Huangarua River at Ponatahi Bridge

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

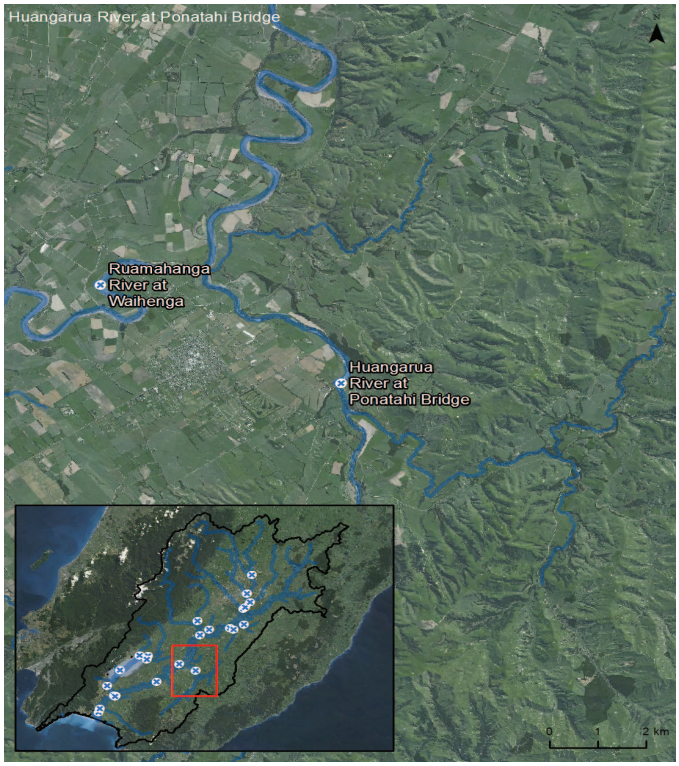
Summary

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

The Huangarua River at Ponatahi Bridge is ~30,239 ha. The catchment is primarily sheep and beef (84.6%), with limited dairy support (0.2%) and 2.3% native bush. The remaining area (13.0%) is a variety of 'other' land uses including lifestyle, mixed and arable of which no mitigations are applied. During BAU, median (50th) percentiles of DIN decrease up to 3.9% by 2080. This is due to Tier 1 mitigations, stock exclusion and effluent management, which applies a 0.1% reduction in loads to modelled nitrogen species (i.e. Ammoniacal-N and Nitrate-N) on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. Limited retirement occurs in BAU (~107 ha or 0.35% of the catchment) and while pole planting is occurring in the catchment, it is considered to have no effect on nitrogen species (i.e. DIN).

In Silver and Gold scenarios, retirement occurs at a greater rate, peaking at 3,240 ha of land by 2080 (~51 ha/yr from 2017). 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 nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. These combined effects lead to DIN reductions in the 50th and 95th percentiles of up to 16% and 11.5% respectively 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	-	46 (0.2%)	-	25581 (84.6%)	693 (2.3%)	3918 (13.0%)	30239

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	107	107	2285	3240	3240	3240	3240	3240

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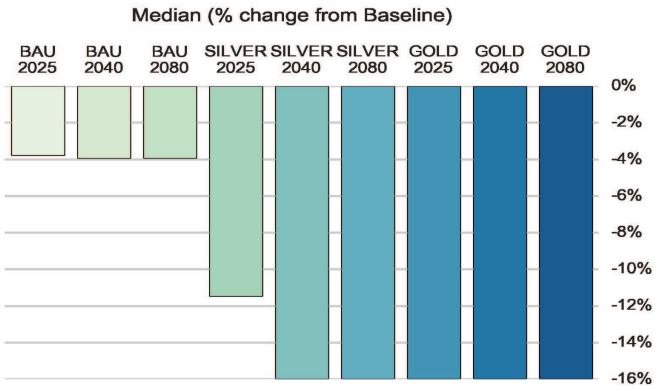
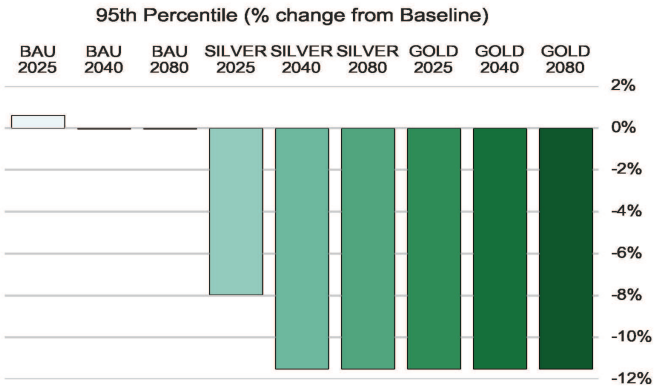
Scenario Results

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)	0.306	0.294	0.294	0.294	0.271	0.257	0.257	0.257	0.257	0.257
95th Percentile (mg/L)	1.071	1.078	1.071	1.071	0.986	0.948	0.948	0.948	0.948	0.948
Median (% change from Baseline)		-3.8%	-3.9%	-3.9%	-11.5%	-16.0%	-16.0%	-16.0%	-16.0%	-16.0%
95th Percentile (% change from Baseline)		0.6%	-0.0%	-0.0%	-8.0%	-11.5%	-11.5%	-11.5%	-11.5%	-11.5%





