

# PLANTING PLANS MADE EASY

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## Summary

- Riparian management is a key approach to help maintain and improve water quality in New Zealand waterways.
- Under the Sustainable Dairying: Water Accord (“Water Accord”), all dairy farms with accord-defined waterways require a riparian management plan by 2020.
- Barriers to meeting the Water Accord riparian commitment include the lack of a nationally consistent tool or template and the time and cost required to tailor-make an effective riparian plan.
- The *Riparian Planner* is an online tool that will help farmers and rural professionals develop an effective riparian plan quickly and freely. The tool is supported by instructional videos and guides on a range of riparian management actions online (e.g., drain management, stock exclusion guidance, weed or pest control – <http://www.dairynz.co.nz/waterways>).
- Built-in mapping tools, calculators and regionally-tailored guidance gives accurate information which can be easily updated, allowing adjustment of an existing plan to ensure accuracy or in light of changes to the farm (e.g., financial, natural, policy changes).
- A plan can be downloaded, emailed and printed in a range of formats suitable for the farm owner, manager and staff, and milk supply companies.

## Why is riparian management important for water quality?

Riparian management is generally considered to be the management of waterway margins for water quality protection or enhancement through stock exclusion and enhanced bankside

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vegetation cover, whether of grass, shrubs or trees. Riparian corridors act as the interface between land and water and can exert a disproportionately large benefit to improving water quality (Naiman and Decamps, 1997; Quinn, 2009).

Livestock exclusion enhances soil structure, protecting riverbanks from erosion under high flows or treading damage (Cooper et al., 1995; Collier and Quinn, 2003; Parkyn et al., 2003; Hughes, 2016) and reduces stream sedimentation which benefits aquatic insects and fish (Rutherford et al., 1999; McDowell 2008). In the Waikato, Nguyen et al. (1998) demonstrated that grazing and treading alone raises total nitrogen and phosphorus loading from margins by 89% and >94%, respectively. Likewise, on smaller low-order streams (<2 m width) the dominant source of sediment to water is typically from livestock treading (Wilcock et al., 2013; Hughes, 2016). A study of New Zealand waterways (Storey, 2010) found strong positive correlations between livestock exclusion and riparian habitat (provided both banks undergo fencing). In addition, Monaghan et al (2010) modelled a reduction in *E.coli* and total phosphorus loading of 35-40%, from total livestock exclusion on dairy farms in Southland (Oreti River – associated principally with erosion and defecation). Stock exclusion can reduce inputs of ammoniacal-nitrogen to waterways by 25-75%, (Goldsmith et al., 2013). In wetlands, stock exclusion improves soil structure and permits the build-up of organic carbon, promoting denitrification and the permanent removal of nitrogen before it can enter streams and rivers (Hill, 1996, Quinn, 2009).

Livestock exclusion then permits the choice between maintaining a grass filter strip and/or planting retired riparian margins. Grass filter strips are highly effective at intercepting runoff and retaining nutrients, sediment and faecal pathogens on-land and reducing diffuse contaminant inputs from pastoral land to waterways (McKergow et al., 2008; Quinn, 2009). For instance, Smith (1989) demonstrated that un-grazed riparian margins (~10-13m) in Tauwhare (Waikato, NZ) can reduce suspended sediment and particulate phosphorus inputs by up to 87% and 84%, respectively, most of which is captured within the first few metres from the fence line. Grass margins of three metres width reduced loads of suspended solids, total nitrogen and total phosphorus by 35-87% at a site in the Bay of Plenty (McKergow et al., 2008). This is in line with international estimates of grass filters (<5 m) reducing total nitrogen, total phosphorus and suspended solids by 51-74% (Dillaha et al., 1989). Whilst considerable particulate loading can occur during a few, intensive rainfall events (Abell et al., 2013), grass filters are still considered highly effective (As with any mitigation, efficacy will vary between farm, principally due to bypass of filters by.) A study of Southland soils demonstrated that runoff velocity slowed by 71% in pasture grass compared to cattle-grazed forage plots (under winter rainfall scenarios) (Goldsmith et al., 2013).

