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HAWKE'S BAY
REGIONAL COUNCIL

LAND FOR LIFE

TUKITUKI LAND CARE- HIGH RISK EROSION ACTION PLAN DEMONSTRATION OPTIONS

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November 2025 - Matt Highway EIS

EXECUTIVE SUMMARY

The Land for Life High Risk Erosion Action Plan Demonstration Options provides Tukituki Land Care with a first cut, farmer-led pathway for demonstrating the reduction of erosion in the four priority hill-country sub catchments of Mangamahaki, Mangarara, Makara and Hāwea. These areas contain steep, highly erodible mudstone and claystone slopes with high sediment yields, ageing erosion plantings and increasing vulnerability to storm events. While landowners have a strong understanding of their landscape and a long history of erosion control planting, recent workshops showed that decisions are often held back by uncertainty. Farmers want clearer guidance on what works in real Tukituki conditions, how much it costs, and how to choose between poplars, natives, mixed systems, direct seeding and sediment trapping options.

The project combined farmer workshops, mapping, erosion modelling and technical review to identify a practical suite of demonstration options that reflect both proven practice and farmer interest in innovation. Participants strongly supported poplars and willows on critical slopes, native fencing and reversion in marginal areas, and simple sediment traps. They also expressed interest in innovative techniques such as legumes on slips, DIY bunds, drone seeding and on-farm native nurseries. Equally, they highlighted the limitations of pine on steep country, crack willow in riparian areas and the challenge of poor survival rates for both natives and poles.

The priority matrix developed through this process outlines seven demonstration themes spanning erosion reduction, biodiversity, water quality and farmer learning. Rather than establishing large new trials, the most cost-effective approach is to document and evaluate existing treatments already widespread across the catchment, complemented by targeted new demonstrations such as direct seeding trials and sediment-trap retrofits. This approach creates a locally credible evidence base farmers can trust, with practical examples of cost, performance, survival and maintenance under real conditions.

The next phase will focus on confirming demonstration sites with landowners, preparing monitoring tools and communication products, and implementing key demonstrations from July 2026. Field days, case studies and simple decision support tools will be essential to building lasting confidence and supporting the wider uptake of erosion-control practices across Tukituki.

CHAPTER 1 -
INTRODUCTION TO TLC LAND FOR LIFE PROJECT

Tukituki Land Care (TLC) has already invested heavily in understanding its landscape through The Big Picture project, which brought together science, mapping and farmer knowledge across all seventeen sub-catchments. With this foundation in place, the next step is to turn knowledge into targeted action in the four priority hill country sub-catchments of Mangamahaki, Mangarara, Makara and Hāwea (figure 1), where erosion risk is highest and where landowners are ready to act. These areas contain steep, highly erodible mudstone and claystone slopes, high sediment yields and ageing erosion plantings, making erosion reduction critical for both environmental and economic resilience.

Workshops with farmers showed strong support for practical, cost-effective erosion solutions that can be applied with confidence on real farms. Farmers expressed a desire for trusted guidance on what works, why it works and what it costs, as well as the ability to compare tried and true approaches with new methods. They also highlighted a clear need for better decision support tools and examples that reflect actual Tukituki conditions, rather than generic advice. While landowners are motivated and willing, uncertainty about techniques, maintenance requirements and long-term outcomes could be slowing uptake.

The High Risk Erosion Action Plan approach, is the first stage to respond to that need. This project is designed to demonstrate the techniques that reduce erosion and its impacts through a range of demonstration approaches designed to provide farmers with more confidence to act. The project focuses on finding, documenting and evaluating treatment methods already present in the landscape, as well as creating new demonstration trials. By assessing, documenting and communicating how these approaches are performing now, under real Tukituki conditions, the plan will build a credible, local evidence base that farmers can rely on. Case studies, simple monitoring and clear communication products will help make confident decisions that support both farm goals and catchment outcomes.

