FarmAPT to identify targeted water quality mitigation practices at farm-scale

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āta mātai, mātai whetū

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DairyNZ's ongoing commitment to GFP

- Clean Streams Water Accord
- Sustainable Dairying: Water Accord
- Dairy Tomorrow: protect and nurture
  - FEPs
  - **GFP (Good Farming Practice)**
  - Nutrient use and targets
  - Catchment-scale projects
  - **Track change in response to actions on dairy farms**
  - Measure and manage for water quality and GHG emissions
- **Support uptake of actions on-farm**

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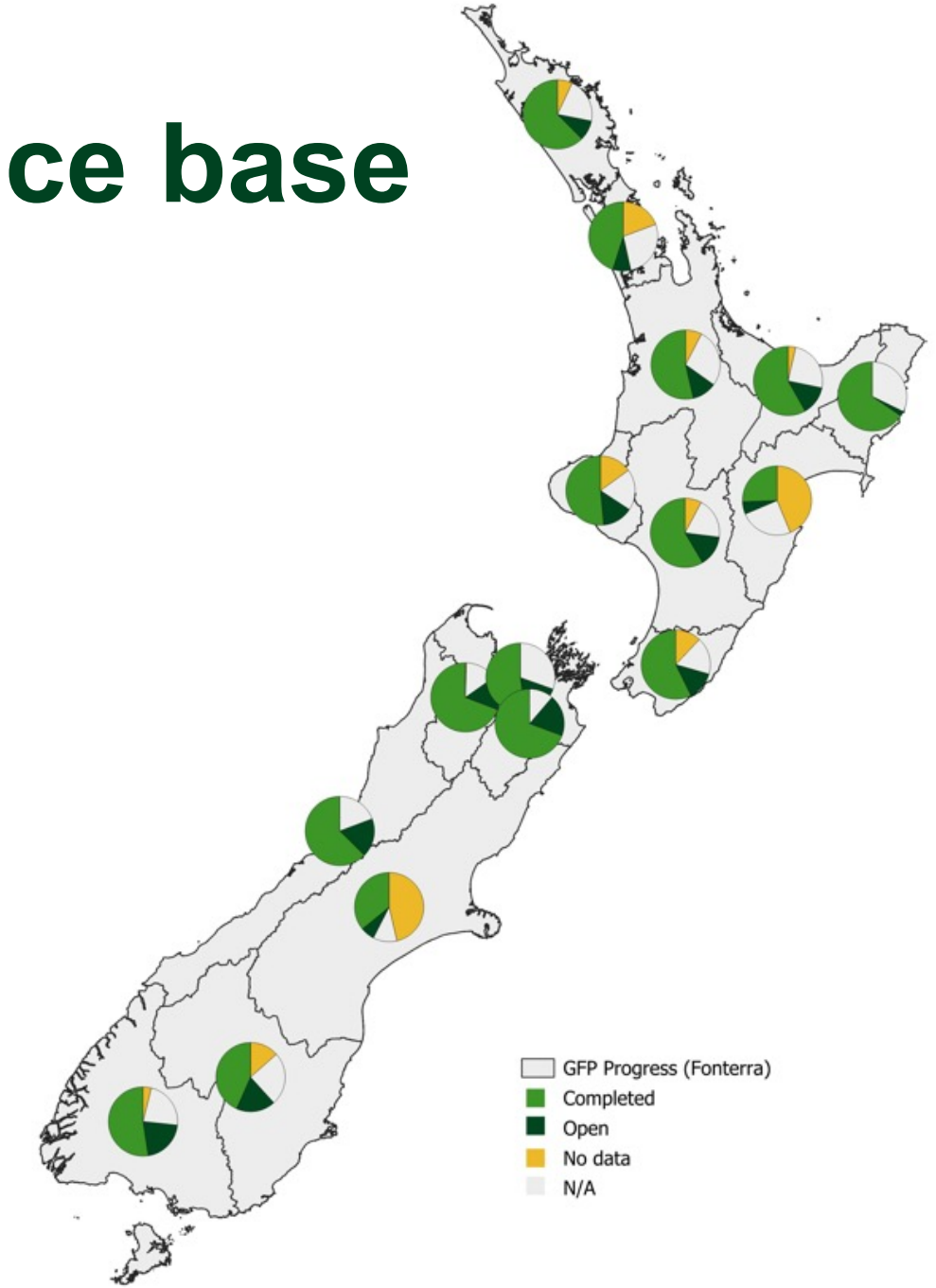
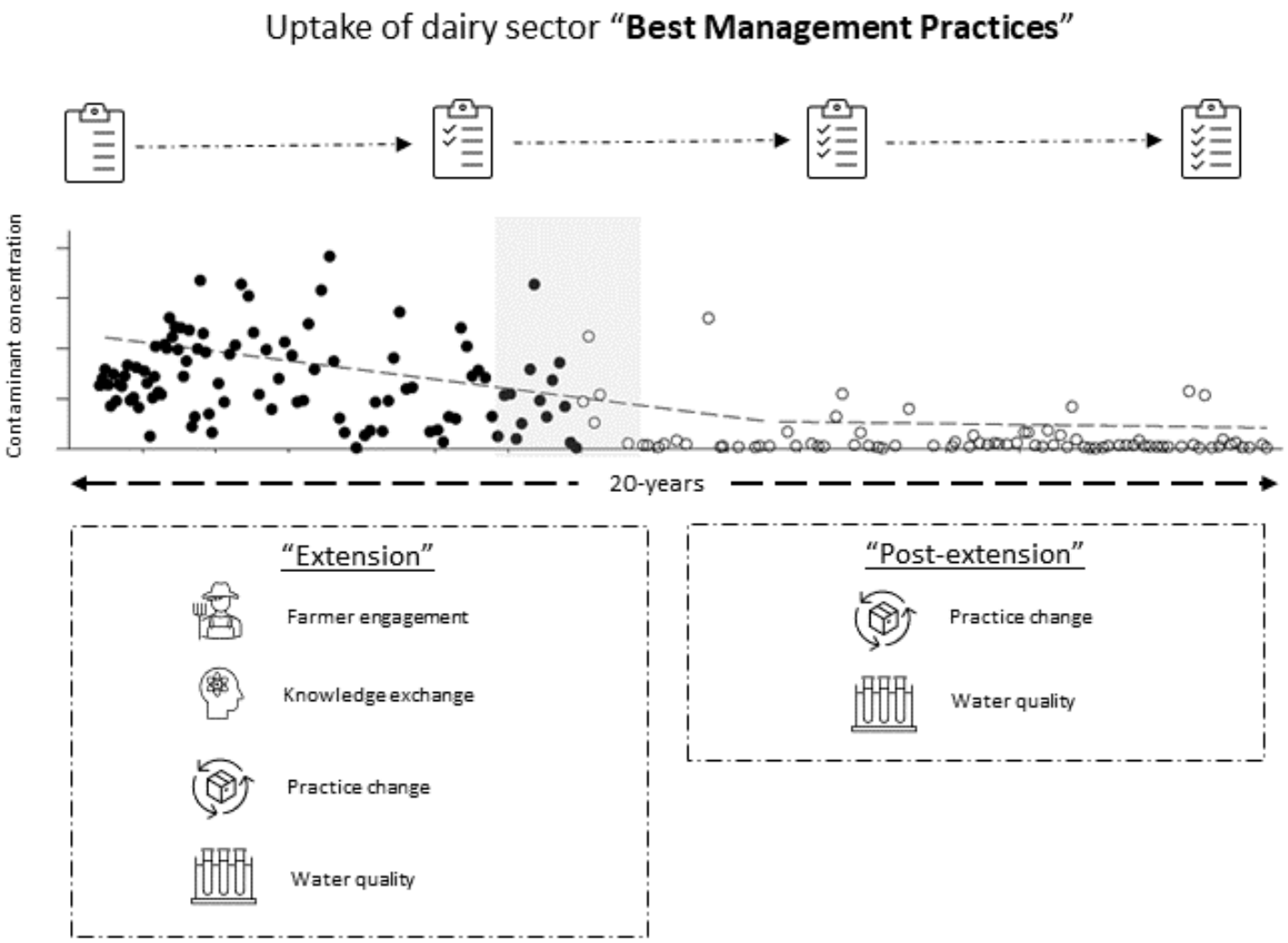
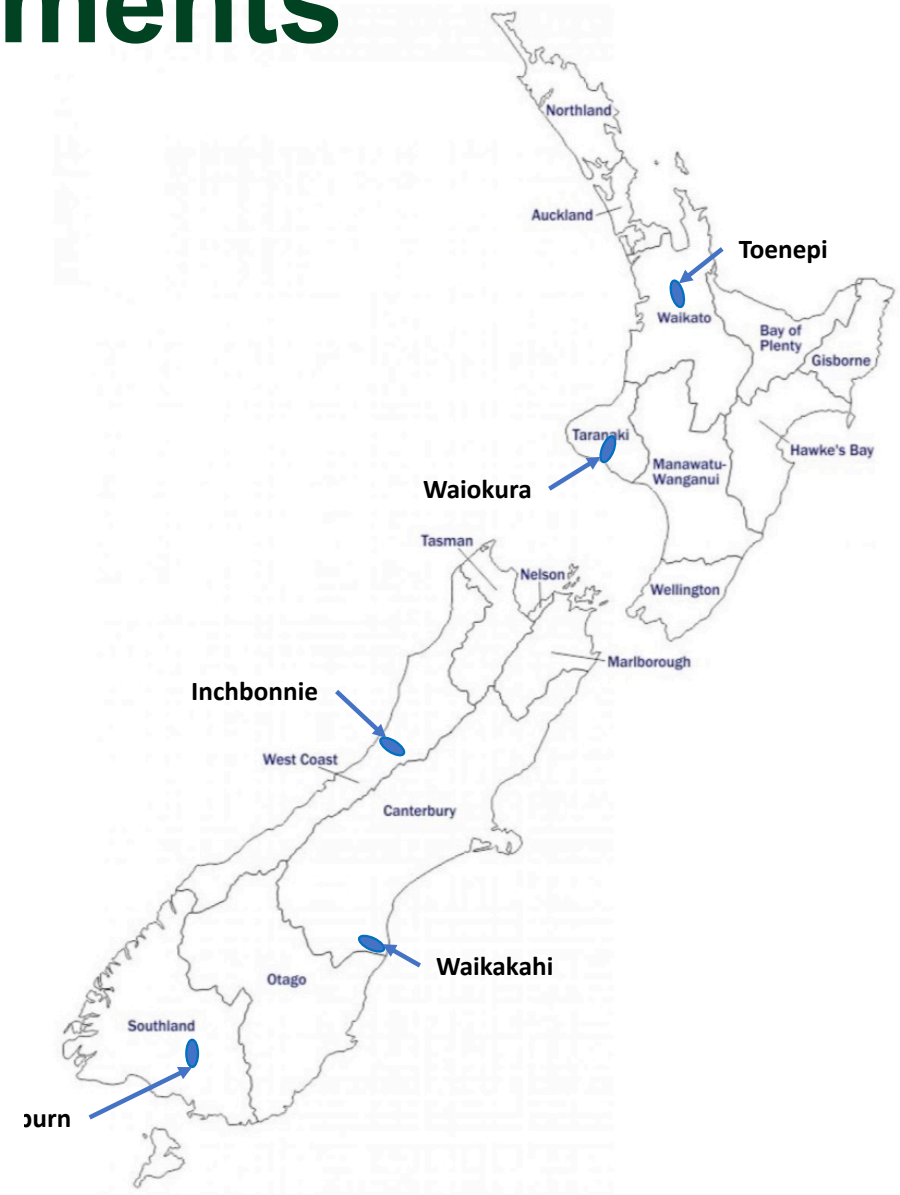
Practice change – evidence base