Kopuaranga River at Stuarts

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

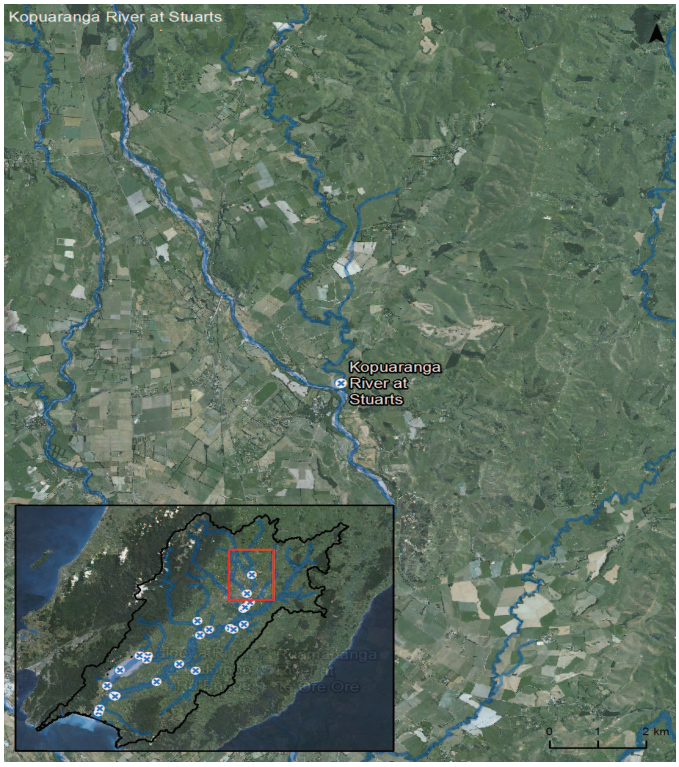
Summary

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

The Kopuaranga River at Stuarts catchment is ~16,686 ha. The catchment is primarily sheep and beef (84.5%), with some dairy and dairy support (6.5%) and native bush (0.9%). The remaining area (8.0%) is a variety of 'other' land uses including lifestyle and mixed of which no mitigations are applied. During BAU, median (50th) and 95th percentiles of DIN decrease up to 10.1% and 8.8% respectively by 2080. This is due to tier 1 mitigations (stock exclusion and effluent management), which applies a 0.1% reduction in loads to modelled nitrogen species (i.e. Ammoniacal-N and Nitrate-N) on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. During BAU 2080 no land is retired, and while pole planting is occurring in the catchment it is considered to have no effect on nitrogen species (i.e. DIN). In addition, MODFLOW-MT3D Nitrate-N loads coming from groundwater fluxes (representing a portion of baseflow in the catchment) have had a noticeable decrease, which contributes to the overall reduction in DIN concentrations.

In Silver and Gold scenarios, there is a considerable increase in land retirement of up to 1,068 ha, or 6.4% of the catchment at a rate of ~16.9 ha/yr from 2017. 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 cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. In a catchment of primarily sheep and beef and dairy/dairy support, these combined effects lead to DIN reductions in the 50th and 95th percentiles of up to 17.5% and 15.5% respectively 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	808 (4.8%)	281 (1.7%)	-	14103 (84.5%)	154 (0.9%)	1339 (8.0%)	16686

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	353	1068	1068	1068	1068	1068

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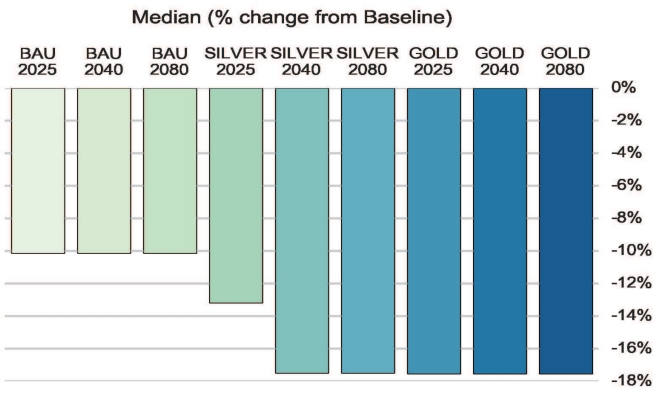
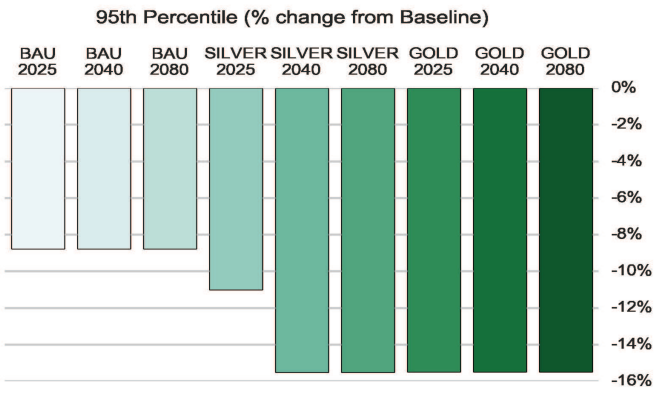
Scenario Results

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)	0.981	0.881	0.881	0.881	0.852	0.809	0.809	0.809	0.809	0.809
95th Percentile (mg/L)	2.141	1.954	1.954	1.954	1.906	1.809	1.809	1.81	1.81	1.81
Median (% change from Baseline)		-10.1%	-10.1%	-10.1%	-13.2%	-17.5%	-17.5%	-17.5%	-17.5%	-17.5%
95th Percentile (% change from Baseline)		-8.8%	-8.8%	-8.8%	-11.0%	-15.5%	-15.5%	-15.5%	-15.5%	-15.5%





Makahakaha Stream at Mouth

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

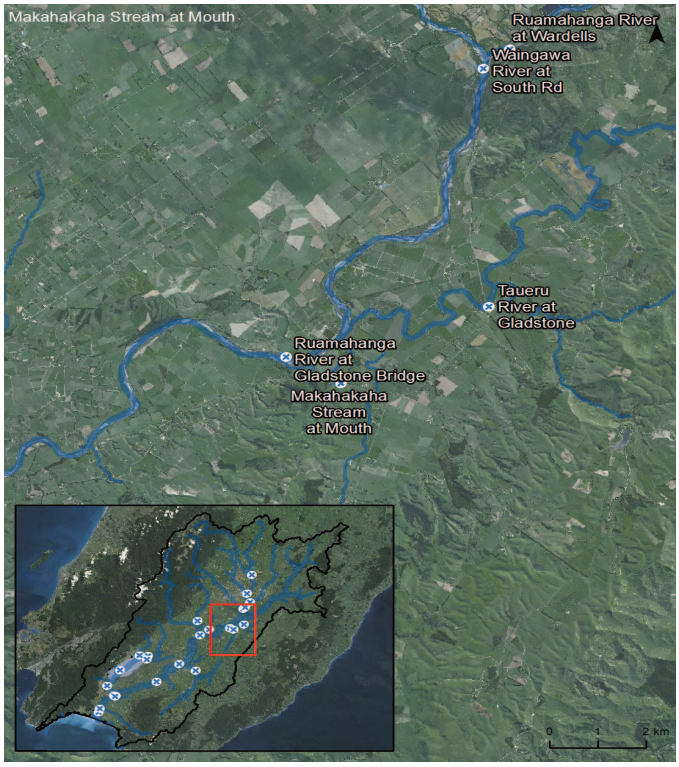
Summary

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

A catchment of ~6,192 ha drains to the Makahakaha Stream Mouth. The catchment is primarily sheep and beef (83.3%), with some dairy and dairy support (8.4%) and native bush (0.1%). The remaining area (7.7%) is a variety 'other' land uses including lifestyle, horticulture and mixed of which no mitigations are applied. During BAU there is only a ~0.02% decrease in DIN median and 95th percentiles. Stock exclusion and dairy effluent management have limited effects in this catchment, which is most likely driven by increased irrigation being modelled at 100% of consented rates, while in the baseline model irrigation ramps up over time. This effectively reduces the stream flow, which means the proportional load reductions achieved from mitigations are offset. In addition, there is no land retired in this catchment during BAU.