Practical guidance often recommends that all riparian margins should retain a grass filter strip of approximately one metre adjacent to fence lines – both to allow for filtration of runoff

and to prevent livestock damaging fences or plants. Planting remaining marginal areas should always be tailored for the intended water quality objective. For instance, in lower reaches of catchments undercutting and mass failure (bank slumping) are believed to dominate sediment loading – here, planting deep-rooted or “upper bank” trees can offer a soft engineering solution to issues of water clarity, loss of instream habitat and phosphorus inputs (Quinn, 2009). Additionally, nuisance algal blooms can be controlled directly through shading of the channel bed (of >60%) (Quinn et al., 1997; Davies-Colley and Quinn, 1998). Notably, water temperature is believed to constrain native aquatic insect and fish communities throughout New Zealand, especially in pastoral lowland catchments where riparian vegetation also offers valuable spawning habitat (Richardson et al., 1994; Quinn et al., 1997). Determining the effect of riparian planting upon shade and then temperature is complex but Rutherford et al., (1999) demonstrated that a drop in peak temperatures of 5°C required plantings that offer ≥75% shade along ≥1-5 km for upland streams (1st order) and ≥10-20 km for lowland streams (5th order). Waterway shading is a function of channel width (Davies-Colley and Quinn, 1998).

The demonstrable link between riparian margins and water quality in New Zealand underlines the increasing importance placed on riparian management by the regional and national Government (MfE, 2016). Accordingly, the dairy industry has voluntarily committed to effective riparian management in the Sustainable Dairying: Water Accord (“Water Accord”; DELG, 2013).

## **Why a riparian planning tool**

Under the Water Accord, all dairy farms in New Zealand with waterways greater than a metre and deeper than 30 cm will require a riparian management plan (RMP) by 2020, with actions outlined in the RMP to be completed by 2030.

Current estimates place this at approximately 8,500 farms requiring a detailed breakdown of Water Accord waterway goals, actions and timeframes around stock exclusion, planting and maintenance within the next four years. The current delivery of these riparian management plans by expert consultants or land managers is limited by their number and the cost or time

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taken to generate a plan. Based on current progress using these traditional extension pathways, it was clear that Water Accord targets could not be met.

Other immediate barriers to successful riparian management were identified as a lack of farmer-friendly resourcing, guidance and support. Still, longer-term barriers to implementing any plan exist, including the need to accommodate unforeseen circumstances in a “living” plan, which can be updated and adjusted for changes in the natural environment (e.g., flooding, drought, wind throw, wildfire) and changes to finances.

In order to reach this target and provide readily accessible waterway management advice, a new approach was needed. Hence, DairyNZ and Landcare Research have developed the “*Riparian Planner*” – a flexible, user-driven and comprehensive online tool to quickly automate and regionalise the creation of riparian plans.

## **The development of the Riparian Planner**

The *Riparian Planner* is funded by dairy farmers (through their levy to DairyNZ) and the Ministry for Primary Industries (as part of the Transforming the Dairy Value Chain Primary Growth Partnership programme) and Landcare Research. The explicit goal has been to meet the needs of dairy farmers as part of the industry commitment to riparian management.

Development of the tool has been guided by experienced riparian management professionals (e.g., New Zealand Association of Resource Management [NZARM] during alpha testing and later directly, with farmers and regional authority riparian experts during beta testing). This external feedback has been acted upon to ensure functionality meets the requirements of the sector, regional and national stakeholders supporting dairy farmers.

This end user feedback cycle led to development of a four-step planning process:

1. Personalising a plan – to ensure the plan is user-driven and is specific to their location and situation
2. Map out and describe waterways – to prioritise suitable actions, areas affected and costs
3. Set actions and timeframes – cost and settle on the extent of suitable actions on a yearly-basis for five years (e.g., site preparation, fencing, planting, crossings, on-going maintenance)
4. Summarise the above for download, printing and editing in later years – offering multiple summary formats.

## **How does the Riparian Planner work?**

The *Riparian Planner* is a secure and freely available web based online tool. Sign up and login is hosted through a third party security service that requires a unique login and password. To ease registration, users can link to their Gmail or Facebook accounts. Authorisation from your linked email account is all that is required. At no point is any information created with the

*Riparian Planner* shared with either service. Alternatively users can register using a valid email address and password. Throughout, helpful information is linked and highlighted for users on each of the four steps.

