Ruamahanga River at Waihenga
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

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Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.
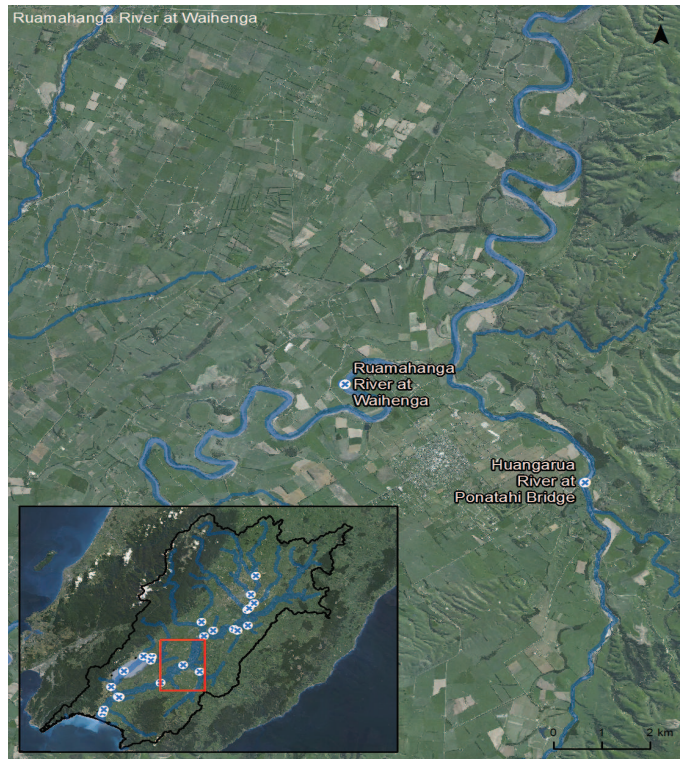
Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

Ruamahanga River at Waihenga has an upstream catchment area of ~236,089 ha. The catchment is 8.0% dairy/dairy support, 19.0% native bush, 54.2% sheep and beef and 0.6% arable. The remaining area (18.2%) is a variety of 'other' land uses including lifestyle, mixed, horticulture and urban of which no mitigations are applied. During BAU, 50th and 95th DRP percentiles decrease 46.5% and 21.0% by 2080. Land retirement of 347 ha occurs by 2080 (0.15% of the catchment at a rate of ~5.5ha/yr from 2017), while 5,759 ha of pole planted land (2.4% of the catchment at a planting rate of ~91.5ha/yr from 2017) is mature by 2080 and contributing to reduced DRP loads. Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. Significant reductions in DRP at Waihenga are also attributed to nearly 100% land treatment of the upstream waste water treatment plants (WWTP-Masterton, Carterton and Greytown) by 2080.

Silver and Gold scenarios lead to a significant increase in pole planting peaking at 26,491 ha of mature trees by 2080 (11.2% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~420.5 ha/yr from 2017. Land retirement also rises to 10,637 ha (4.5% of catchment at a rate of 168.8 ha/yr from 2017). Mitigations such as 100% land treatment of WWTP, constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to further decreases in median and 95th percentiles, with reductions of 60.7% and 58.6%, respectively, simulated by 2080 in both scenarios.

Location

Ruamahanga River at Waihenga

Ruamahanga River at Waihenga

Huangarua River at Ponatahi Bridge

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	13451 (5.7%)	5413 (2.3%)	1487 (0.6)	128058 (54.2%)	44818 (19.0%)	42862 (18.2%)	236089

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	107	245	347	5272	10637	10637	10637	10637	10637
Pole Planting	0	926	5759	0	8787	26491	0	8792	26491

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
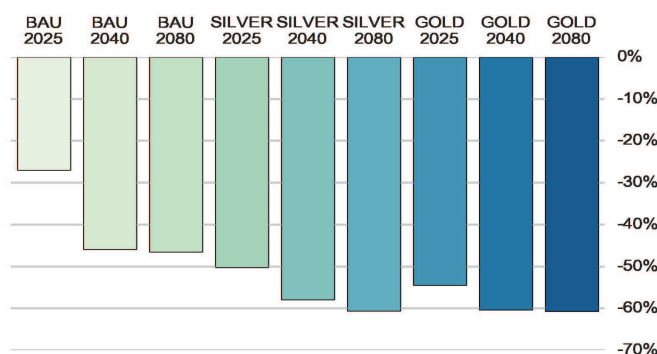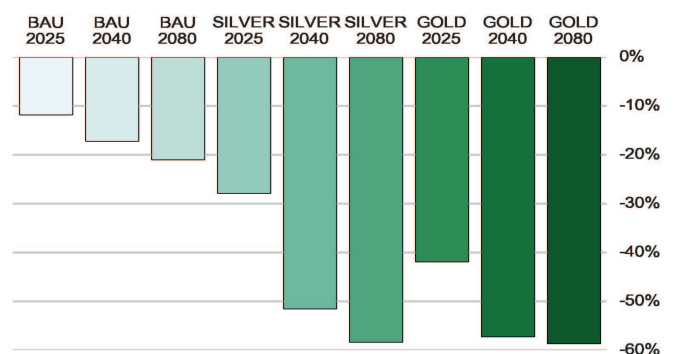
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.016	0.012	0.009	0.009	0.008	0.007	0.006	0.007	0.006	0.006
95th Percentile (mg/L)	0.029	0.026	0.024	0.023	0.021	0.014	0.012	0.017	0.013	0.012
Median (% change from Baseline)		-27.0%	-45.9%	-46.5%	-50.2%	-57.9%	-60.6%	-54.4%	-60.3%	-60.7%
95th Percentile (% change from Baseline)		-11.7%	-17.2%	-21.0%	-27.9%	-51.5%	-58.3%	-41.8%	-57.2%	-58.6%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Ruamahanga River at Wardells
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