In Silver and Gold scenarios, the amount of retired land increases to 341 ha, equivalent of 5.5% of the catchment at a rate of ~6 ha/yr from 2017. 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 reductions in the DIN 50th and 95th percentiles of 6% and 5.6% 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	129 (2.1%)	389 (6.3%)	38 (0.6%)	5155 (83.3%)	4 (0.1%)	477 (7.7%)	6192

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	218	341	341	341	341	341

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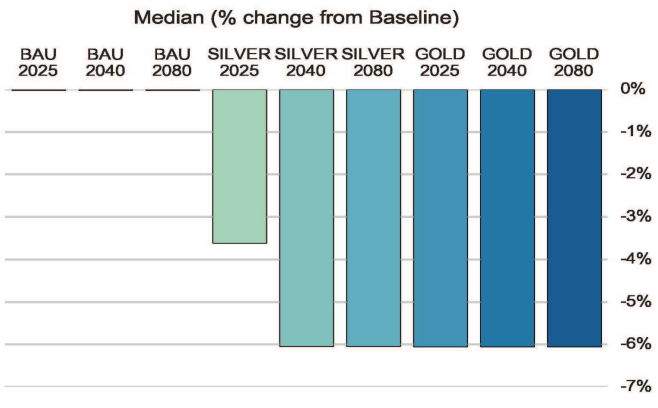
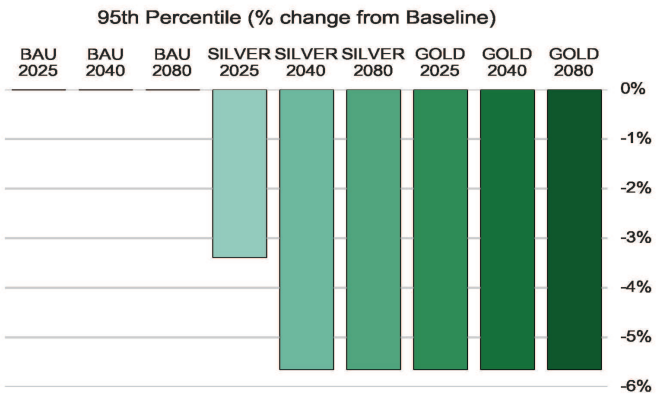
Scenario Results

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)	0.783	0.783	0.783	0.783	0.755	0.736	0.736	0.736	0.736	0.736
95th Percentile (mg/L)	1.705	1.705	1.705	1.705	1.647	1.609	1.609	1.609	1.609	1.609
Median (% change from Baseline)		-0.0%	-0.0%	-0.0%	-3.6%	-6.0%	-6.0%	-6.0%	-6.1%	-6.1%
95th Percentile (% change from Baseline)		-0.0%	-0.0%	-0.0%	-3.4%	-5.6%	-5.6%	-5.6%	-5.6%	-5.6%





Mangatarere River at SH2

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

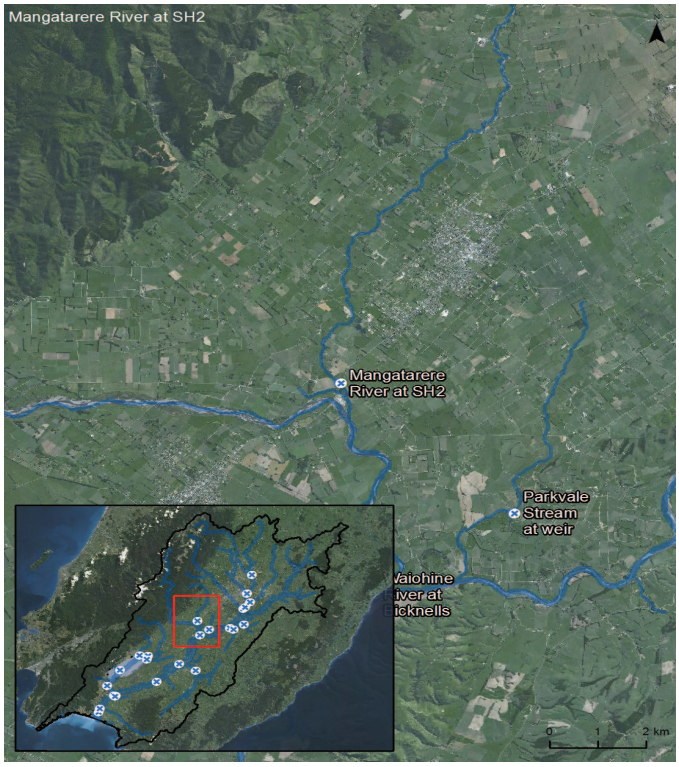
Summary

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

Mangatarere at SH2 has a catchment area of ~11,947 ha. The catchment is a mixture of landuses, including ~27% dairy/dairy support, 35% native bush and 21% sheep and beef. The remaining area is a variety 'other' (17%) land uses including lifestyle, mixed and arable. During BAU, 50th and 95th DIN percentiles decrease 7.3% and 4.4% by 2080. No land retirement occurs in this catchment in all scenarios, and pole planting is considered to have no effect on nitrogen species (i.e. Ammoniacal-N and Nitrate-N). Stock exclusion and effluent management applies a 0.1% reduction in loads to modelled nitrogen species on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. Nutrient reductions are also due to a large amount of land treatment of the Carterton Waste Water Treatment Plant (WWTP), with 85% of the volume being treated by 2025. Land treatment is considered to remove ~73% of nitrogen species load.

In Silver and Gold scenarios, tier 1 mitigations (stock exclusion and effluent management), constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% (sheep and beef farms). The Carterton WWTP has 100% land treatment in these scenarios. The combined mitigations lead to further decreases in 50th and 95th percentiles, peaking at 12.4% and 3.9% in 2040 (Gold scenario). By 2080, both Silver and Gold exhibit minor increases in concentrations, which is attributed to the simulated increase in population and subsequent load from the WWTP.

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	2842 (23.8%)	357 (3.0%)	40 (0.3%)	2515 (21.0%)	4190 (35.1%)	2003 (16.8%)	11947

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

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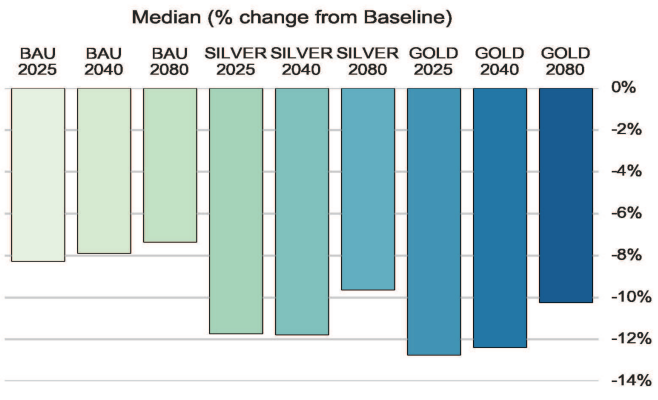
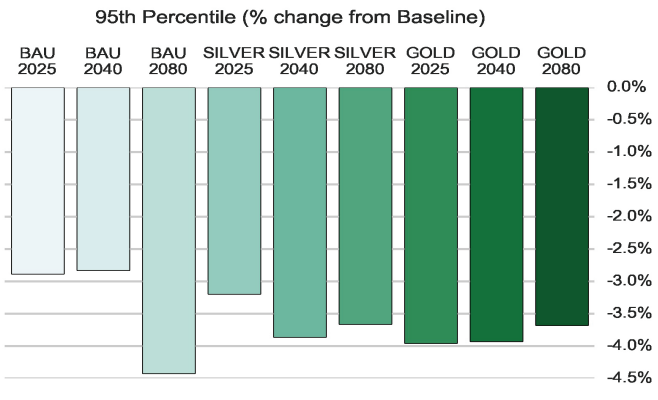
Scenario Results