- **Best Practice Dairy Catchments**
- Baseline – 10-yr. period
- Dairy Tomorrow
- Fonterra – Tiaki & Insights Report
- Other data sources



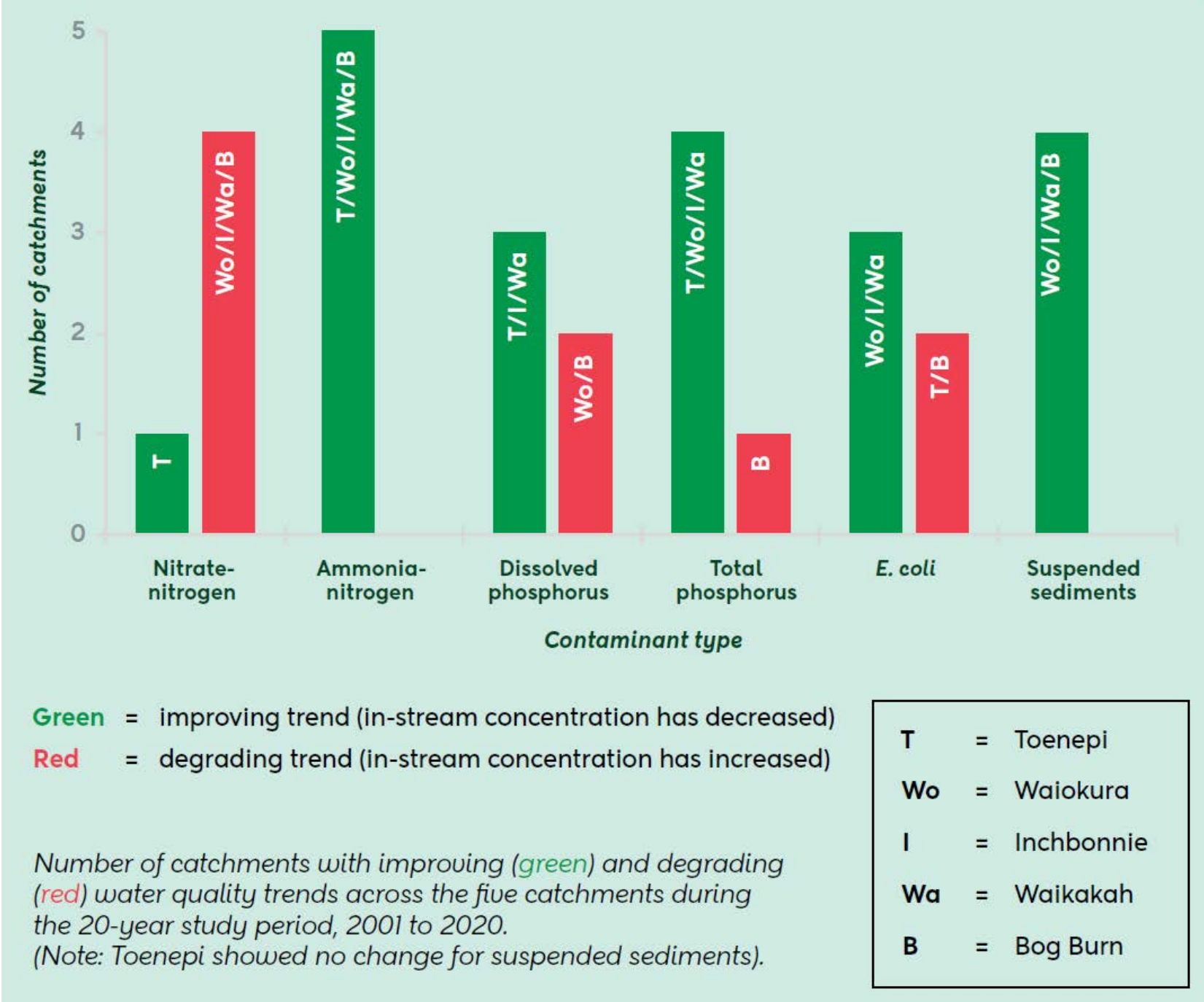
Best Practice Dairy Catchments





20-years

- Two-thirds of in-stream water quality trends were improving
- Some were degrading, especially nitrate-nitrogen



Number of catchments with improving (green) and degrading (red) water quality trends across the five catchments during the 20-year study period, 2001 to 2020.
(Note: Toenepi showed no change for suspended sediments).

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Linking the uptake of best management practices on dairy farms to catchment water quality improvement over a 20-year period

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Inside Dairy

Your levy in action

Farm tech trends

Wearables, automation and getting value from the spend

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Good practice has flow-on effects

While a 20-year research project indicates good farming practices have improved water quality, it's also shown more can be done by everyone within the sector to help all farmers meet targets.

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FarmAPT – support uptake of actions

- **Farm Action Prioritisation Tool** (for dairy)
- Freshwater farm plans
- Online geospatial resource tool
- API – OCD, Fonterra, QCONZ
- Identify & prioritise mitigations for water quality
- Easy access to data & resources
- Used in conjunction with expert knowledge & farm visit(s)

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fep.opencountry.co.nz/FarmAPT

The Farm Action Prioritisation Tool (FarmAPT) was developed by DairyNZ with funding from the DairyNZ dairy farmer levy, in collaboration with AgResearch, and co-funded by the Our Land and Water National Science Challenge Rural Professionals Fund 2020-21