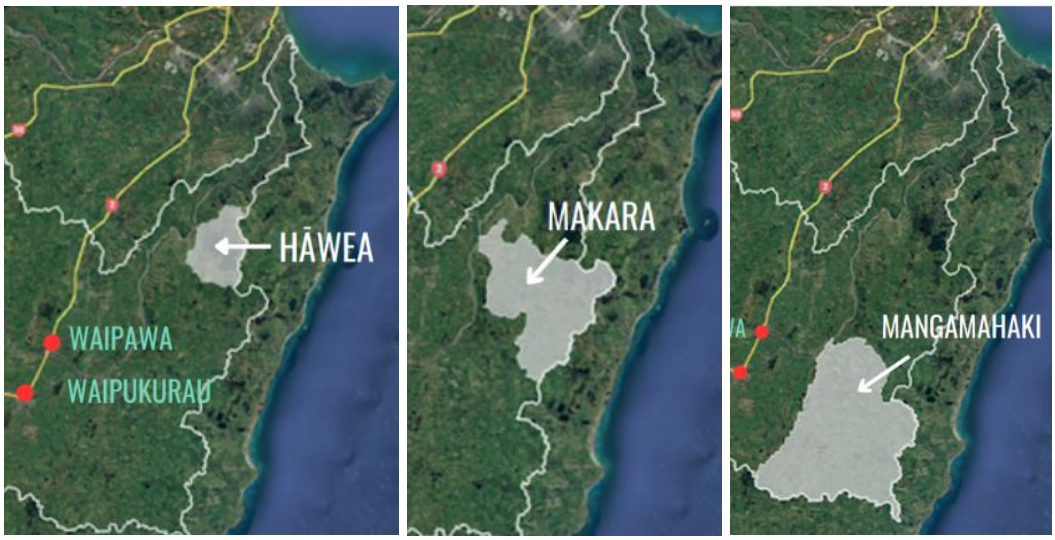

Figure 1 – Locations of the three catchments of the Wider Tukituki. These three catchments have been chosen as they have some of the most significant erosion challenges in the catchment.

CHAPTER 2 - METHODS

1. Project Approach

This action plan was developed through a structured process that combined local knowledge, farmer workshops, erosion mapping and technical review. The aim was to identify practical, high impact demonstration options that reflect real farm conditions in the four priority hill country subcatchments.

1.1. Farmer Engagement

A facilitated session was held with landowners from Mangamahaki, Mangarara, Makara and Hawea. Farmers were presented with land for life goals and a series of erosion control options that have worked locally or nationally. A feedback session was central to this engagement, where farmers rotated through discussion stations to identify what works on their farms, what does not, and what they want to see more or less of. This included drawing opportunity areas on large maps that were provided.

The workshop captured consistent themes such as strong support for poplar planting, native fencing and reversion, and interest in innovative approaches including legumes on slips, DIY bunds and on-farms and native nurseries. They also highlighted challenges such as pine failure on steep slopes, crack willow removal, and the need to improve native survival rates.

1.2. Workshop results

Key questions were presented to farmers during the workshop. The questions were focussed on what works and doesn't work, and what they would like to see more of or less of (table 1).

Table 1 – Workshop results outlining what farmers would like to would like to see more of or less of, what works and doesn't work in an erosion reduction context.

What Works?	What Doesn't Work?
Feedlot (of willows) on flow path into dam areas	Pine does not work well as shelterbelt – creates dead ground and cold
Native shelterbelts	Crack willow taking out riparian planting (in cyclone). Flaxes and cabbage trees were
Fence off dams	
Planting poles + 1 wire fencing	
What Do We Want to See Less Of?	**What Do We Want to See More Of?**
Pine	Common sense approaches
Erosion	Poplar
	Establish on-farm nurseries (provide cheaper natives)
	Increased survival rates in new plantings (current rates include about ~50% loss of plants)

	Different approaches for example legumes on slip faces.
	DIY bunds / debris dams/ retro fitting dams
	Bunds (& retro-fitting dams)

Workshop participants were presented with typical soil conservation and sediment capture actions, noting how "The Big Picture" project enables some of these actions to be implemented, including the prioritisation approaches, and maps that could be used to focus effort.

As part of the workshop all participants were given 3 votes to mark down where they think land for life should prioritise effort. The below table outlines the results of that session (table 2).

Table 2 – Voting results from the land for life workshop on what types of erosion control techniques they would like to see

Category	Tried & True	Cost Effective	Innovative / Cutting Edge	Other Notes
Wetlands	6	2	2	
Hill Erosion	8	13	5	Want to see how to scale. Better communication of practices
Bunds/ sediment traps etc	2	3	1	Includes sediment bunds and debris dams Some existing bunds have failed.
Riparian	0	2	2	Need new ideas on planting to cope with sediment.
Other Ideas	Examples: manuka (Timata), grazing management, mixed grazing, direct seeding			
Notes	Would like knowledge on how to repair when something has gone wrong. How to tie L4L in with existing TLC strategy			

Workshop facilitators also asked participants to confirm, by raising hands who would prefer tried and true approaches and understanding best practice, versus trying new innovative approaches.

Most participants (12) opted for innovative approaches, while others (4) would prefer tried and true approaches. This voting does not mean TLC have to choose one over the other, it was just a gauge of where the thoughts were in the room at the time.

CHAPTER 3 – PRIORTY MATRIX OF DEMONSTRATION OPTIONS AND ALIGNMENT TO OUTCOME AREAS

The below table 3 outlines a priority matrix and the full range of demonstration options available to Tukituki Land Care as [part of the Land for Life project. The details of each demonstration option are outlined fully in the below chapters, this table however provides a short overview of how each demonstration option contributes to Tukituki Land Care's L4L outcomes. While there is a huge range of options available, these options have been built from farmer feedback explored in the workshop. This 1-page summary is a useful comparison tool, however increased detail and richness of demonstration options is covered in the below chapters.