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)	0.945	0.867	0.871	0.876	0.835	0.834	0.854	0.825	0.828	0.849
95th Percentile (mg/L)	2.305	2.238	2.24	2.203	2.231	2.216	2.22	2.214	2.214	2.22
Median (% change from Baseline)		-8.3%	-7.9%	-7.3%	-11.7%	-11.8%	-9.6%	-12.7%	-12.4%	-10.2%
95th Percentile (% change from Baseline)		-2.9%	-2.8%	-4.4%	-3.2%	-3.9%	-3.7%	-4.0%	-3.9%	-3.7%





Otukura Stream at Mouth

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

JACOBS

Ruamāhanga Whaitua Committee

Introduction

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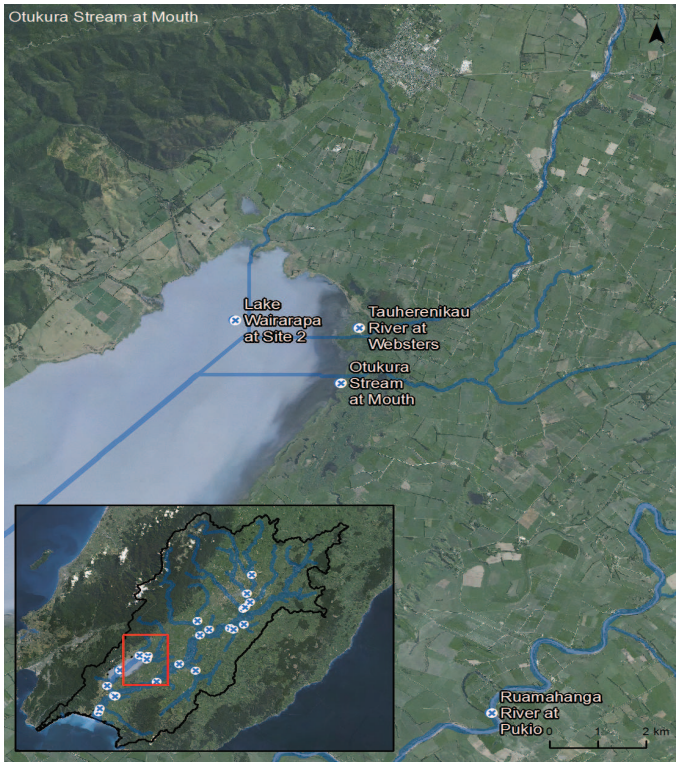
Summary

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

The Otukura Stream at Mouth has a catchment of ~9,366 ha. The catchment is primarily dairy and dairy support (56.0%), with some sheep and beef (17.2%) and native bush (0.9%). The remaining area (25.9%) is a variety of 'other' land uses including lifestyle and mixed of which no mitigations are applied. During BAU, median (50th) and 95th percentiles of DIN decrease up to 1.1% and 5.1% respectively by 2080. This is due to tier 1 mitigations, stock exclusion and effluent management, which applies a 0.1% reduction in loads to modelled nitrogen species (i.e. Ammoniacal-N and Nitrate-N) on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. No land retirement occurs in BAU.

In Silver and Gold scenarios only 1 ha of land is retired, and while pole planting is occurring in the catchment it is considered to have no effect on nitrogen species (i.e. DIN). 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 cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. In a catchment of primarily dairy/dairy support and sheep and beef, these combined effects lead to DIN reductions in the 50th and 95th percentiles of up to 15.4% and 18.5% respectively 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	2790 (29.8%)	2454 (26.2%)	-	1611 (17.2%)	83 (0.9%)	2428 (25.9%)	9366

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	1	1	1	1	1

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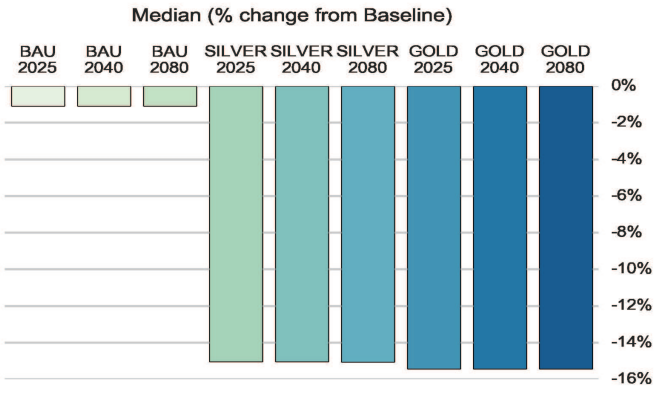
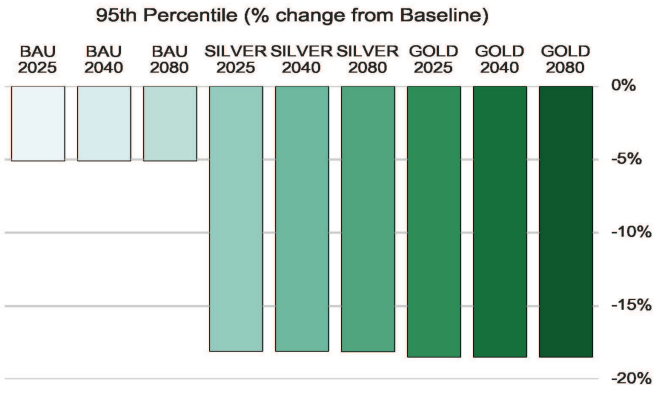
Scenario Results

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)	1.43	1.414	1.414	1.414	1.215	1.215	1.215	1.209	1.209	1.209
95th Percentile (mg/L)	1.588	1.508	1.508	1.508	1.301	1.301	1.301	1.295	1.295	1.295
Median (% change from Baseline)		-1.1%	-1.1%	-1.1%	-15.0%	-15.0%	-15.1%	-15.4%	-15.4%	-15.4%
95th Percentile (% change from Baseline)		-5.1%	-5.1%	-5.1%	-18.1%	-18.1%	-18.1%	-18.5%	-18.5%	-18.5%