LOCATION

PROPERTY TITLES

ZOOM LEVEL

1km

TYPOLOGY

Climate: Cool | Warm

Soil: Light | Well draining | Poor draining

Slope: Flat | Rolling

Wetness: Dry | Moist | Wet | Irrigated

CATCHMENT CONTEXT

FRESHWATER MANAGEMENT UNIT

CATCHMENT

SURFACE WATER QUALITY

NITROGEN

TON 0.9 mg/L A	Recorded at site ES-00021(Mataura River at Mataura Island Bridge)
NH4 0.025 mg/L A	Recorded at site ES-00102(Mataura at Seaward down (nrwqn) (dn5))
TN 1.47 mg/L Q4	Recorded at site ES-00102(Mataura at Seaward down (nrwqn) (dn5))

PHOSPHORUS

DRP 0.0094 mg/L B	Recorded at site ES-00102(Mataura at Seaward down (nrwqn) (dn5))
TP 0.03 mg/L Q3	Recorded at site ES-00102(Mataura at Seaward down (nrwqn) (dn5))

BACTERIA

SEDIMENT

How it works?

- Dairy typologies (Monaghan et al., 2021a&b; McDowell et al., 2021)
  - Climate; slope; soil drainage & wetness
- Nearest downstream water quality data
  - LAWA (monitored) & NIWA (modelled) = ***catchment context***
- Comprehensive list of mitigation actions (over 20 yrs. research)
- Rank actions by:
  - '*Effectiveness*' or '*Cost-effectiveness*' (for N, P, sediment & *E. coli*)
  - '*Established*' or '*Developing*' mitigation
  - '*Capital*' cost
- Quick link(s) to implementation resources

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FarmAPT - Farm Action Prioritization Tool

Pick a location on the map to get started.

Go to map

This freely available online-spatial mitigation action prioritisation resource has been designed for use when preparing for environmental risk discussions with landowners and the development of Farm Environment Plans (FEP). It has been co-developed by DairyNZ, the Our Land and Water National Science Challenge, and AgResearch.

The aim of the tool is to link users to the most up-to-date science and resources, physical parameters of a farm, and to help prioritise FEP mitigation actions based on key water quality attributes, to ensure on-farm effort is targeted and advice is consistent.

The tool is designed to guide the selection and prioritisation of actions for inclusion in a FEP, as well as directing users to useful resources, information, and guidelines.

The functionality of the tool enables users to:

- select a farm
- access farm physical data relating to climate, soil, slope, and wetness
- view surface water quality data (and associated water quality attribute bands)
- prioritise mitigation actions
- view a description of each action, and sources of relevant information

The tool developers acknowledge that no two farms are the same, and so each farm will have a unique solution for a given question. This tool should therefore be used in conjunction with expert knowledge and on-farm visit(s) to ascertain both site specific practice(s) and farmer goal(s)/outcome(s).

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Basemap:
Satellite
Click the map to select the farm's property titles
Clear
Proceed

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Location

Property titles

1. 214068
2. 97213

Typology

Climate:	Cool	**Warm**		
Soil:	**Light**	Well draining	Poorly draining	
Slope:	**Flat**	Rolling		
Wetness:	Dry	**Moist**	Wet	Irrigated

Surface Water Quality

Nitrogen

TON	1.42	mg/L	B	Recorded at site EW-00012
NH4	0.71	mg/L	C	Recorded at site EW-00012
TN	3.29	mg/L	Q4	Recorded at site EW-00012

Phosphorus

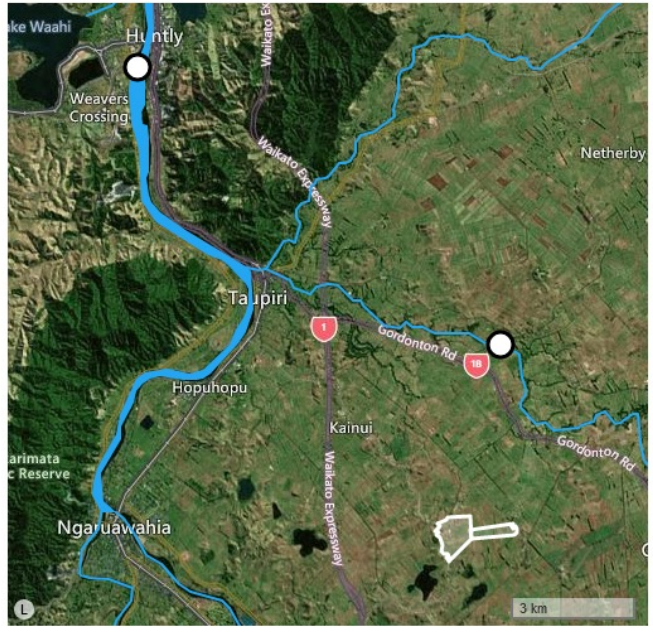
DRP	0.021	mg/L	D	Recorded at site EW-00078
TP	0.1	mg/L	Q4	Recorded at site EW-00012