Outcome areas key: Erosion reduction; Increased native afforestation; Increased biodiversity Improved water quality; Demonstration trial/ corridors. The more stars the greater the outcome area is meet, using a scale of 0-3 stars.

Table 3 - Demonstration options mapped against key outcomes to guide investment, site selection and farmer decision making.

Action Area	Outcome areas					Purpose	ROI (to meet PCG goals)	Scale	Scalability	Demonstration action	Demonstration benefits
1. Poplar and willow space planting on critical slopes	***			**	*	Reduce erosion on the worst hill country while keeping land in productive pasture. Demonstrate and communicate existing good practice to enhance uptake	**Medium – High** helps meet core erosion issues at reasonable cost; long track record and high farmer acceptance. Does not meet all goals	Individual paddocks or sub catchments; tens to hundreds of poles	Very scalable with existing pole supply and contractors	Document real-world examples perform under Tukituki conditions, build a locally credible evidence base and communicate good practice so farmers can act with confidence	Give farmers confidence to act, irrespective of their specific situation and goals. Decision support tools that last and are freely available.
2. Mixed systems: poplars with native understorey or native islands	**	**	**	*	*	Combine proven erosion control trees with targeted natives to create future native corridors at modest extra cost	**High** meets multiple goals; slightly higher cost than poles alone but far higher biodiversity and cultural value	Small to medium areas on key ridges, gullies and riparian lines	Scalable over time as budgets allow and as farmers see good examples	Find and document existing popular and native mixes. Create case studies. If needed, underplant and infill with native shrubs and trees; create fenced seed islands on marginal land	Show farmers how to lift biodiversity and create corridors without losing profitability. Provide practical examples that make it easy to choose when and where to add natives.
3. Native reversion pockets on marginal land	**	***	**	*	*	Retire very steep or marginal faces and assist natural regeneration into indigenous shrubland and forest	**Medium** core issue but higher cost and slower erosion payback than poplars; very good biodiversity return, but loss of production	Small pockets across farms where grazing value is low and erosion is hard to control.	Scalable as an implementation approach across the entire catchment once approaches are proven	Case study existing native planting on erosion sites. Implement low cost, low diversity, resilient, native planting (for example: manuka, kanuka, tauhinu)	Provide clarity on when reversion is worth it, how quickly natives return, and what level of effort and management is realistic. Helps guide low-cost options for hard-to-farm areas.
4. Direct seeding of native shrubs on slips and slopes	**	**	**	**	***	Test whether low-cost seeding can jump start native cover on eroding slopes and gullies, providing a low-cost approach	**Medium – High** low upfront cost per hectare but biological risk and variable success	Possible large scale where erosion is fenced off.	Scalable if success rates are satisfactory and seed supply issues are solved	Prepare strips, reduce grass competition, sow a range of species including, mānuka and kānuka mixes, manage grazing, monitor germination and survival	Evidence for or against direct seeding as a tool, opportunities for large scale native establishment if successful, strong story for innovation funding
5. Legume and grass seeding on slips and inter tree spaces	**			*	**	Improve ground cover and pasture recovery around erosion features and under tree plantings	**Low - Medium** helps meet core issue of surface erosion at low cost, but limited biodiversity and native benefits. Unable to slow deeper erosion.	Can be applied broadly across farms where aerial or ground seeding is practical	Highly scalable using existing farm practice	Sow suitable legumes and grasses on slips, with fertiliser if required.	Evidence for or against direct seeding as a tool, opportunities for large scale native establishment if successful, strong story for innovation funding
6. Hill country sediment traps/ detention bunds and ponds	*			**	***	Capture coarse and some fine sediment from small hill country catchments before it enters main streams	**Medium** helps meet sediment and water goals but does not address root cause; requires maintenance	Individual gullies or drains	Scalable where suitable topography and space exist	Design and excavate small traps. Locate sites using TLCs TWI model. Monitor inlets and outlets, periodically remove sediment	Show the effectiveness of sediment capture after storms, easy visual demonstration of "mud caught here rather than ending up in the river".
7. Constructed or enhanced wetlands	*			**	***	Provide "kidneys" that clean runoff from mixed land use, while delivering high value wetland habitat	**Low - Medium** meets multiple goals but high capital cost, so best for strategic sites and partnership funding	Typically, one to a few hectares treating catchments of ten to several hundred hectares	Scalable where there are suitable low-lying sites and co funding; not every farm will have a suitable site	Design and build wetlands following current guidelines, plant with natives, integrate into farm layout, monitor inflow and outflow quality	Show the cost effectiveness and reduction in sediment and nutrients, improved ecological values. Wetlands can become iconic demonstration sites suitable for field days.