Parkvale Stream at weir

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

JACOBS

Ruamāhanga Whaitua Committee

Introduction

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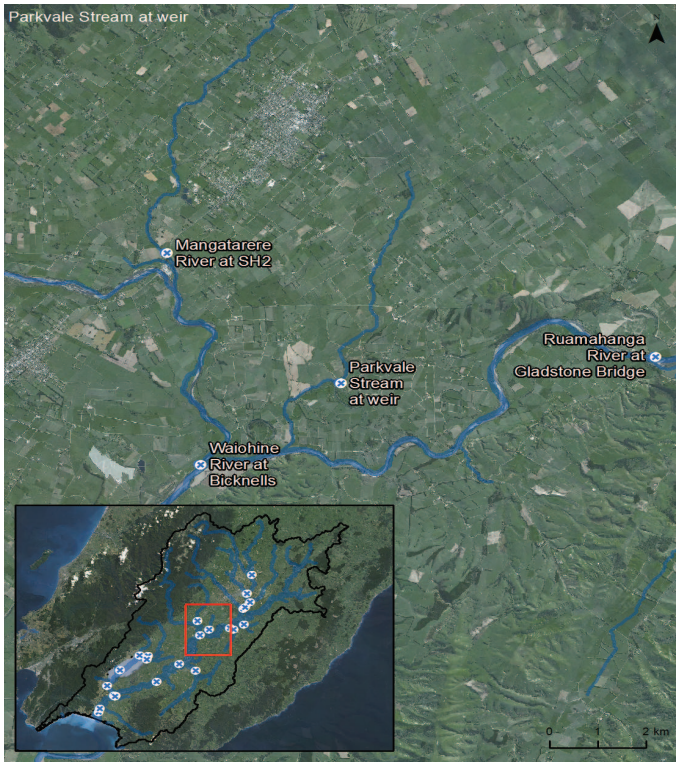
Summary

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

The Parkvale Stream at Weir has a catchment area of ~5,006 ha. The catchment is 35.9% dairy and dairy support, 19.6% sheep and beef and 0.8% native bush. The remaining area (43.6%) is a variety of 'other' land uses including lifestyle, deer and mixed of which no mitigations are applied. During BAU 2080, the median (50th) percentile of DIN decreases by up to 0.1% and the 95th percentile increases by up to 0.7%. Tier 1 mitigations, stock exclusion and effluent management, applies a 0.1% reduction in loads to modelled nitrogen species (i.e. Ammoniacal-N and Nitrate-N) on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. The slight increase in 95th DIN concentrations in the BAU is due to minor decreases in the flows (from higher irrigation abstraction rates) that mean nutrient reductions are offset. No land is retired in any scenarios, and while pole planting is occurring in the catchment it is considered to have no effect on nitrogen species (i.e. DIN).

In Silver and Gold scenarios, 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 cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. These combined effects lead to DIN reductions in the 50th and 95th percentiles of up to 12.6% and 5.6% respectively 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	1246 (24.9%)	553 (11.0%)	-	980 (19.6%)	42 (0.8%)	2185 (43.6%)	5006

Table 2. Mitigation (area in ha)

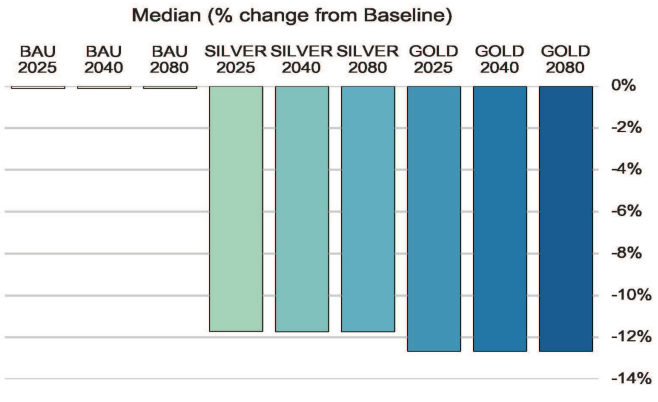
Mitigation	BAU 2025	BAU 2040	BAU 2080	Silver 2025	Silver 2040	Silver 2080	Gold 2025	Gold 2040	Gold 2080
Retirement	0	0	0	0	0	0	0	0	0

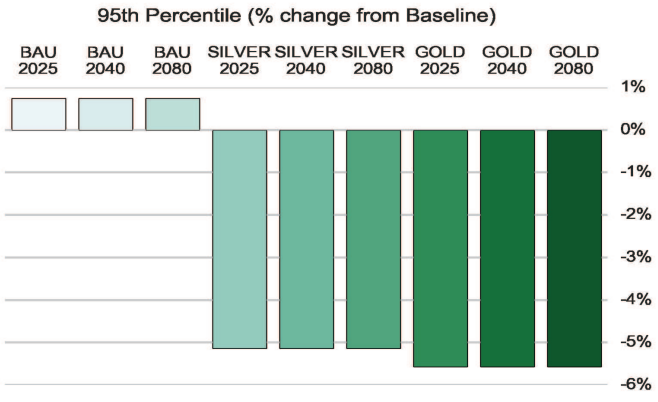
Disclaimer: This fact sheet should be read in conjunction with the report "IZ090000_RP_Rua_Scenarios_Ecological Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites. Modelled DIN is the sum of Nitrate-N and Ammoniacal-N loads. 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 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)	1.504	1.502	1.502	1.502	1.328	1.327	1.327	1.313	1.313	1.313
95th Percentile (mg/L)	1.932	1.947	1.947	1.947	1.833	1.833	1.833	1.825	1.825	1.825
Median (% change from Baseline)		-0.1%	-0.1%	-0.1%	-11.7%	-11.7%	-11.7%	-12.6%	-12.6%	-12.6%
95th Percentile (% change from Baseline)		0.7%	0.7%	0.7%	-5.1%	-5.1%	-5.1%	-5.6%	-5.6%	-5.6%