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Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.
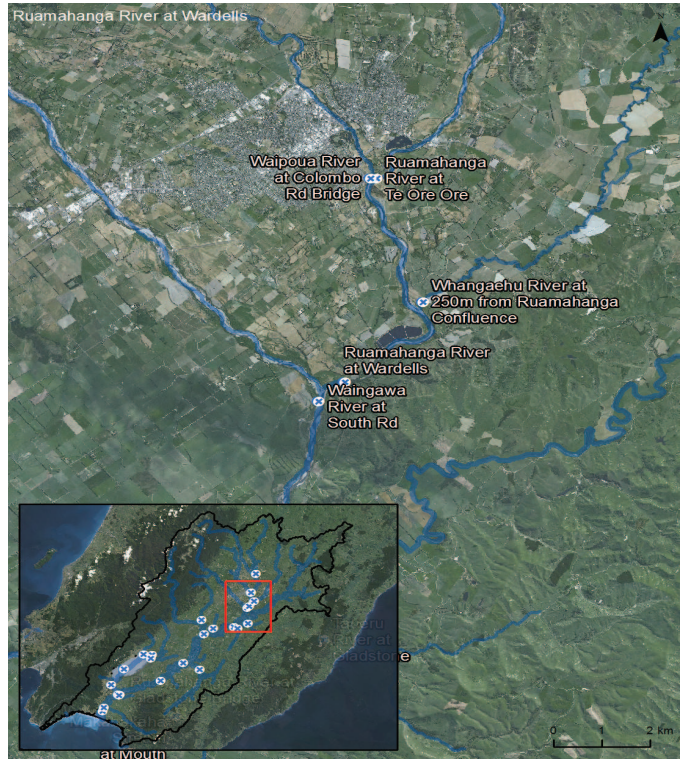
Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

Ruamahanga River at Wardells has an upstream catchment area of ~64,284 ha. The catchment is 6.0% dairy/dairy support, 16.0% native bush, 59.9% sheep and beef and 0.3% arable. The remaining area (17.9%) is a variety 'other' land uses including lifestyle, mixed, horticulture and urban of which no mitigations are applied. During BAU, 50th and 95th DRP percentiles decrease by up to 57.4% and 51.4%, respectively by 2080. Land retirement of 225 ha occurs by 2080 (0.35% of catchment at a rate of ~3.5 ha/yr from 2017), while 580 ha of pole planted land is mature by 2080 and contributing to reduced loads (0.9% of the catchment at a rate of 9.2 ha/yr from 2017). Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. Significant reductions in DRP at Wardells are also attributed to nearly 100% land treatment of the upstream Masterton Waste Water Treatment Plant (WWTP) by 2080.

Silver and Gold scenarios lead to a significant increase in pole planting, peaking at 5,914 ha of mature trees by 2080 (9.2% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~93.9 ha/yr from 2017. Land retirement also rises to 3,008 ha (4.7% of catchment at a rate of 47.7 ha/yr since 2017). Mitigations such as 100% land treatment of Masterton WWTP, constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to further decreases in median and 95th percentiles, with reductions of 71.2% and 76.4%, respectively, simulated by 2080 in both scenarios.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	2322 (3.6%)	1518 (2.4%)	161 (0.3)	38490 (59.9%)	10298 (16.0%)	11495 (17.9%)	64284

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	132	225	1241	3008	3008	3008	3008	3008
Pole Planting	0	49	580	0	2444	5914	0	2444	5914

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
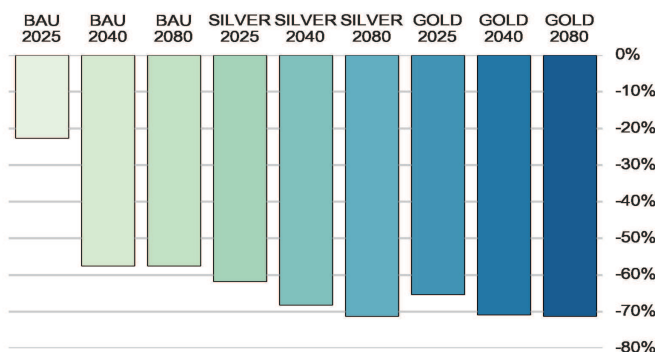
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.021	0.016	0.009	0.009	0.008	0.007	0.006	0.007	0.006	0.006
95th Percentile (mg/L)	0.04	0.03	0.021	0.019	0.02	0.011	0.009	0.013	0.01	0.009
Median (% change from Baseline)		-22.6%	-57.5%	-57.4%	-61.8%	-68.1%	-71.2%	-65.3%	-70.8%	-71.2%
95th Percentile (% change from Baseline)		-25.2%	-46.9%	-51.4%	-50.6%	-71.8%	-76.4%	-66.6%	-76.0%	-76.4%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Tauanui River at Mouth
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

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Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

A catchment of ~4,155 ha drains to the Tauanui River Mouth. The catchment is largely native bush (61.0%), with some sheep and beef (14.9%) and no dairy/dairy support. The remaining area (24.1%) is a variety of 'other' land uses including lifestyle, sheep and mixed of which no mitigations are applied. During BAU 2080, the 50th DRP percentile increases by up to 0.1% and 95th DRP percentiles decrease by up to 0.3%. In BAU 2080 there is no land retirement or pole planting in the catchment. Stock exclusion and effluent management (tier 1 mitigations) only have a 1.5% reduction to DRP loads generated by EMC's on sheep and beef.