CHAPTER 4 -
OPTION 1: COST EFFECTIVE HILL COUNTRY EROSION

2. Why trees matter on hill country

Erosion costs New Zealand an estimated 100 to 150 million dollars each year in lost production, causing infrastructure damage and downstream flood management[1]. Much of this sediment originates from shallow landslides, earthflows and gullies. Erosion is natural but is disproportionally triggered during large storms on steeper, erodible slopes.

Long term research shows that tall woody cover is one of the few options that can substantially reduce hill country erosion at scale. A national review concluded that closed canopy tall woody vegetation can reduce landsliding during major storms by about seventy to ninety per cent, and that well established space-planted trees can achieve similar reductions if survival and spacing are adequate[2]. Poplars and willows have been the primary hill country erosion tool for more than fifty years in New Zealand pastoral landscapes as they are effective and inexpensive compared to other methods.

3. Afforestation options for Tukituki Land for Life

3.1. Poplars and willows

- Poles can be installed rapidly, with minimal site preparation, and can often be grazed once established (typically 1 year after planting).
- Compared with native species such as tōtara and kānuka, they reach effective root size much faster, meaning equivalent erosion protection after about fifteen years rather than forty or more.
- Poplar is best suited to dry or moderately dry hill slopes, where survival and root development outperform willow[3]. Willow is preferred on wetter slopes, gullies, riparian margins, and streambanks, performing better in areas prone to piping, slumping, or high groundwater, where soils remain moist
- Both species have deep, wide root systems that stabilise approximately 200–300 m^2 of soil per tree, increasing shear strength and reducing landslide risk[4].
- Space-planted poplars and willows can reduce shallow landsliding by 70–90%, making them among the most effective hill-country erosion tools available[5]

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[1] Ministry for Primary Industries. (2018). *Hill Country Erosion Fund* [Factsheet]. New Zealand Government. https://www.mpi.govt.nz/hill-country-erosion-programme

[2] Basher, L. R. (2013). *Erosion processes and their control in New Zealand*. Landcare Research for the Ministry for the Environment.

[3] McIvor, I. R., & Douglas, G. B. (2011). *Poplars and willows in hill country – stabilising soils and storing carbon*. Paper presented at NZ Grasslands Conference. Massey University. https://www.massey.ac.nz/~flrc/workshops/12/Manuscripts/McIvor_2012.pdf

[4] McIvor, I. R., & Douglas, G. B. (2011). *Poplars and willows in hill country – stabilising soils and storing carbon*. Paper presented at NZ Grasslands Conference. Massey University. https://www.massey.ac.nz/~flrc/workshops/12/Manuscripts/McIvor_2012.pdf

[5] Douglas, G. B., McIvor, I., Potter, J. F., & Marden, M. (2010). *Reducing shallow landslide occurrence in East Coast hill country: A review of poplar and willow research and practice*. New Zealand Journal of Forestry, 55(3), 3–8.

3.2. Space Planted Native Forest

- Best suited to moderate slopes where full retirement is impractical, but landowners want native presence and future forest structure[6]
- Provides moderate erosion control initially, becoming effective long term as deep-rooted native trees mature[7]
- Offers high biodiversity value, as even sparse native trees create structure and perching sites that accelerate natural regeneration[8]

3.3. Native Trees with Stock Exclusion

- Suited to gully floors, riparian margins, headwater streams, and steep escarpments, where native establishment is slower but long-term benefits are highest[9]
- Once established, native shrublands and forests provide strong long-term erosion control comparable to exotic forests, with far higher ecological value[7].
- Erosion control is moderate in the first decade, becoming high long-term as root networks and canopy develop[7].
- Provides obviously high biodiversity value.

3.4. Afforestation with Alternative Exotic Species (Eucalyptus, Cypress, Douglas-fir, Redwoods, Acacia)

- General Benefits
    - Often more climate- and disease-resilient than radiata[10]
- Eucalyptus spp. (fast-growing hardwoods)
    - Very fast early growth, excellent for quick canopy closure.
    - Deep roots provide strong slope reinforcement.
- Cupressus spp. (*cypresses*)
    - Suitable for drier regions; moderate-to-high erosion control.
    - Disease resilience relative to radiata.
- Douglas-fir (*Pseudotsuga menziesii*)
    - Deep rooting and strong anchoring capacity on cool hill country.
    - Slow initial growth but strong long-term stability.
- Redwoods (*Sequoia sempervirens, Sequoiadendron giganteum*)
    - High carbon sequestration and long-term canopy permanence

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[6] Tāne's Tree Trust. (2021). *Establishing native trees on erosion-prone land*. Tāne's Tree Trust Technical Guide. https://www.tanesforest.nz

[7] Basher, L. R., & Phillips, C. J. (2019). *Tōtara, kānuka and mānuka for erosion control on marginal farmland: A review of scientific evidence*. MPI Technical Paper No. 2018/67. Ministry for Primary Industries.