Ruamahanga River at Gladstone Bridge

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

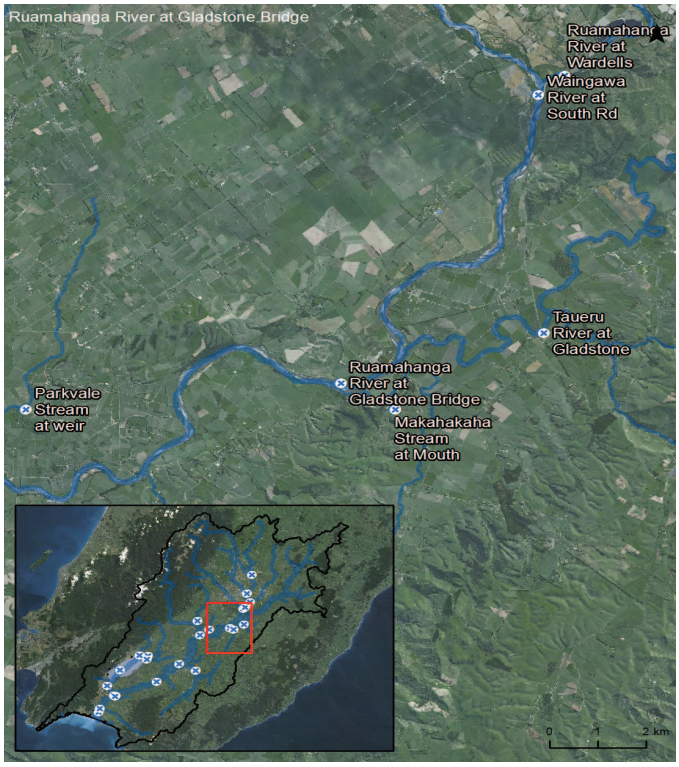
Summary

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

Ruamahanga River at Gladstone Bridge has an upstream catchment area of ~133,694 ha. The catchment is 4.3% dairy/dairy support, 15.3% native bush and 61% sheep and beef. The remaining area is a variety of 'other' (19%) land uses including lifestyle, mixed, urban and arable of which limited mitigations are applied. During BAU, 50th and 95th DIN percentiles decrease up to 14.1% and 2.2%, respectively by 2080. Land retirement of 231 ha occurs by 2080 (0.18% of the catchment at a rate of ~3.7ha/yr since 2017) and while pole planting has occurred, it has no effect on nitrogen species (i.e. Ammoniacal-N and Nitrate-N). These reductions in concentrations are attributed to Tier 1 mitigations, stock exclusion and effluent management, which applies a 0.1% reduction in loads to nitrogen species on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. In addition, the Masterton Waste Water Treatment Plant (WWTP) has increasing land treatment in BAU, ~80% of volume by 2040 and 100% by 2080.

Silver and Gold scenarios lead to a significant increase in land retirement to 6,340 ha (4.7% of the catchment area at a rate of ~100 ha/yr since 2017). In addition to tier 1 mitigations (stock exclusion and effluent management), mitigations from optimal fertiliser use and constructed wetlands (tier 2) and riparian planting/buffer strips (tier 3) lead to cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. Masterton WWTP has 100% land treatment in these scenarios. The combined influences lead to a decrease in DIN 50th and 95th percentiles of ~20.8% and 8.3% 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	3564 (2.7%)	2095 (1.6%)	791 (0.6%)	81249 (60.8%)	20401 (15.3%)	25593 (19.1%)	133694

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	138	231	2468	6340	6340	6340	6340	6340

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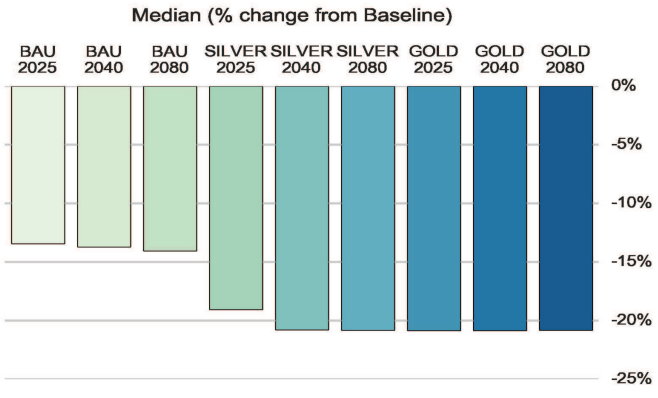
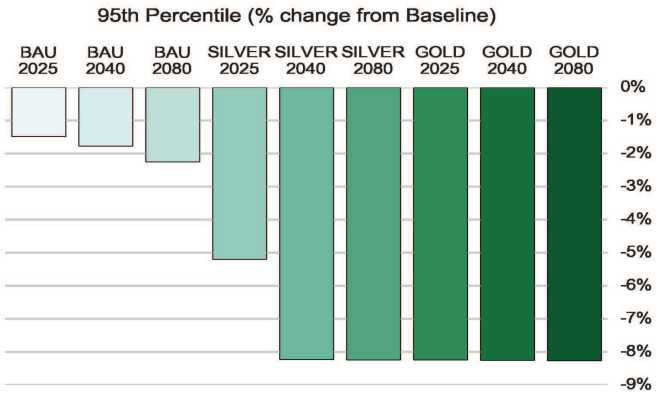
Scenario Results

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)	0.531	0.46	0.458	0.457	0.43	0.421	0.421	0.421	0.421	0.421
95th Percentile (mg/L)	1.062	1.046	1.043	1.038	1.007	0.975	0.975	0.975	0.975	0.974
Median (% change from Baseline)		-13.4%	-13.7%	-14.1%	-19.0%	-20.8%	-20.8%	-20.8%	-20.8%	-20.8%
95th Percentile (% change from Baseline)		-1.5%	-1.8%	-2.2%	-5.2%	-8.2%	-8.2%	-8.2%	-8.2%	-8.3%





Ruamahanga River at Pukio

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

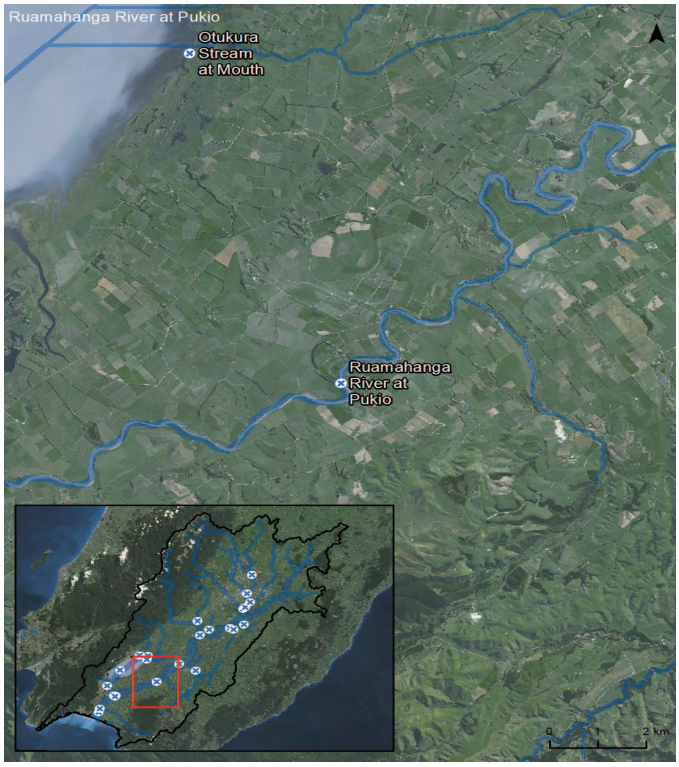
Summary

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

Ruamahanga River at Pukio has an upstream catchment area of ~246,366 ha. The catchment is 8.3% dairy/dairy support, 18.3% native bush and 53.9% sheep and beef. The remaining area (19%) is a variety of 'other' land uses including lifestyle, mixed, urban and arable of which limited mitigations are applied. During BAU, 50th and 95th DIN percentiles decrease up to 10.1% and 2.0%, respectively by 2080. Land retirement of 347 ha occurs by 2080 (0.14% of the catchment at a rate of 5.5% ha/yr since 2017), and while pole planting has occurred it is considered to have no effect on reduction in loads for nitrogen species (Nitrate-N and Ammoniacal-N). Reductions in BAU are due to Tier 1 mitigations, stock exclusion and effluent management, which applies a 0.1% reduction in loads to modelled nitrogen species on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. Additionally, compounding effects of Waste Water Treatment Plant (WWTP) land treatment up to 80–100% at Masterton, Carterton, Martinborough and Greytown further reduce DIN at Pukio.

