill country farmers on the whole are interested in sustaining resources. Many have taken steps already, and most have plans to do more, but these actions must compete against other priorities.

4.1 Implications Of These Constraints For Environment Waikato

This situation means that environmentally beneficial practices are more likely to be implemented if they bring financial benefits either directly, or by attracting a grant. Sound information provided in appropriate ways can help inform decision-making, but it may not overcome financial barriers. Regulating land use is widely regarded by farmers as an unhelpful imposition on their flexibility and a travesty of their property rights. Environment Waikato must weigh up all of these factors in deciding which types of intervention will achieve sustainable management, at least cost to farmers and ratepayers.

In addition to implementing rules, incentives and education, there are leadership, facilitation and strategic roles that the council can take to increase people's participation in fulfilling the purpose of the Resource Management Act. These include:

- research and monitoring, and making results accessible,
- participatory planning at a local level,
- building meaningful partnerships with tangata whenua
- community empowerment and capacity-building

5 Recommendations For Environment Waikato: Opportunities To Support Change

Overall, Environment Waikato has a range of initiatives in the hill country which, in combination, constitute a diverse policy response. It is recommended that this range be retained and refined as a general hill country response, with another level of more intensive support for specific priority areas.

There is a need for a cross-organisational prioritisation of effort, that identifies key locations and issues for more intensive approaches and combinations of initiatives. An ongoing process is required to monitor progress and review in the light of new information, concerns or pressures. This will require an **appropriate structure** that effectively **traverses existing internal boundaries** and can **co-ordinate prioritising, designing, funding and monitoring** for strategic projects. A co-ordinated response would mean that all staff knew not only where they were focusing their efforts, but also why. The prioritisation process requires:

- bringing together what we already know about human values and ecological needs, and overlaying these to build a better picture of the issues (this report is a start)
- filling critical gaps in our knowledge (see Section 5.4)
- identifying key limiting factors to human use and values or to ecological health
- matching these with appropriate actions and policy responses.

At this stage, it is unclear that more **regulatory initiatives** will be cost-effective, given the landholder resistance they generate and the difficulties in defining and enforcing rules for grazing. But the priority issues listed below should be closely monitored, and non-regulatory and incentive-based approaches pursued more vigorously in areas under threat. It may be possible to devise local rules where this is deemed necessary. Working with industry to achieve environmental quality assurance may provide some of the certainty and coverage of regulation without the associated costs, and should be pursued.

Greater **incentives for action** will be needed to assist implementation. While debate continues about the equity of the wider community paying to mitigate the effects of farming, this is a pragmatic way to achieve results when hill country farmers are under economic pressure. **Protecting biodiversity should be a priority for community funding**, given that there are limited on-farm benefits, and that ongoing biodiversity decline is not necessarily an 'effect' of current-day farming. The limitations of regional responsibility for terrestrial biodiversity under current mandates are recognised, but given the benefits of forested areas for flood control and soil conservation, and regional councils' pest management roles, much hill country habitat protection can still be done under current mandates. A further recommendation is to lobby for an expanded on-the-ground role for regional councils in managing biodiversity. The most significant **incentives for water and soil protection** should be directed to priority areas where work can be achieved at a sub-catchment, rather than individual property level, and where dialogue has achieved commitment to action and maintenance (e.g. via a Care group, group farm planning, or catchment planning process). A transitional funding period could be considered (i.e. a cut-off date). The need to legally bind future landowners to maintain works (e.g. on a title) must be balanced against the extra cost and bureaucracy involved. Wetlands may require specific focus as the values of these areas are not widely known.

Links should be maintained with **central government** during the emergence of **regional and rural development policy**. This should include discussions on what useful roles central government can play, given that many hill country properties are economically marginal (e.g. facilitation of boundary adjustment, generating alternative employment, financial input from government into ecosystem services such as biodiversity protection or carbon sequestration).

As **sovereignty issues** arise, **co-management** should be considered as a pathway for shared learning and positive environmental outcomes.