[8] Tāne's Tree Trust. (n.d.). *Accelerating landscape scale restoration of native forest*. https://www.tanestrees.org.nz/projects/accelerating-landscape-scale-restoration-of-native-forest/

[9] Tāne's Tree Trust. (2021). *Establishing native trees on erosion-prone land*. Tāne's Tree Trust Technical Guide. https://www.tanesforest.nz

[10] Scion (2020). *Alternative Forestry Species – Technical Series*.

    - Deep, fibrous root systems provide excellent erosion stability.
- Acacia melanoxylon (blackwood)
    - Nitrogen-fixing, rapid early growth, stabilises soils quickly.
    - Valued hardwood timber species

4. Meeting Multiple Outcomes for Tukituki Land for Life

While many of the above options enable soil conservation, funders and the Tukituki community are also seeking multiple outcomes. Exotic trees alone do not deliver the same biodiversity, cultural outcomes as indigenous vegetation. Native forest and shrublands provide a richer structure, greater variety of flowering and fruiting species and higher habitat value for birds, lizards and invertebrates.

The cost challenge is that full native planting on steep country is expensive. The Tanes Trees "seed islands" guidance highlights indicative costs of twenty thousand dollars or more per hectare for blanket native planting, which is often impractical at landscape scale. To meet multiple outcomes, that are cost effective and scalable is pushes Tukituki Landcare hill country planting should lean towards smart combinations of:

- Space-planted poplars on the worst erosion features.
- Targeted native planting and assisted reversion in key gullies.
- Corridor and seed-island design that use small pockets of native planting.

However, demonstration of newly planted sites is unlikely to be of the highest value, given there is already a range of planting techniques demonstrated Tukituki farmers. Instead, as noted by workshop participants it is the understanding of good practice, the maintenance challenges, uptake and confidence to act that will help meet land for life objectives.

5. Demonstration and trial design for tree-based erosion control

5.1. Approach to Hill Country Demonstration

Many Tukituki landowners already understand the value of soil conservation planting. The issue is not willingness to act but confidence in choosing the right option for the right place. Farmers often feel unsure about how different treatments perform on different erosion types, what they cost over time, and how native, exotic or mixed systems compare in real Tukituki conditions. Without clear local evidence, decisions feel uncertain and people tend to rely on familiar practices. It is assumed that providing simple, locally grounded information, in a way that farmers need it an can access it, will help farmers make decisions with greater confidence.

With a limited budget and a landscape that already contains decades of poplar planting, native regeneration, riparian fencing and mixed systems, the most practical approach for Tukituki Landcare is not to establish large new trials, but instead to locate and evaluate treatments that already exist across the catchment. By documenting how these real-world examples perform under Tukituki conditions, the programme can quickly build a locally credible evidence base and identify which practices offer the best erosion, biodiversity and water-quality outcomes in different settings.

5.2. Active Erosion Sites

The first set of demonstration sites should focus on poplar and willow plantings on active erosion features. Many farms already have poles on landslip heads, earthflow sites and gullies, and by selecting a small number of representative sites and documenting clone type, spacing, age, survival and erosion reduction, Tukituki Landcare can develop a clear picture of how well space-planted poplars and willows perform across the catchment in different locations.

Monitoring these sites also allows for collection of farmer experience around grazing, maintenance and storm behaviour. The outputs can form short case studies showing what “good” hill country erosion management looks like, what it costs, and how effective it is.

5.3. Mixed poplar/ native systems

A second group of demonstration sites should examine mixed poplar and native systems. Across Tukituki there should be some places where native shrubs or seedlings are emerging under and between poplars. Assessing a small number of gullies, spurs or ridges where poplars and natives coexist will help illustrate how microclimate, shade and moisture created by pole plantings influence native regeneration. These evaluations can then be used to show farmers how poplar programmes might be adapted or gradually transitioned toward native-dominated systems without retiring large amounts of grazing land.

5.4. Native Reversion

The third set of sites should focus on native reversion in marginal areas. Steep faces, riparian edges demonstrate a variety of regeneration. By documenting the differences in establishment, cover, stability and cost across existing examples, Tukituki Land Care can provide landowners with realistic expectations around how quickly native vegetation can develop and what level of effort is required relative to exotic options. One option is to implement low-cost well-spaced planting of Manuka, kanuka or Tauhinu. See the Tīmata method for more information[11].