In Silver and Gold scenarios, pole planting peaks at 159 ha (4% of the catchment at a planting rate of ~ 2.5ha/yr since 2017) and the amount of retired land increases to 8 ha (0.2% of the catchment at a retirement rate of ~0.1 ha/yr since 2017). The Silver and Gold scenarios show reductions in 50th and 95th DRP percentiles of up to 15.1% and 22.2% are simulated by 2080. The majority of the tier 1, 2, and 3 mitigations under the Silver and Gold scenarios would occur on the sheep and beef farms as the remaining 85% of land in the catchment is combination of native bush and 'other' land use, where no mitigations are applied.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	-	-	-	617 (14.9%)	2535 (61.0%)	1003 (24.1%)	4155

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	5	8	8	8	8	8
Pole Planting	0	0	0	0	3	159	0	3	159

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
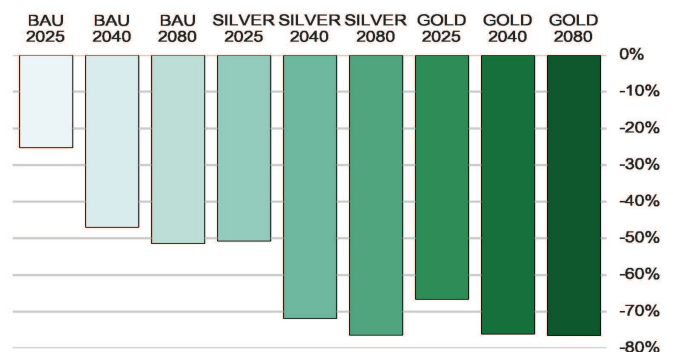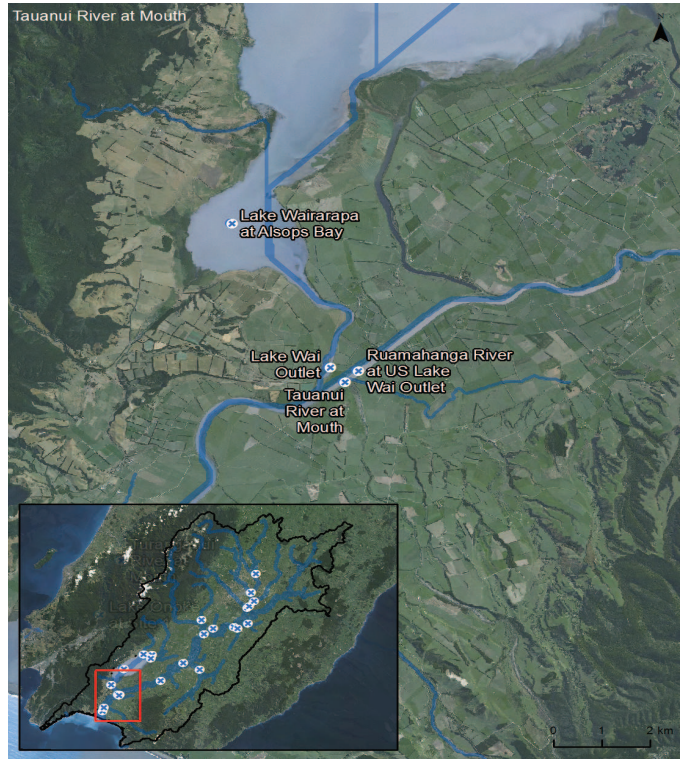
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003
95th Percentile (mg/L)	0.009	0.009	0.009	0.009	0.008	0.007	0.007	0.008	0.007	0.007
Median (% change from Baseline)		0.1%	0.1%	0.1%	-5.1%	-11.4%	-15.1%	-8.0%	-14.1%	-15.1%
95th Percentile (% change from Baseline)		-0.3%	-0.3%	-0.3%	-7.8%	-16.4%	-22.2%	-11.6%	-20.7%	-22.2%

Taueru River at Gladstone
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

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Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Taueru River at Gladstone has an upstream catchment area of ~49,244 ha. The catchment is 1.1% dairy/dairy support, 0.5% native bush, 80.5% sheep and beef and 1.2% arable. The remaining area (16.7%) are all 'other' land uses including lifestyle, plantation forestry, mixed and horticulture of which no mitigations are applied. During BAU, 50th and 95th DRP percentiles decrease by up to 3.0% and 4.3%, respectively by 2080. No land retirement occurs in BAU, while 2,241 ha of pole planted land (4.6% of the catchment at a planting rate of ~35.5ha/yr from 2017) is mature by 2080 and contributing to reduced loads. Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. The Tier 1 mitigations and pole planting are the primary reason for reductions in BAU.

Silver and Gold scenarios lead to a significant increase in pole planting, peaking at 8,198 ha of mature trees by 2080 (16.6% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~130 ha/yr from 2017. Land retirement also rises to 3,310 ha (6.7% of catchment at a rate of 52.5 ha/yr from 2017). Mitigations such as constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to further decreases in median and 95th percentiles, with reductions of up to 52.0% and 71.4%, respectively, simulated by 2080 in both scenarios.

Location

Taueru River at Gladstone

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	298 (0.6%)	246 (0.5%)	587 (1.2)	39655 (80.5%)	242 (0.5%)	8217 (16.7%)	49244

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	1213	3310	3310	3310	3310	3310
Pole Planting	0	658	2241	0	1414	8198	0	1414	8198