All users land on a tailored “My plans” homepage following sign-in, where all riparian plans are stored (i.e., valuable both for farmers planning separately on a milking platform to support block, or equally to professionals delivering multiple plans to land holders).

### ***Describe plan***

A new plan is started by clicking the ‘Create a new plan’ button. This will prompt the user to begin by distinguishing and personalising their plan, including name, starting date, and supply number. A valid supply number will help locate the farm on the map used during the next planning step. Previously created plans can be updated at a later time by selecting the plan name.

### ***Map waterways***

The *Riparian Planner* uses intuitive web mapping to allow the user to draw their waterways (including wetlands and critical source areas) onto an aerial image of the farm. Using geo-referenced supply numbers, the map will automatically centre the aerial image on their dairy shed. Waterways to mark include ponds/lakes, stream/drains and wetlands/critical source areas. The first two waterway types are linear tools and the latter a polygon. Once drawn, users are prompted to describe each waterway, or section of waterway later following delineation of all waterways (e.g., erosion status, stock exclusion, vegetation cover, weed dominance and setback into three zones from fence to river of grass, upper and lower bank). Answers prompt later guidance and recommended actions. Setback is defined as a whole-of-waterway average to prevent spurious precision later deriving inaccurate costs – the result of aerial imagery being limited to 10-20 m resolution.

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## ***Plan and cost actions***

Users choose to select or alter pre-defined costs for riparian management (e.g., fencing, plants, labour or other). Then a sliding “effort meter”, a spatial calculator linked to the earlier definition of the riparian margin extent, allows the user to determine what proportion of a waterway to plant over a five-year timeframe. This decision is then informed both by guidance on whether this would be beneficial and its cost. The riparian plan output should reduce the incidence of poor riparian management from insufficient knowledge of the effort required to plant a margin effectively (i.e., with greater awareness of initial preparation, planting and later maintenance costs).

The *Riparian Planner* is extremely flexible, offering many combination of actions, before presenting this both by waterway and year simultaneously so the user is able to operate within temporal and financial constraints. A key benefit is that users can return to update their actions at a later date should earlier decision-making require revision.

## ***Summarise the plan***

The *Riparian Planner* summarises in two alternative ways: an overview of waterways actions over all years, presenting the net cost or detail of riparian management from start to finish of the plan (useful for reporting purposes); or by year, presenting the actions by waterway for each year in sequence (useful for management purposes). Accompanying both reporting summaries is a regionally-tailored list of recommended upper and lower bank plants, available from most nurseries, with relevant tolerances and benefits highlighted in case users have more specific goals (e.g., biodiversity, habitat). The summary and regionally tailored guidance can be downloaded, emailed or printed directly.

## **Why use the Riparian Planner?**

It is free, secure and trusted by both the dairy industry and experts to enable rural professionals and farmers alike to develop, review, and update a riparian plan. Add to this, the speed and flexibility afforded users in setting actions or timeframes, with a high level of detail, and you have access to a regionally-tailored but nationally consistent service able to support land holders to improve water quality regardless of the policy, financial or natural environment.

The *Riparian Planner* improves planning by breaking riparian management down into achievable, farmer-agreed actions. While water quality problems are complex, the *Riparian Planner* simplifies and speeds up the process of effective riparian management on-farm. The *Riparian Planner* is a valuable new tool for riparian management planning and will help dairy farmers and the industry to achieve the targets outlined in the Sustainable Dairying: Water Accord.

## What can you do?

If you have waterways on your property, or work with farmers who do, then you can use the tool at: <http://www.dairynz.co.nz/environment/waterways/riparian-planner>.

Here you will find the Riparian Planner, supporting videos and user guides as well as links to riparian management guides and technotes on waterways management.

Please contact one of the DairyNZ authors above on 0800 4 DAIRYNZ or the riparian planner team on [riparianplanner@dairynz.co.nz](mailto:riparianplanner@dairynz.co.nz) if you have any further questions comments or suggestions.

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