5.5. Improving uptake and confidence to act

Once documented, these examples and case studies should be translated into farmer-friendly communication tools. Decision-support tools can help farmers match treatment types to slope, erosion mechanism, cost and long-term objectives. Field days and farm walks will reinforce these messages, using real sites and farmer experience to build trust and confidence in the recommended approaches.

By grounding the programme in what is already working in Tukituki, and by communicating farmer led actions clearly, farmers will be better equipped to choose the erosion-control methods that best fit their land, budget and long-term aspirations.

[11] https://ourlandandwater.nz/news/the-timata-method-for-low-cost-native-forest/

CHAPTER 5 -
OPTION 2: DIRECT SEEDING HILL COUNTRY EROSION

6. Direct Seeding for Erosion Overview

Direct seeding is the practice of sowing seed directly into pasture or bare soil, rather than planting nursery raised seedlings. For restoration practitioners like Tukituki Landcare it offers a potential way to establish native shrubs, or improve ground cover with legumes and grasses, at lower cost than conventional planting.

6.1. Evidence for native direct seeding

Research on direct seeding in New Zealand, is relatively sparse and not highly conclusive. Work by Dodd and colleagues[12] tested direct seeding of indigenous shrubs and trees into hill country pasture. The study showed that direct seeding could successfully establish at least two shrub species when soil moisture and competition were managed carefully. Mob stocking just after sowing in spring helped by checking pasture, but the same approach was less effective in autumn when soils were drier.

A broader review[13] of direct seeding for native restoration across exotic grasslands highlighted several recurring points:

- Pioneer shrubs with small seed and tolerance of open conditions, such as mānuka and kānuka, show the best prospects.
- Seedbed preparation and reduction of competition are critical. Herbicide strips, light cultivation or surface scarification can all improve results.
- Grazing and browsing must be carefully managed. Light pre-sowing grazing or mob stocking can help, but seedlings need protection from repeated grazing once they emerge.
- Establishment success is variable between seasons and sites, so risk is far more variable than when planting with seedlings.

Additionally, a study of direct seeding of *Carex* species in New Zealand wetlands noted that weed competition and soil moisture were the two largest factors influencing success[14]

In terms of dollars per hectare, direct seeding can be cheaper than planting, particularly when the alternative is dense planting of seedlings at a thousand to two thousand stems per hectare. Seed and application costs are modest, but the true cost effectiveness depends on germination rates and on the value placed on early survival. A high degree of failure and risk can increase the overall establishment costs and could in fact provide a higher cost overall compared to conventional planting.

[12] Dodd, M. B., & Power, I. L. (2007). Direct seeding of native shrubs and trees on pasture: Effects of pre- and post-sowing management. *New Zealand Journal of Ecology*, 31(2), 139–147.
[13] Douglas, G. B., Dodd, M. B., & Power, I. L. (2007). Potential of direct seeding for establishing native plants into pastoral land in New Zealand. *New Zealand Journal of Ecology, 31*(2), 143–147.
[14] Highway, M. (2020). The feasibility of hydroseeding Carex species as a restoration technique (Unpublished master's thesis). University of Auckland.

6.2. Direct seeding of legumes and grasses

Hill country farms already use over sowing and direct drilling to introduce improved pasture species and legumes onto steep land that cannot be fully cultivated. Legumes such as clovers and lotus fix nitrogen and improve pasture quality and can be a great start in low nutrient slip sites. Researchers have found that a vigorous sward of legumes and grasses reduces sheet and rill erosion on slopes but does not give the deep root reinforcement that trees provide for larger slips, so they may provide limited cover[15].

From an erosion perspective, direct seeded or oversown legumes and grasses are best viewed as supporting measures that:

- Protect soil between trees
- Speed recovery of ground cover after disturbance
- Can be used on gentler slopes where the risk is surface erosion rather than big landslides.
- Legume and grass seeding is relatively cheap and already familiar to farmers, but provides limited additional biodiversity and does not replace tree planting for deep-seated erosion[16].

7. Direct seeding demonstration design

A practical way to test direct seeding in Tukituki is to establish one or two small demonstration areas and trial all seeding methods side by side. This creates a clear comparison of what works, what is marginal, and what delivers the best mix of erosion and native regeneration benefits. Each demonstration area can be one to three hectares, divided into treatment strips on similar slopes.

7.1. Choosing and mapping sites

Select paddock corners or small sub catchments that have recent slips or areas of bare soil, moderate to steep slopes with thin soils, and ideally some nearby native seed sources. Combine all treatments in the same area so performance differences relate to the method, not the site.

7.2. Treatment options to test in one unified demonstration

The demonstration should include a full suite of direct seeding approaches. This allows farmers to see all options in one site together and compare effort, cost and establishment rates. If there is a soil slip with a range of slopes and aspects this will also enable testing of direct seeding on real world slopes.