Bacteria

E. coli	1400	CFU/100ml	D	Recorded at site EW-00012

Sediment

Clarity	0.93	m	D	Recorded at site EW-00078



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Actions (43)

☑ Effluent (7) ☑ Erosion/Soil (6) ☑ Farm System (2) ☑ Grazing/Cropping (1) ☐ Irrigation (4) ☑ Nutrient (11) ☑ Waterways (13) ☑ Winter Grazing (3)

Sort by: Effectiveness [N P B S] Cost-Effectiveness [N P B S] [Mahinga Kai] [Capital cost]

Appropriate rates and timing of fertiliser to reduce losses — Nutrient — more

N P B S Effectiveness	N P B S Cost-Effectiveness	Mahinga Kai	Capital cost	Established
		M	L	E

Avoid applying N fertiliser when risk of loss is high — Nutrient — more

N P B S Effectiveness	N P B S Cost-Effectiveness	Mahinga Kai	Capital cost	Established
		M	L	E

Whole farm nutrient budget (nutrient managment plan) — Nutrient — more

N P B S Effectiveness	N P B S Cost-Effectiveness	Mahinga Kai	Capital cost	Established
		M	L	E

Catch/cover crop (maize on effluent areas) — Nutrient — more

N P B S Effectiveness	N P B S Cost-Effectiveness	Mahinga Kai	Capital cost	Developing
		L	-	D

Reducing farm N surplus — Nutrient — more

N P B S Effectiveness	N P B S Cost-Effectiveness	Mahinga Kai	Capital cost	Established
		H	L	E

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Actions (40)

☑ Effluent (5) ☑ Erosion/Soil (5) ☑ Farm System (2) ☑ Grazing/Cropping (1) ☐ Irrigation (3) ☑ Nutrient (11) ☑ Waterways (14) ☑ Winter Grazing (2)

Sort by: Effectiveness [N P B S] Cost-Effectiveness [N **P** B S] Mahinga Kai Capital cost

Optimum soil test P concentration

Nutrient
more

Effectiveness	Cost-Effectiveness	Mahinga Kai	Capital cost	Established
N P B S	N P B S	L	L	E

Description

Matching soil Olsen P concentration to pasture and forage crop requirements avoids enriched soil P concentrations that are more likely to lose more P in runoff compared to that in an agronomic optimum concentration

Co-benefits

- None Reduced fertiliser cost or applied when response is greatest

Factors limiting uptake

- Cost of soil testing and number of tests per area to provide a more specific fertiliser programme

Potential measurements

- Average Olsen P by enterprise and region (can be calculated by fertiliser companies or soil testing labs (ARL and Hills)

Good Farming Practice

This action aligns with action 4 of the Good Farming Practice Action Plan for Water 2018

References

McDowell et al. 2003, McDowell et al. 2018

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Location

Property titles

1. WN39B/633
2. 511886
3. WN26A/507
4. 70017
5. WN107/227
6. WN29D/668
7. WN53C/243
8. 365990

Typology

Climate:	Cool	**Warm**		
Soil:	Light	Well draining	**Poorly draining**	
Slope:	**Flat**	Rolling		
Wetness:	**Dry**	Moist	Wet	Irrigated

Surface Water Quality

Nitrogen

TON	0.42	mg/L	A	Recorded at site LAWA-101931
NH4	0.2	mg/L	B	Recorded at site LAWA-101931
TN	0.93	mg/L	Q3	Recorded at site LAWA-101931