Silver and Gold scenarios lead to an increase in land retirement to 10,812 ha (4.4% of catchment at a planting rate of ~172 ha/yr from 2017). Mitigations such as 100% land treatment of the four WWTP's, stock exclusion and effluent management (tier 1), 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 18.4% and 8.0% simulated by 2040 in Gold scenario. There is a minor increase in concentrations by 2080, which is due to the modelled WWTP loads incorporating population increase over time.

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	14438 (5.9%)	5867 (2.4%)	1556 (0.6%)	132684 (53.9%)	45104 (18.3%)	46717 (19.0%)	246366

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	5376	10812	10812	10812	10812	10812

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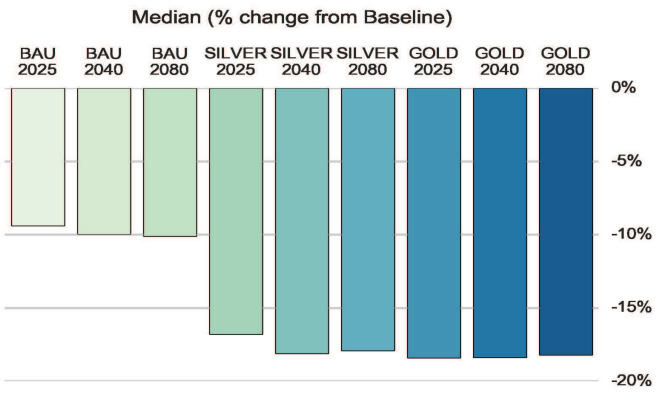
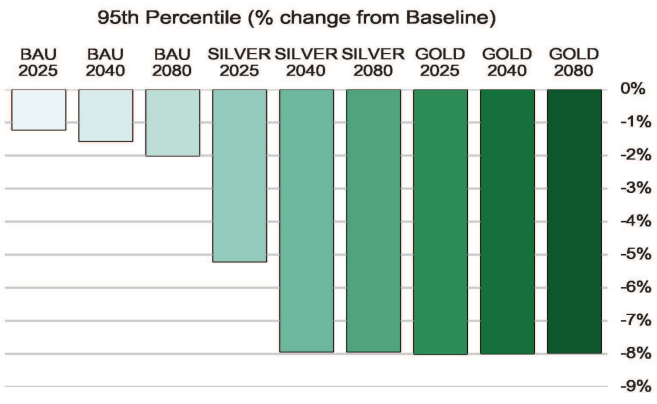
Scenario Results

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)	0.476	0.431	0.429	0.428	0.396	0.39	0.391	0.388	0.389	0.389
95th Percentile (mg/L)	0.976	0.964	0.961	0.956	0.925	0.898	0.898	0.898	0.898	0.898
Median (% change from Baseline)		-9.4%	-10.0%	-10.1%	-16.8%	-18.1%	-17.9%	-18.4%	-18.4%	-18.2%
95th Percentile (% change from Baseline)		-1.2%	-1.6%	-2.0%	-5.2%	-7.9%	-7.9%	-8.0%	-8.0%	-8.0%





Ruamahanga River at Te Ore Ore

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

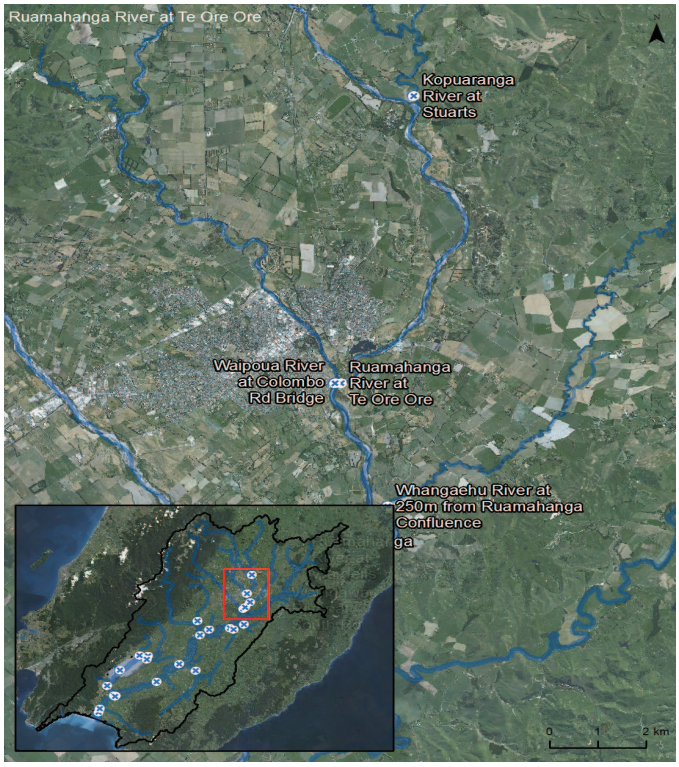
Summary

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

Ruamahanga River at Te Ore Ore has an upstream catchment area of ~31,078 ha. The catchment is 5.4% dairy/dairy support, 24.1% native bush and 57.8% sheep and beef. The remaining area (12.8%) is a variety of 'other' land uses including lifestyle and mixed of which no mitigations are applied. During BAU, 50th and 95th DIN percentiles decrease 6.4% and 0.9%, respectively by 2080. Land retirement of 61 ha occurs by 2080 (0.19% of the catchment at a rate of ~1 ha/yr from 2017). Stock exclusion and effluent management (tier 1) applies a 0.1% reduction in loads to modelled nitrogen species (i.e. Ammoniacal-N and Nitrate-N) on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms.