A. **Native shrub direct seeding on slips and steep faces**
   Use mixes dominated by manuka and kanuka, with small amounts of hardy shrubs where seed is available. Sow onto prepared strips on small slips.
B. **Legume and grass seeding on adjacent slopes**
   Oversow clovers and grasses to test how quickly ground cover reestablishes compared with native mixes.

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[15] Basher, L. R. (2013). *Erosion processes and their control in New Zealand*. Landcare Research for the Ministry for the Environment.

[16] Basher, L. R., Botha, N., Dodd, M. B., Douglas, G. B., Lynn, I., Marden, M., McIvor, I. R., & Smith, W. (2008). *Hill country erosion: A review of knowledge on erosion processes, mitigation options, social learning and their long-term effectiveness in the management of hill country erosion* (Landcare Research Contract Report LC0708/081). Landcare Research.

C. **Native direct seeding under or between trees**
   Apply native seed mixes in new or existing poplar or willow blocks to test whether a native understorey can be encouraged beneath partial shade.
D. **Control strips**
   Include untreated strips that follow the same grazing and fertiliser management. Where possible, establish a small planted reference plot of native seedlings to compare cost and survival.

7.3. Application technique testing

A. **Drone seeding techniques**
   Trial the use of small aerial drones to apply both native seed mixes and legume mixes. This is useful for hard to reach faces, narrow gullies and slopes where it is unsafe to work on foot.
B. **Seed carrying dogs**
   Include a small feasibility trial where trained dogs carry and release seeds across steep or broken terrain[17]. This emerging method has been used in other regions to spread native seed in areas that are difficult or unsafe for people but could be a great option for highly skilled farmers and sheep dogs in NZ. A cheap method to test effectiveness could be to use dyed rice, sand or similar biodegradable substitutes that will be easy to monitor.
C. **Hydo-seeding/ slurry application**
   Apply seed mixtures at the same rates as above, using a slurry mixture of typical slope application, using tackifiers and soil.
D. **Hand broadcasting**
   Test the above techniques against the effectiveness of hand broadcast methods.

8. Direct Seeding Implementation

8.1. Site selection

Choosing an existing slip site or retired area will be key. Sites should be free of vegetation, and a range of slopes and aspects should be chosen to trial.

8.2. Carrying out the seeding

For native plants, use species that are most likely to survive in Hawkes Bay hill country. Use local eco-sourced seed wherever possible.

Calibrate sowing rates using supplier advice and past research, but where possible apply at very high sowing rates. This will determine the seeding percentage effectiveness and help inform future sowing rates if this is a viable option.

Sowing for sensitive species is best in late winter or early spring when soil moisture improves and frost risk declines. Trials should include simple broadcast methods that farmers can replicate, alongside hydroseeding, drone application and dog delivery where appropriate.

[17] https://greatergood.com/blogs/news/dogs-reseed-forests

8.3. Managing, monitoring and reporting

Keep stock out of sites with permanent fencing. TLC may wish to trial grass and legume planting in the presence of stock, however that may have low likelihood of success. Establish photo points and fixed quadrats to monitor germination, seedling density, ground cover and any early signs of rill or sheet erosion. Record all costs in detail, including seed, application method, fencing, spraying and any drone or dog deployment time or operating costs.

Consistent monitoring should include weed establishment and cover. Changes to the management approach to weeding should be implemented as required. Techniques, time taken, costs and management changes should be recorded throughout.

This seeding demonstration will not produce immediate native forest, but it will provide clear evidence on which direct seeding options are realistic for Tukituki conditions. Working out how quickly they establish, and how they compare in cost and practicality will be the main goal. By testing all methods together, the demonstration becomes a useful decision-making tool for farmers across the catchment. With good management, monitoring and communication, even if these trials fail, it will provide good evidence of what to do or not do in the future.

CHAPTER 6 -
OPTION 3: SEDIMENT TRAPPING

9. Why sediment trapping matters

Even with excellent hill country treatment, some sediment will always move downslope into streams. Sediment trapping aims to intercept this material before it reaches main channels, and to slow water so that fine particles can settle.

Sediment trapping will not be as effective as soil conservation techniques in hill country. However sediment trapping can add a lot of value when strategically places and when using techniques like wetlands that boost habitat.

New Zealand research on sediment traps shows that their annual effectiveness at capturing sediment varies widely, from about ten to ninety-eight per cent of the sediment load, depending on design, storm size, location and maintenance regime[18].

9.1. The value of trapping sediments

- Sediment traps are relatively cheap to build with a digger and can be located where they intercept concentrated flows. They are most effective where there is enough flat area to build low bunds and decant structures. However, they require ongoing maintenance to remove accumulated sediment and manage vegetation.
- Constructed wetlands are more expensive per hectare than simple traps because they involve larger excavations, shaping, inlet and outlet structures and planting. Case study examples report costs of several hundred thousand dollars for wetlands in the one to two hectare range treating catchments of more than one hundred hectares.
- In terms of multi outcomes, constructed or managed wetlands in particular score highly for native biodiversity and water quality, while traps by themselves are mainly sediment tools unless planted and managed as wetland habitat.