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
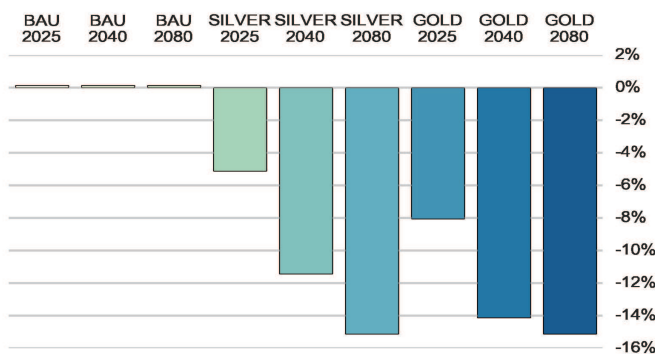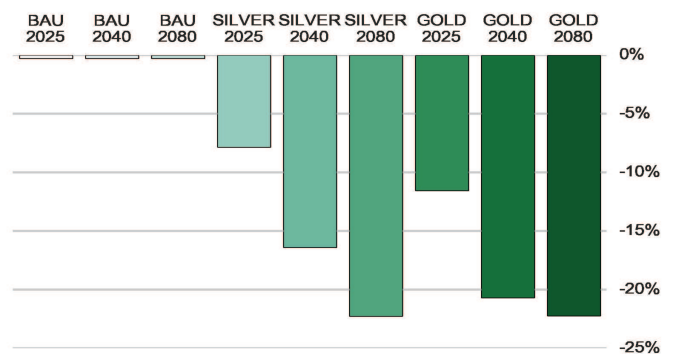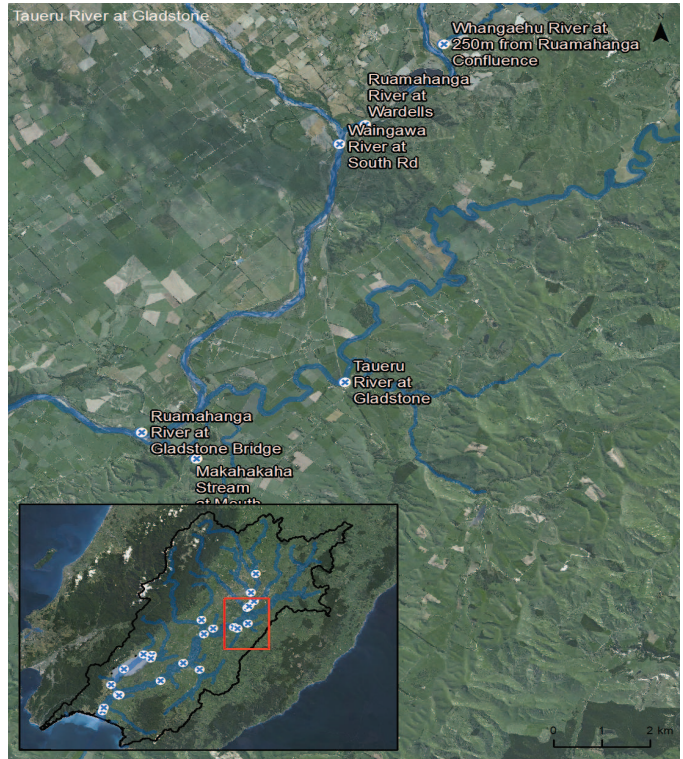
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.017	0.017	0.017	0.017	0.014	0.01	0.008	0.012	0.009	0.008
95th Percentile (mg/L)	0.033	0.032	0.032	0.031	0.024	0.014	0.009	0.019	0.01	0.009
Median (% change from Baseline)		-1.1%	-1.6%	-3.0%	-19.7%	-42.8%	-52.0%	-31.0%	-50.7%	-52.0%
95th Percentile (% change from Baseline)		-1.5%	-2.3%	-4.3%	-27.1%	-58.3%	-71.4%	-41.1%	-69.5%	-71.4%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Tauherenikau River at Websters
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

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Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Tauherenikau River at Websters catchment is ~14,481 ha. The catchment is largely native bush (77.7%), with some sheep and beef (6.5%) and dairy/dairy support (4.7%). The remaining area (11.0%) is a variety of 'other' land uses including lifestyle and mixed which no mitigations are applied. During the BAU 2080, no land is retired and 34 ha of pole planting is >15 years old and considered to effect DRP (0.2% of the catchment at a planting rate of ~0.5 ha/yr since 2017). Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. While the mitigations reduce loads from these landuses, an increase in the DRP 50th percentile of up to 0.9% is simulated. This is due to increase irrigation at 100% of consented abstraction rates in the BAU, Silver and Gold scenarios, where the baseline model ramps up over time. Effectively this results in a slight decrease in flows, increasing concentrations and offsetting the effect of mitigations.

In Silver and Gold scenarios, pole planting increases and peaks at 530 ha (3.7% of the catchment at a planting rate of ~ 8.5 ha/yr since 2017), but no land is retired. The Silver and Gold scenarios show small reductions in 50th and 95th DRP percentiles of up to 3.3% and 5.4% observed by 2080. These small reductions are as a result of three quarters of the total catchment being native bush where no mitigation is applied, and most mitigations being applied on sheep and beef and dairy land uses covering less than a quarter of the total catchment area.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	267 (1.8%)	419 (2.9%)	-	944 (6.5%)	11255 (77.7%)	1596 (11.0%)	14481

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	0	0	0	0	0	0
Pole Planting	0	0	34	0	473	530	0	473	530

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
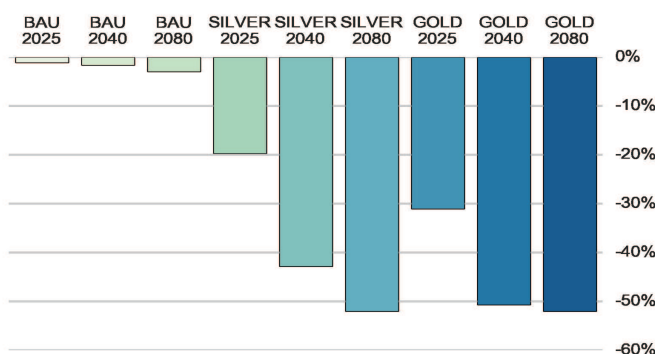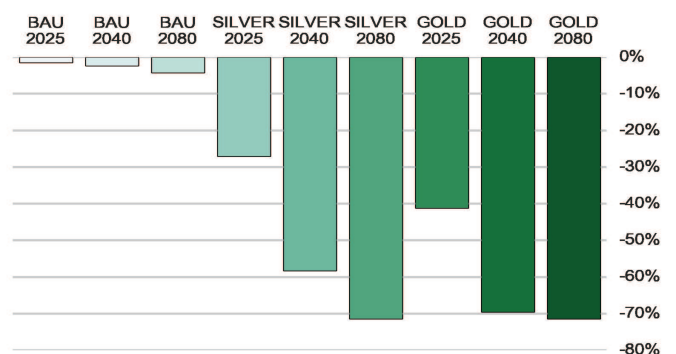
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
95th Percentile (mg/L)	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
Median (% change from Baseline)		0.9%	0.9%	0.9%	-0.5%	-2.3%	-3.3%	-1.2%	-3.1%	-3.1%
95th Percentile (% change from Baseline)		-0.1%	-0.1%	-0.1%	-2.0%	-4.3%	-5.4%	-2.8%	-5.2%	-5.2%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Turanganui River at Mouth
Dissolved Reactive Phosphorous (DRP)
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Introduction