Farmer knowledge and input are central to the success of any initiatives, and there will always be a tension between the need for farmers to retain a sense of control, and the need for wider community input. However, where farmer knowledge and experience can be placed alongside that offered by others, where action

strategies are sought collaboratively, and where contributions come from various sources, it is likely that positive initiatives and outcomes will result.

Redefining with farmers the meaning of good farm management will take time. It requires trust and credibility. **Internal capacity-building** is needed, and sufficient time must be allocated so that staff can take part in strategies that bring people and science together to find solutions that will work on the land.

5.1 Recommendations For Defining Priority Areas

Priority areas need to be refined by **Resource Information** and **Policy Groups**, working with other agencies (e.g. DoC, NIWA) and communities. Ideas include:

- **Key areas for biodiversity** (large intact areas, sites where linkages would add great value, rare vegetation types or habitat, sites under pressure). Liaison with DoC and the QEII National Trust is needed to identify these sites and co-ordinate action. The Key Ecological Sites surveys and the Waikato Protection Strategy (Forest Heritage Fund) provide guidance. Pest control in such areas should go beyond possums to other pests, as is intended with Key Ecological Sites. There are large outstanding areas requiring pest control, fencing, and legal protection in the western hill country.
- **Nitrate leaching to Lake Taupo** which is affected by dry stock farming (for greater detail on managing nitrogen discharges, see Ritchie (1999)).
- **Areas which currently show high faecal contamination and have high use** e.g. some shellfish gathering sites, the Waikato river and some Coromandel streams used for swimming. Addressing both human (septic and sewerage discharges) and animal waste is required. Grazing management and buffer strips are key focus practices.
- **Vulnerable lakes, karst features, estuaries and harbours which are presently threatened by sediment.** Current initiatives in the Waitomo, Upper Waipa, Whaingaroa and Whangamata are good examples, as long as appropriate levels of resourcing follow in the implementation phase. Lakes with significant indigenous plant communities should be monitored for trends. More research is needed regarding the effects of sediment on specific cave systems and on biota in harbours, and particularly western harbours, where there is little research currently underway.
- **Freshwater invertebrates that are endemic to the Waikato Region.** Records of their occurrence should be reviewed, and riparian shade and streambank protection should be promoted in these sites. Protection of a range of habitat (e.g. forest cover at different altitudes, wetlands) will enhance the survival chances of species which have not yet been recorded.
- **Populations of native fish under threat.** Many of these fish migrate through the lower reaches of rivers, especially within 50km of the sea/ 100m altitude, and from August-December. To help focus efforts, an analysis should be done of regional water data to see when turbidity in these waters at this time of year approaches 20 NTU (a level shown in trials to produce 50% avoidance in banded kokopu, a silt-sensitive species). However, reducing silt may be less important than rectifying physical barriers to migration, protecting spawning areas, and providing woody riparian vegetation in streams and rivers at lower altitudes near the coast. Areas where short-jawed kokopu have been recorded should receive special attention, as their habitat is limited. More work is needed regarding other priorities (e.g. do we focus on rare species only, or should we aim for higher whitebait populations and a species mix that closer approximates that in undeveloped land?)

- **Culturally important areas, landscapes or resources and archaeological sites that are under threat.** These will usually be identified by local communities, hapu or iwi, and may need specific attention through means such as Care groups and Heritage Protection Orders. Liaison with tangata whenua is needed to protect spiritual values.
- **Catchments susceptible to flooding and low flows** (such as the Piako, and karst areas where percolation/flows to caves may be affected). Land use change may be needed for these sites, with appropriate community dialogue and funding strategies, including rate relief where feasible. (This is under development in the Piako.)
- In addition, the **impacts of dairy expansion into rolling lower hill country and heavier classes of stock** more generally in the hill country need to be monitored closely. Greater run-off of faecal material, nutrients and sediment are expected to result. New drainage associated with dairy development will compound these effects, and also have flood and aquatic habitat impacts.

5.2 A General Level Of Support For Hill Country Management

The basic level of service provision for hill country areas across-the-board would be to retain similar services as are currently provided, with some refinements. These include:

For the **Asset Management Group**

1. Clarifying funding criteria and make sure these are well understood by farmers
2. Supporting community-run, local mitigation funds where there is a downstream industry (along the lines of the South Waikato Environmental Initiatives Fund) and also supporting community-run nurseries to help re-establish riparian vegetation
3. Working to provide rating relief for good practice wherever this is practicable.