10. Sediment trapping demonstration design

For Tukituki Landcare the aim should be to show a small suite of low-risk, easily replicated sediment management options that farmers can copy or commission.

10.1. Option 1 – retrofitting existing dams for sediment capture

Demonstrate practical approaches for using existing dam infrastructure to trap sediments. This will likely include identification of appropriate dams that can be retro fitted across the trial catchments, identify case studies where this has already occurred, and promote good practice.

10.2. Option 2 - Series of small sediment traps in a hill country gullies

[18] Chris Smith, L., & Muirhead, R. W. (2023). A review of the effectiveness of sediment traps for New Zealand agriculture. *New Zealand Journal of Agricultural Research*, *67*(5), 547–564.

Demonstrate practical trap design and maintenance on a typical eroding farm gully. Use a small sub-catchment of 10-20 hectares for small sediment traps or larger, 50-80 hectares for detention bund sediment traps.

10.3. Option 3 - Small constructed or enhanced wetland

Show the performance and co benefits of a well-designed wetland that treats runoff or drainage from a modest sized catchment. Measure the sediment accumulation at site, alongside biodiversity and water quality changes through the wetland.

10.4. Option 4 - Riparian/ vegetated sediment filters in CSAs

Highlight the value of vegetated riparian strips at concentrating sediment before it enters traps or wetlands. These are simply a stock excluded critical source area (CSA) with rank grass or native sedges designed to slow flows and trap sediment. Ideally large CSAs or a series of CSA along a single stream network.

10.5. Monitoring in brief

- Photo points
- Periodic measurement of sediment depth in traps to estimate accumulation
- Farmer observation on maintenance effort and performance during storms.
- Before and after sampling of turbidity and nutrients at inlets and outlets during selected events, at a level appropriate to budget
- Bird and plant species observations
- Visual recording of water clarity in the downstream reach.

CHAPTER 7 – CONCLUSION AND NEXT STEPS

10.1. Land for Life Tukituki Demonstration Site Option Conclusion

The first stage of the High Risk Erosion Action Plan has confirmed that Tukituki farmers are willing to act but need clearer, locally grounded guidance to help with decision making. The October workshops showed strong interest in practical, cost-effective erosion solutions, with farmers emphasising poplar planting, native fencing, reversion pockets, legumes on slips, and innovative approaches such as DIY bunds and on-farm native nurseries. At the same time, participants were clear about the limitations of some approaches, particularly pine on steep slopes, crack willow in riparian zones, and the ongoing challenge of low native and pole survival rates. These insights underpin how demonstration sites should be selected and communicated.

The analysis of treatment options in the action plan highlights that the catchment already contains many examples of erosion control plantings, native regeneration, sediment traps and mixed systems. The most valuable next step is therefore not to create large new trials, but to document, evaluate and communicate the performance of existing treatments and to set up a small number of targeted demonstrations where there are clear knowledge gaps. This approach will build a trusted evidence base under real Tukituki conditions, reduce uncertainty for landowners, and support confident decision making.

Looking ahead, the priority is to seek feedback from landowners to confirm the demonstration options, and which align most with farmer feedback and catchment priorities. Ultimately, the success of Land for Life in Tukituki will depend on how well these examples are communicated and how easily farmers can apply the lessons on their own land. Building simple, durable decision support tools, running farm walks and field days, and developing farmer-led case studies is likely essential for long term uptake.

10.2. Next Steps

1. **Confirm demonstration sites and farmer partners (Dec 2025 – Feb 2026)**

- Review this plan with TLC, HBRC, iwi and other partners as needed to confirm priorities.
- Work directly with landowners in the four sub catchments to identify suitable demonstration types.

2. **Prepare for implementation (March – April 2026)**

- Finalise monitoring methods, photo points, data sheets and reporting templates.
- Develop early communication materials, including simple guidance sheets, case study templates and decision support tools built from farmer priorities.
- Establish any required fencing, site preparation or drone/seed supply arrangements for direct seeding trials.

3. **Deliver the demonstrations (July – August 2026)**

- Implement the selected soil conservation, direct seeding and sediment trapping demonstrations.
- Begin baseline monitoring and document the immediate practical lessons and on-farm experience.

4. **Evaluate and communicate results (Sept – Oct 2026)**

- Complete a first round of evaluation, focusing on what is working, where challenges are emerging and how each treatment performs relative to expectations.
- Produce farmer focused communication products including visual summaries, case studies, maps and short guidance notes.
- Share results through field days, farm walks and online resources to support wider uptake across Tukituki.