Silver and Gold scenarios lead to an increase in land retirement to 1,244 ha (4.0% of catchment at a rate of 19.7 ha/yr from 2017). Tier 1 mitigations, constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to cumulative nutrient reductions in the DWC's of ~24–25.7% (dairy/dairy support) and ~3.8% on sheep and beef farms. The simulated DIN median and 95th percentiles reduce 12.3% and 7.6% 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	1115 (3.6%)	549 (1.8%)	3 (0.0%)	17950 (57.8%)	7487 (24.1%)	3974 (12.8%)	31078

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	52	61	452	1244	1244	1244	1244	1244

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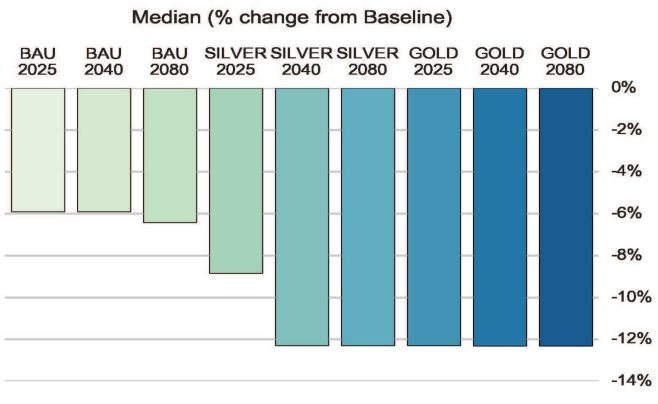
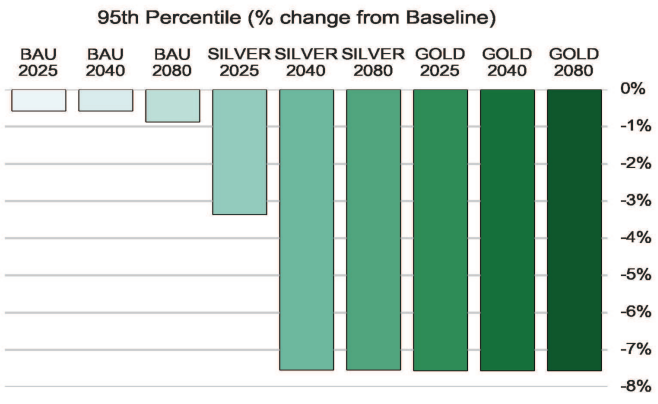
Scenario Results

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)	0.377	0.355	0.355	0.353	0.344	0.331	0.331	0.331	0.331	0.331
95th Percentile (mg/L)	0.97	0.964	0.964	0.961	0.937	0.897	0.897	0.896	0.896	0.896
Median (% change from Baseline)		-5.9%	-5.9%	-6.4%	-8.8%	-12.3%	-12.3%	-12.3%	-12.3%	-12.3%
95th Percentile (% change from Baseline)		-0.6%	-0.6%	-0.9%	-3.4%	-7.5%	-7.5%	-7.6%	-7.6%	-7.6%





Ruamahanga River at U/S Lake Wai Outlet

Dissolved Inorganic Nitrogen (DIN)

Revision 1

Date: 2017-11-20

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 Inorganic Nitrogen (DIN) 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 ecosystem health and periphyton.

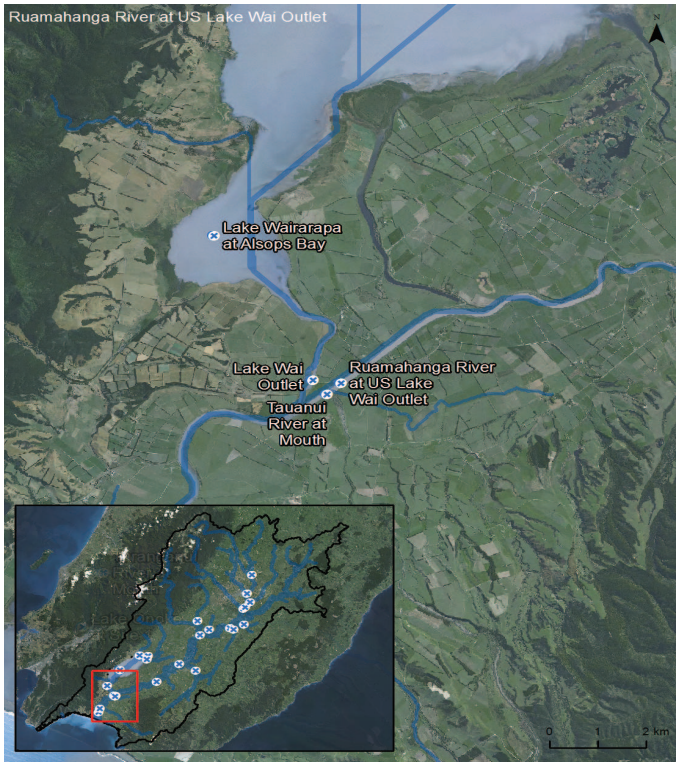
Summary

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

Ruamahanga River upstream of Lake Wairarapa Outlet is the most downstream reporting site in catchment modelling (excluding lakes). The site has an upstream catchment area of ~254,496 ha. The catchment is 8.7% dairy/dairy support, 18.5% native bush, 53.5% sheep and beef and 0.6% arable. The remaining area (18.7%) are all 'other' land uses including lifestyle, mixed, horticulture and urban of which no mitigations are applied. During BAU, 50th and 95th DIN percentiles decrease 6.5% and 1.7%, respectively by 2080. Land retirement of 347 ha occurs by 2080 (0.13% of the catchment at a rate of ~5.5 ha/yr from 2017). Pole planting is considered to have no effect on load reductions of nitrogen species (i.e. Ammoniacal-N and Nitrate-N). The decreases in BAU are due to stock exclusion and effluent management which applies a 0.1% reduction in loads to modelled nitrogen species on sheep and beef farms, and 1.6–4.1% on dairy support/dairy farms. In addition, further reductions in DIN are attributed to 80–100% land treatment of the upstream Waste Water Treatment Plants (WWTP) in Masterton, Carterton, Greytown and Martinborough by 2080.

Silver and Gold scenarios increase land retirement to 11,092 ha (4.4% of catchment at a rate of 176 ha/yr from 2017). Further mitigations such as 100% land treatment of the WWTP's, constructed wetlands and optimal fertiliser use (tier 2) and riparian planting/buffer strips (tier 3) contribute to further decreases in median and 95th percentiles, up to 18.9% and 8.7% respectively, simulated by 2040 in both scenarios. Minor increases in percentiles occur by 2080, due to WWTP's load incorporating population growth.

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	16146 (6.3%)	6139 (2.4%)	1556 (0.6%)	136133 (53.5%)	47016 (18.5%)	47506 (18.7%)	254496

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	5634	11092	11092	11092	11092	11092

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. Modelled DIN is the sum of Nitrate-N and Ammoniacal-N loads. 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 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)	0.512	0.481	0.48	0.479	0.42	0.416	0.417	0.415	0.415	0.416
95th Percentile (mg/L)	0.951	0.942	0.938	0.935	0.899	0.87	0.87	0.869	0.869	0.869
Median (% change from Baseline)		-6.1%	-6.4%	-6.5%	-17.9%	-18.8%	-18.7%	-18.9%	-18.9%	-18.8%
95th Percentile (% change from Baseline)		-1.0%	-1.4%	-1.7%	-5.5%	-8.6%	-8.6%	-8.7%	-8.7%	-8.7%