Phosphorus

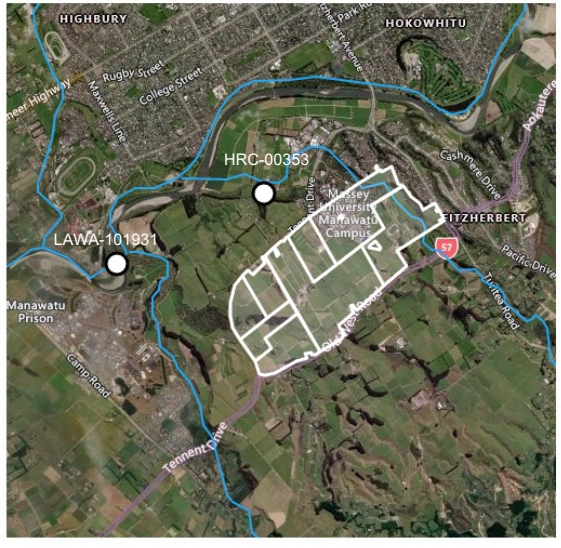
DRP	0.022	mg/L	D	Recorded at site LAWA-101931
TP	0.062	mg/L	Q4	Recorded at site LAWA-101931

Bacteria

E. coli	490	CFU/100ml	D	Recorded at site HRC-00353

Sediment

Clarity	1.6	m	A	Recorded at site HRC-00353



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☐ Effluent (7) ☑ Erosion/Soil (6) ☐ Farm System (2) ☐ Grazing/Cropping (1) ☐ Irrigation (3) ☐ Nutrient (11) ☑ Waterways (16) ☐ Winter Grazing (4)

Sort by: Effectiveness [N P B S] Cost-Effectiveness [N **P** B S] Mahinga Kai Capital cost

Stream fencing — Waterways — more

Effectiveness

Cost-Effectiveness

H — Mahinga Kai

L — Capital cost

E — Established

Fence wetlands — Waterways — more

Effectiveness

Cost-Effectiveness

H — Mahinga Kai

L-M — Capital cost

E — Established

Move water and feedout troughs away from waterways — Waterways — more

Effectiveness

Cost-Effectiveness

H — Mahinga Kai

L — Capital cost

E — Established

Raised edges or nib walls on bridge crossings to divert runoff away from waterway — Waterways — more

Effectiveness

Cost-Effectiveness

M — Mahinga Kai

- — Capital cost

D — Developing

☐ Effluent (7) ☑ Erosion/Soil (6) ☐ Farm System (2) ☐ Grazing/Cropping (1) ☐ Irrigation (3) ☐ Nutrient (11) ☑ Waterways (16) ☐ Winter Grazing (4)

Sort by: Effectiveness [N | P | B | S] Cost-Effectiveness [N | P | B | S] [Mahinga Kai] [Capital cost]

Stream fencing

Waterways

more

Effectiveness

Cost-Effectiveness

H
Mahinga Kai

L
Capital cost

E
Established

In-stream sorbents

Waterways

more

Effectiveness

Cost-Effectiveness

M
Mahinga Kai

-
Capital cost

D
Developing

Detainment bunds

Waterways

more

Effectiveness

Cost-Effectiveness

H
Mahinga Kai

-
Capital cost

D
Developing

Move water and feedout troughs away from waterways

Waterways

more

Effectiveness

Cost-Effectiveness

H
Mahinga Kai

L
Capital cost

E
Established

End-user testing…

- Beta version has been used tested
  - Dairy farmers
  - Rural professionals
  - Dairy environment leaders
  - Milk companies
- High-level feedback
  - Easy to use
  - Would recommend it to others
  - Support for the tool
  - Added value for farm environment planning

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Next steps…

- Continue to work & support milk company access via API
- New functionality:
  - Macroinvertebrate Community Index (MCI)
  - Groundwater monitoring sites
  - Management zones (e.g. nutrients; groundwater allocation zones)
  - GHG co-benefits of actions for water quality
- Interface development

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Ngā mihi nui
Thank you
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Location

Property titles

1. WN443/198
2. WN443/199

Typology

Climate:	**Cool**	Warm		
Soil:	Light	Well draining	**Poorly draining**	
Slope:	**Flat**	Rolling		
Wetness:	**Dry**	Moist	Wet	Irrigated

Surface Water Quality

Nitrogen

TON	0.4	mg/L	A	Recorded at site HRC-00015
NH4	0.005	mg/L	A	Recorded at site HRC-00015
TN	0.72	mg/L	Q3	Recorded at site HRC-00015

Phosphorus

DRP	0.013	mg/L	C	Recorded at site HRC-00015
TP	0.035	mg/L	Q3	Recorded at site HRC-00015