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Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

A catchment of ~6,740 ha drains to the Turanganui River Mouth. The majority of the catchment is native bush (51.8%), with some sheep and beef (26.8%) and dairy and dairy support (4.5%). The remaining area (16.9%) is a variety of 'other' land uses including lifestyle and mixed of which no mitigations are applied. During BAU 2080, 152 ha of land is retired (2.3% of the catchment at a retirement rate of ~2.4 ha/yr since 2017) and 99 ha of pole planting is >15 years old and considered to effect DRP (1.4% of the catchment at a planting rate of ~1.6 ha/yr since 2017). These mitigations are contributing to decreases in the DRP 50th and 95th percentiles of up to 6.8% and 7.1%, respectively.

In Silver and Gold scenarios, pole planting increases and retired land decreases slightly compared to the BAU. Pole planting peaks at 831 ha (12.3% of the catchment at a planting rate of ~ 13.2 ha/yr since 2017), and retired land peaks at 131 ha (1.9% of the catchment at a retirement rate of ~2 ha/yr since 2017). Most of these mitigations would apply to sheep and beef and dairy land uses covering approximately one third of the catchment. In addition to tier 1 mitigations (stock exclusion and effluent management), mitigations such as constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) lead to significant cumulative reductions in the DRP-EMC input concentrations of up to 20-30% for dairy/dairy support and 80% on sheep and beef landuses. The Silver and Gold scenarios show reductions in 50th and 95th DRP percentiles of up to 49.7% and 55.6% are simulated by 2080.

Location

Turanganui River at Mouth

Lake Wairarapa at Alsops Bay

Lake Wai Outlet
Ruamahanga River at US Lake Wai Outlet

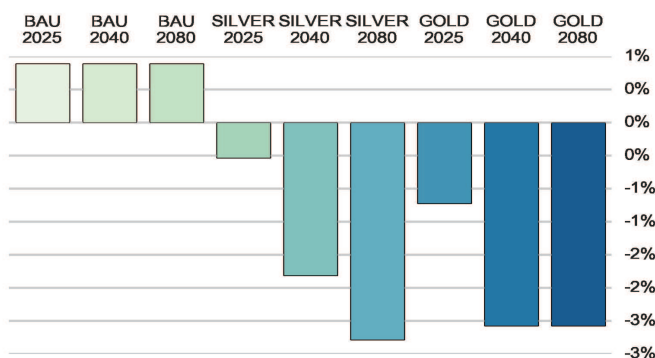Turanganui River at Mouth

Lake Onoke at Site 1

0 1 2 km

Disclaimer: This fact sheet should be read in conjunction with the report "IZ090000_RP_Rua_Scenarios_Ecological Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites. On farm mitigations reduce input concentrations, and are applied to Event Mean Concentrations (EMC's) linked to quickflow, and Dry Weather Concentrations (DWC's) which are linked to baseflows.
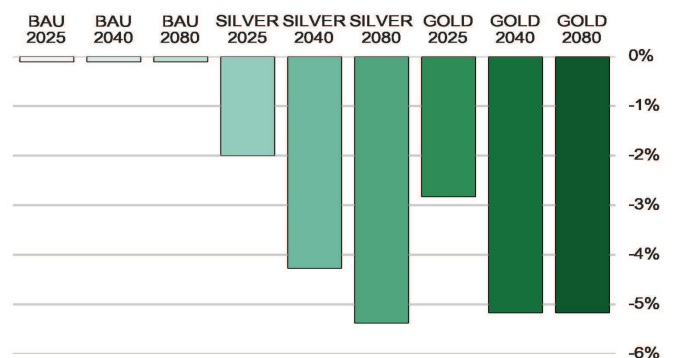
Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	260 (3.9%)	38 (0.6%)	-	1810 (26.8%)	3491 (51.8%)	1141 (16.9%)	6740

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	2	67	152	123	131	131	131	131	131
Pole Planting	0	70	99	0	739	831	0	739	831

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.

Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.006	0.005	0.005	0.005	0.004	0.003	0.003	0.004	0.003	0.003
95th Percentile (mg/L)	0.022	0.021	0.021	0.021	0.018	0.011	0.01	0.016	0.01	0.01
Median (% change from Baseline)		-3.6%	-6.4%	-6.8%	-19.4%	-45.6%	-49.5%	-25.9%	-49.7%	-49.7%
95th Percentile (% change from Baseline)		-4.1%	-6.6%	-7.1%	-21.0%	-50.9%	-55.4%	-28.4%	-55.6%	-55.6%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Waingawa River at South Rd
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

JACOBS®

Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Waingawa River at South Road catchment is ~14,969 ha. The catchment is primarily native bush (65.8%), with some sheep and beef (16.0%) and dairy and dairy support (2.3%). The remaining area (15.9%) is a variety of 'other' land uses including lifestyle and mixed of which no mitigations are applied. During the BAU 2080, land retired is 7 ha and 324 ha of pole planting or ~2% of the catchment is >15 years old and considered to effect DRP. Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. Cumulatively, mitigations are contributing to a decrease in the DRP 50th and 95th percentiles of up to 3.8% and 5.3%, respectively.

In Silver and Gold scenarios, there is a considerable increase in pole planting but a decrease in retired land compared to BAU. In addition to tier 1 mitigations (stock exclusion and effluent management), mitigations such as constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) lead to significant cumulative reductions in the DRP-EMC input concentrations of up to 80% on sheep and beef and 20–30% on dairy landuses. Land retirement is minimal, ~5 ha while pole planting covers 2,488 ha or 5.3% of the catchment, equivalent to a planting rate of ~14.2 ha/yr from 2017. The Silver and Gold scenarios show significant reductions in 50th and 95th DRP percentiles of up to 26.5% and 32.7% are simulated by 2080.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	215 (1.4%)	127 (0.9%)	-	2389 (16.0%)	9856 (65.8%)	2382 (15.9%)	14969

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	7	7	0	5	5	5	5	5
Pole Planting	0	0	324	0	1529	2488	0	1529	2488

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.