For the **Environmental Education Programme** and the **Resource Information Group**

1. Providing information that promotes sustainable land management as good farm management. Opportunities to present information include rural media, videos, factsheets, and existing discussion groups. Information could also be provided to real estate agents or valuers so that capital value gains from sustainable land use might improve. Specific information promotion could include:
 - The effect on yields of soil loss and pugging, and the costs to production
 - The concept that most farms have areas which are low producing and inputs are better put into other areas (giving examples with dollar values)
 - The practical benefits of sustainability practices such as paddock subdivision, gully retirement and alternative water and shade provision
 - The multiple environmental, recreational and aesthetic values of wetlands
 - The profitability of alternative land uses such as pine and other tree species
 - Ways to finance forestry on the farm
 - Suitable tree species for different localities in the Region
 - Pest control techniques for both economic and environmental benefit
 - Information on unique biota, communities or features that exist in a locality, the types of threat they face, and the management practices that would be of benefit
 - Low cost initiatives/ how to select priority sites for action
 - Networks and contacts e.g. Farm Forestry Assn, QEII National Trust, CRIs.

5.3 More Intensive Support For Priority Areas

A second level of more intensive effort is suggested for some sites and issues identified above. Specific actions should be customised for priority areas in consultation with local people. They could include:

- Active dissemination of information about the catchment or local environment
- Ensuring particular landholders have information on special values on their property or significant potential impacts on downstream values
- Farm planning – especially group capacity-building to produce farm plans
- Study groups and decision support tools based on the strengths and weaknesses of the farm's land/soil types, combining economic, farm physical, and environmental aspects
- Local field days with examples of good practice, even small things that can make a difference (such as any local winners of merit awards in the FEA)
- Proactive promotion of Care groups and more intensive support to them
- Particular school-based initiatives around the key issues of that locality
- Stronger liaison with Maori land trusts/marae to address specific concerns or barriers
- Participatory research projects with science agencies, farmers, iwi, hapu etc.
- Learning processes involving people with different perspectives. The focus could range from a single farm (e.g. Westview-Gwavas project), to sub-catchments (e.g. Whatawhata catchment group), and even to larger catchments (e.g. Upper Waipa).

5.4 Recommendations For Further Monitoring And Research

Continued research effort is required into both best practice and most cost-effective practice for significant issues. Environment Waikato can play a critical liaison role between researchers and land users, working closely with CRIs to tie PGSF-funded research to policy development and to support farmers and communities to take action. **Resource Information, Environmental Education, and Policy** staff need to work together on this. Some ideas for relevant topics are suggested below.

5.4.1 Understanding The Issues And Threats

- Monitoring trends in land use types, systems and practices
- More information on the effect of silt on river mouths and west coast harbours
- Further coverage by Protected Natural Area / Key Ecological Site survey programmes
- Research into what we can expect from well-managed modified catchments, as benchmarks (e.g. Waitomo) - for other topography, soil types and land use patterns.
- Better understanding of food-gathering patterns and important social/cultural sites (within the constraints of the sensitivity of this type of information).
- Further research on limiting factors for different species of native aquatic biota.
- Comprehensive survey of archaeological sites in the hill country
- Better understanding of animal pathogens and human disease – incidence of human disease-causing organisms in animal faeces, how they travel to water, what is their fate, how they are communicated to humans (underway at MIRINZ-AgResearch)

5.4.2 Understanding Management Factors And Benefits

- Factors linked to better environmental performance by some catchments, areas or farms under the same land use (i.e. analysing outliers to identify which farm management factors make a difference)

- Practical farm-level research into the effects of various management practices, especially research that helps landowners to identify significant constraints on ecosystem health (e.g. whether the limiting factor is habitat or contaminants).
- Maori-based research on how to manage for mauri, waahi tapu and mahinga kai.
- Quantifying economic benefits of practices e.g. weight gains from clean water
- Practical ways of killing mustelids