Bacteria

E. coli	190	CFU/100ml	D	Recorded at site HRC-00015

Sediment

Clarity	0.8	m	B	Recorded at site HRC-00015

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Location

Property titles

1. SL6D/685
2. SL111/270
3. SL6C/451
4. SL6D/991

Typology

Climate:	Cool	Warm		
Soil:	Light	Well draining	Poorly draining	
Slope:	Flat	Rolling		
Wetness:	Dry	Moist	Wet	Irrigated

Surface Water Quality

Nitrogen

TON	3.4	mg/L	C	Recorded at site ES-00035
NH4	0.005	mg/L	A	Recorded at site ES-00035
TN	3.85	mg/L	Q4	Recorded at site ES-00035

Phosphorus

DRP	0.043	mg/L	D	Recorded at site ES-00035
TP	0.072	mg/L	Q4	Recorded at site ES-00035

Bacteria

E. coli	370	CFU/100ml	D	Recorded at site ES-00035

Sediment

Clarity	1.25	m	D	Recorded at site ES-00035

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Location

Property titles

1. CB32B/613
2. CB4D/1316
3. CB3D/1132

Typology

Climate:	**Cool**	Warm		
Soil:	**Light**	Well draining	Poorly draining	
Slope:	**Flat**	Rolling		
Wetness:	Dry	Moist	Wet	**Irrigated**

Surface Water Quality

Nitrogen

TON	11.9	mg/L	D	Recorded at site ECAN-00194
NH4	0.005	mg/L	A	Recorded at site ECAN-00194
TN	12.2	mg/L	Q4	Recorded at site ECAN-00194

Phosphorus

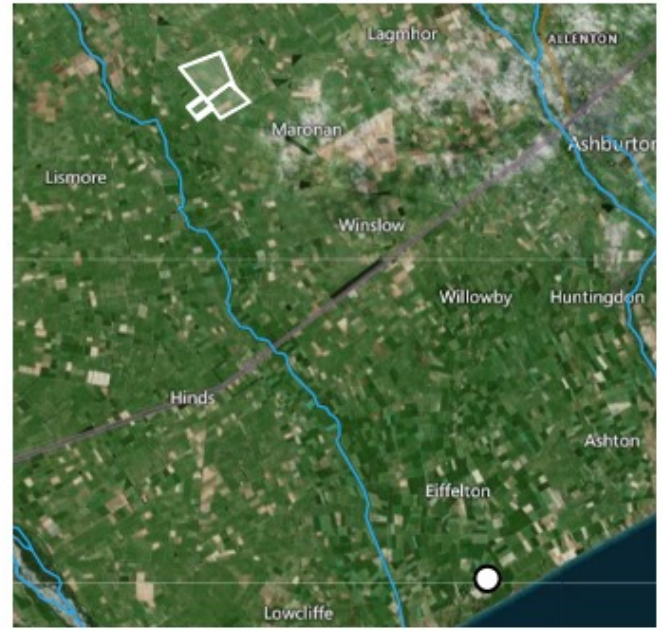
DRP	0.0034	mg/L	A	Recorded at site ECAN-00194
TP	0.02	mg/L	Q2	Recorded at site ECAN-00194

Bacteria

E. coli	225	CFU/100ml	D	Recorded at site ECAN-00194

Sediment

Clarity	1.31	m	D	Recorded at site ECAN-00194



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Location

Property titles

1. NA59D/853
2. NA281/266
3. 313100
4. NA125B/329

Typology

Climate:	Cool	**Warm**		
Soil:	Light	Well draining	**Poorly draining**	
Slope:	**Flat**	Rolling		
Wetness:	Dry	**Moist**	Wet	Irrigated

Surface Water Quality

Nitrogen

TON	0.4	mg/L	A	Recorded at site NRWQN-00022
NH4	0.014	mg/L	A	Recorded at site NRWQN-00022_NIWA
TN	0.61	mg/L	Q3	Recorded at site NRWQN-00022_NIWA

Phosphorus

DRP	0.016	mg/L	C	Recorded at site NRWQN-00022_NIWA
TP	0.054	mg/L	Q4	Recorded at site NRWQN-00022_NIWA

Bacteria

E. coli	99.95	CFU/100ml	A	Recorded at site NRWQN-00022_NIWA

Sediment

Clarity	0.89	m	B	Recorded at site NRWQN-00022_NIWA

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