Scenario Results
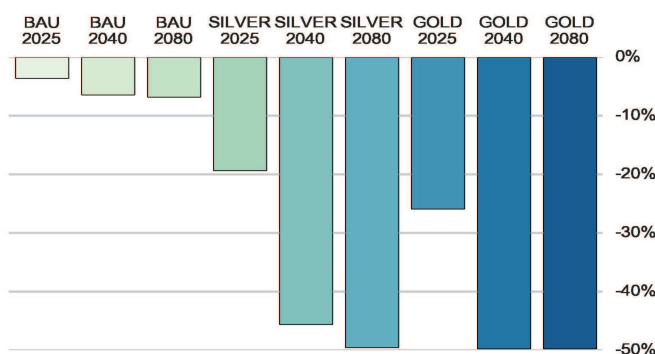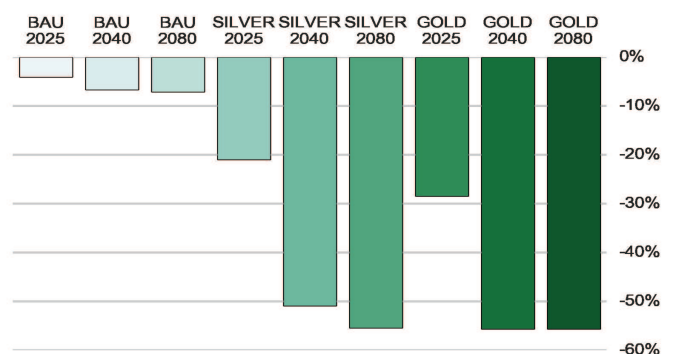
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.004	0.004	0.004	0.004	0.004	0.003	0.003	0.004	0.003	0.003
95th Percentile (mg/L)	0.013	0.013	0.013	0.012	0.011	0.009	0.009	0.011	0.009	0.009
Median (% change from Baseline)		-0.9%	-0.9%	-3.8%	-9.3%	-23.1%	-26.3%	-13.5%	-26.4%	-26.5%
95th Percentile (% change from Baseline)		-1.4%	-1.4%	-5.3%	-12.0%	-28.5%	-32.6%	-17.6%	-32.3%	-32.7%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Waiohine River at Bicknells
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

JACOBS

Ruamāhanga
Whaitua
Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Waiohine River at Bicknells is a reporting site slightly upstream of the confluence with the Ruamahanga River. The upstream catchment area is ~39,320 ha. The catchment is 18.0% dairy/dairy support, 60.1% native bush, 9.1% sheep and beef and 0.6% arable. The remaining area (12.1%) are all 'other' land uses including lifestyle, mixed, urban and horticulture of which no mitigations are applied. During BAU, 50th and 95th DRP percentiles decrease by up to 51.3% and 22.6%, respectively by 2080. No scenarios involve land retirement, while 872 ha of pole planted land (2.2% of the catchment at a planting rate of 13.8 ha/yr from 2017) is mature in BAU by 2080 and contributing to reduced loads. Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. The primary reason for significant DRP reductions is due to land treatment of the Carterton WWTP, ~85% of volume by 2080. This occurs along the Mangatarere River, which joins the Waiohine River upstream of Bicknells.

Silver and Gold scenarios lead to a significant increase in pole planting, peaking at 2,629 ha of mature trees by 2080 (6.7% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~41.7 ha/yr from 2017. Mitigations such as constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3), coupled with 100% land treatment of Carterton WWTP contribute to further decreases in median and 95th percentiles, with reductions of up to 57.1% and 50.4%, respectively, simulated by 2080 in both scenarios.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	6070 (15.4%)	1036 (2.6%)	227 (0.6)	3595 (9.1%)	23641 (60.1%)	4750 (12.1%)	39320

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	0	0	0	0	0	0
Pole Planting	0	2	872	0	1599	2629	0	1599	2629

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
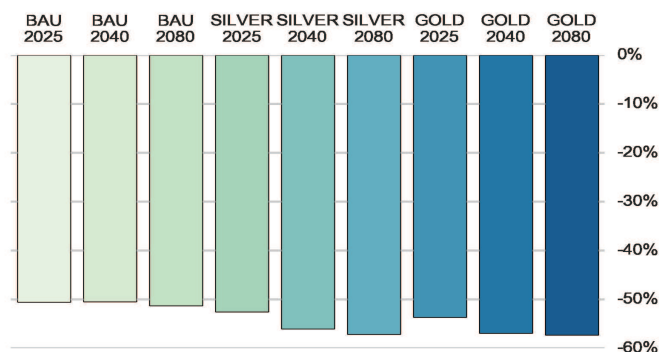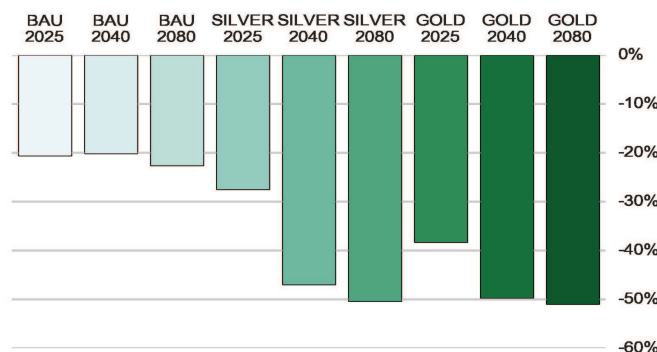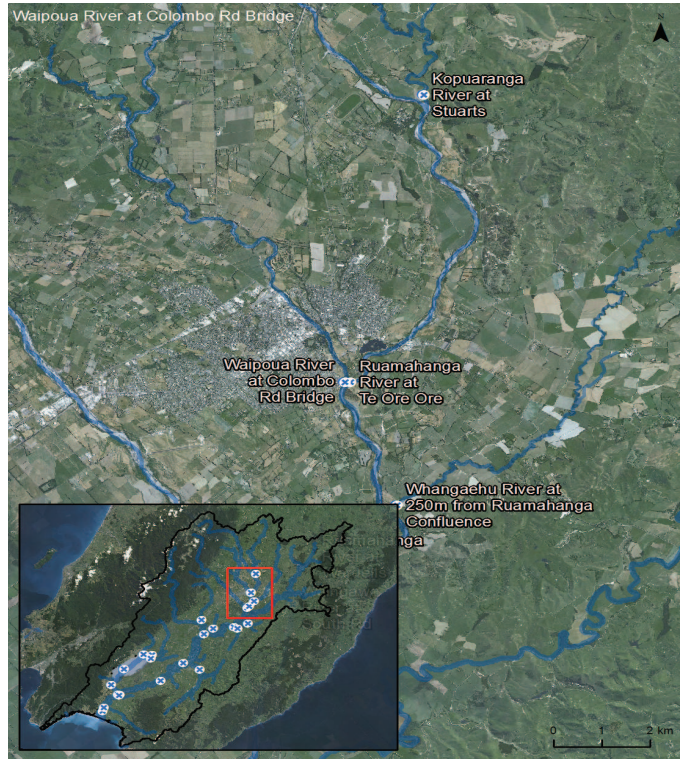
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.016	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007
95th Percentile (mg/L)	0.04	0.031	0.032	0.031	0.029	0.021	0.02	0.024	0.02	0.019
Median (% change from Baseline)		-50.5%	-50.4%	-51.3%	-52.5%	-56.0%	-57.1%	-53.6%	-56.9%	-57.3%
95th Percentile (% change from Baseline)		-20.6%	-20.1%	-22.6%	-27.5%	-47.0%	-50.4%	-38.3%	-49.7%	-51.0%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Waipoua River at Colombo Rd Bridge
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

JACOBS

Ruamāhanga Whaitua Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.

Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Waipoua River at Colombo Road Bridge is a reporting site in the upper Ruamahanga, with an upstream catchment area is ~17,542 ha. The catchment is 4.8% dairy/dairy support, 16.1% native bush, 56.5% sheep and beef and 0.6% arable. The remaining area (22%) are all 'other' land uses including lifestyle, mixed, urban and horticulture of which no mitigations are applied. During BAU, 50th and 95th DRP percentiles decrease 2.7% and 4.0% by 2080. 163 ha of land retirement occurs in this catchment in BAU, while 301 ha of pole planted land is mature by 2080 and contributing to reduced loads (4.8 ha/yr from 2017). Stock exclusion and effluent management (tier 1 mitigations) have a ~5.9–16.8% reduction to DRP loads on dairy support and dairy farms, however only ~1.5% on sheep and beef.

Silver and Gold scenarios lead to an increase in pole planting, peaking at 1,548 ha of mature trees by 2080 (8.8% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~24.6 ha/yr from 2017. Land retirement has also increased to 454 ha (2.5% of the catchment at a rate of 7.2 ha/yr). Mitigations such as stock exclusion (tier 1), constructed wetlands and optimal fertiliser use (tier 2), and riparian planting/buffer strips (tier 3) result in cumulative DRP reductions to loads of up to 80% for sheep and beef, and 20–30% for dairy, arable and dairy support. Subsequently, further decreases in median and 95th percentiles at the reporting point are observed in Silver and Gold, with reductions of ~38.7% and ~65.2% simulated by 2080 in both scenarios.

Location

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	173 (1.0%)	670 (3.8%)	113 (0.6)	9862 (56.5%)	2802 (16.1%)	3832 (22.0%)	17452

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	79	163	314	454	454	454	454	454
Pole Planting	0	8	301	0	914	1548	0	914	1548

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
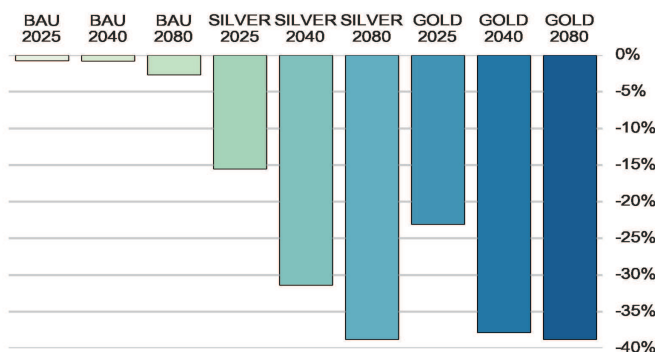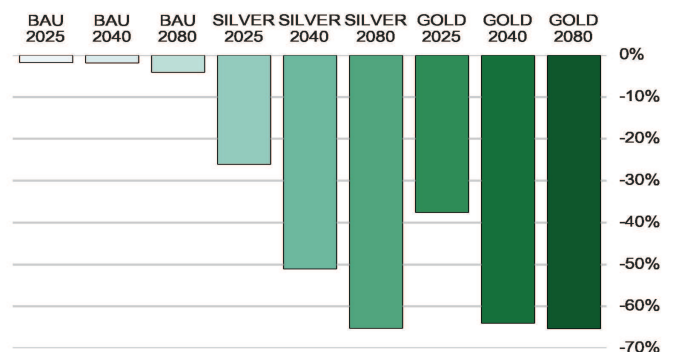
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.004	0.004	0.004	0.003	0.003	0.002	0.002	0.003	0.002	0.002
95th Percentile (mg/L)	0.012	0.012	0.012	0.011	0.009	0.006	0.004	0.007	0.004	0.004
Median (% change from Baseline)		-0.7%	-0.8%	-2.7%	-15.5%	-31.3%	-38.7%	-23.0%	-37.8%	-38.8%
95th Percentile (% change from Baseline)		-1.7%	-1.8%	-4.0%	-26.0%	-51.0%	-65.2%	-37.5%	-63.9%	-65.2%

Median (% change from Baseline)

95th Percentile (% change from Baseline)

Whangaehu River at 250m from Ruamahanga Confluence
Dissolved Reactive Phosphorous (DRP)
Revision 1 DRAFT
Date: 2017-11-10

JACOBS

Ruamāhanga
Whaitua
Committee

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamahanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Dissolved Reactive Phosphorus (DRP) has no limit setting criteria defined in the National Policy Statement for Freshwater Management 2014 (amended 2017), however is required to be considered in relation to periphyton, and river and lake water quality conditions.
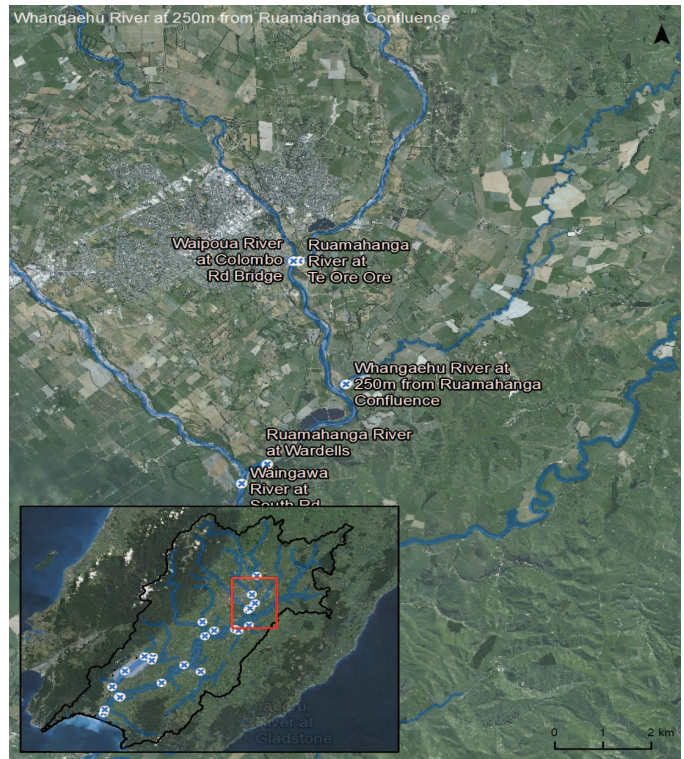
Summary

See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The Whangaehu River at 250m from Confluence has a catchment area of ~14,578 ha. The catchment is primarily sheep and beef (70.9%), with some dairy and dairy support (8.4%) and no native bush. The remaining area (20.4%) is a variety of 'other' land uses including lifestyle, mixed, forestry and arable of which limited mitigations are applied. During the BAU 2080, no land is retired and 274 ha of pole planting is >15 years old and considered to effect DRP (1.9% of the catchment at a planting rate of ~4.4 ha/yr since 2017). Stock exclusion and effluent management has a ~16.8% reduction to DRP loads on dairy farms, however only 1.5% on sheep and beef. These mitigations are contributing to a decrease in the DRP 50th and 95th percentiles of up to 1.7% and 3.1%, respectively.

In Silver and Gold scenarios, there is a significant increase in land retirement and pole planting in the catchment. In addition to tier 1 mitigations (stock exclusion and effluent management), mitigations such as constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) lead to significant cumulative reductions in the DRP-EMC's input concentrations of up to 80% for sheep and beef and 20–30% for dairy/dairy support. Land retirement is up to 1,286 ha (8.8% of the catchment at a rate of ~20.5 ha/yr since 2017) and pole planting peaks at 1,750 ha (12% of the catchment at a planting rate of ~ 27.7 ha/yr since 2017). The Silver and Gold scenarios simulate significant reductions in 50th and 95th DRP percentiles of up to 26.1% and 59.7% by 2080.

Location

Whangaehu River at 250m from Ruamahanga Confluence

Scenario Input Data

Table 1. Current landuse area in ha (% of total)

	Dairy	Dairy Support	Arable	Sheep and Beef	Native Bush	Other	Total
Baseline Landuse	915 (6.3%)	299 (2.1%)	45 (0.3)	10335 (70.9%)	5 (0.0%)	2979 (20.4%)	14578

Table 2. Mitigation (area in ha)

Mitigation*	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	452	1286	1286	1286	1286	1286
Pole Planting	0	37	274	0	512	1750	0	512	1750

*Pole planting is effective for DRP at >15 years. Area given here is not reflective of the total area planted in the catchment.
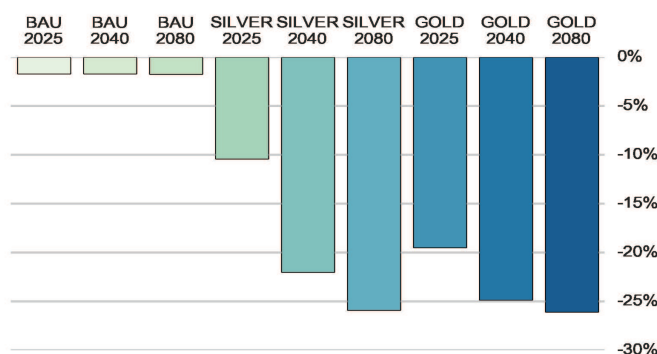
Scenario Results

Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005
95th Percentile (mg/L)	0.04	0.04	0.04	0.039	0.031	0.02	0.016	0.025	0.017	0.016
Median (% change from Baseline)		-1.7%	-1.7%	-1.7%	-10.4%	-22.0%	-25.9%	-19.5%	-24.8%	-26.1%
95th Percentile (% change from Baseline)		-2.0%	-2.1%	-3.0%	-24.0%	-51.5%	-59.7%	-37.4%	-59.0%	-59.7%

Median (% change from Baseline)

95th Percentile (% change from Baseline)