

Huangarua River at Ponatahi Bridge

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

Summary

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

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

Huangarua River at Ponatahi Bridge has an upstream catchment area of ~30,239 ha. The catchment is primarily sheep and beef (84.6%) with limited dairy support (0.2%) and native bush (2.3%). 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) concentrations of SSC increases by up to 7.2% by 2025 due to irrigation being modelled at 100% of the consented rates, where during the baseline model irrigation ramps up over time. Effectively this higher abstraction decreases flow, which contributes to an increase in concentrations. In addition, by 2025 no retirement or pole planting is mature and contributing to reduced SSC loads. By BAU 2080, 107 ha of matured retired land is present, and 1,669 ha of pole planting at a rate of ~26 ha/yr from 2017 is >15 years old and considered to reduce SSC loads. Stock exclusion also contributes to reduced SSC loads, and with the combined mitigations, there is a decrease in the 50th and 95th SSC percentiles by up to 18.0% and 26.9%, respectively, by BAU 2080.

In Silver and Gold scenarios pole planting and land retirement occurs at a greater rate. Mature pole planted land peaks at 3,955 ha or 13% of the catchment, equivalent to a planting rate upstream of this reporting point of ~63 ha/yr from 2017. In addition, up to 3,240 ha of land has been retired or 10.7% of the catchment, equivalent to a rate of ~51 ha/yr from 2017. Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. These combined effects on a catchment dominated by farming landuses results in decreases of the Silver and Gold median and 95th percentiles of up to 64.0% and 69.7%, respectively, 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	-	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	0	107	107	0	2285	3240	0	3240	3240
Pole Planting	0	204	1669	0	1697	3955	0	1702	3955

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

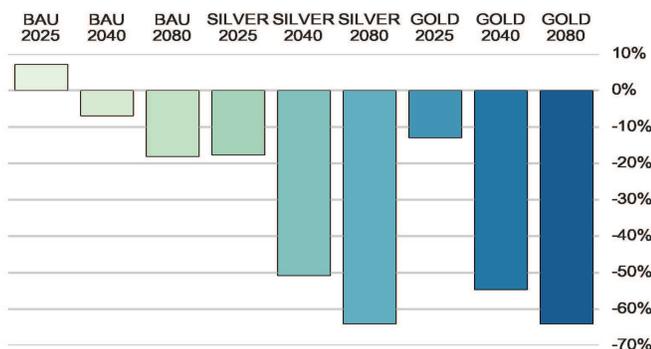
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

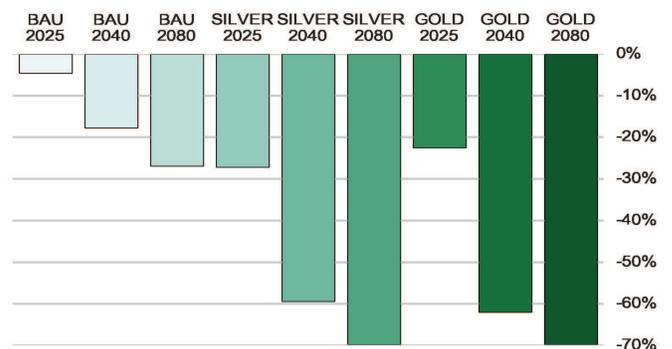
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	1.6	1.8	1.5	1.3	1.4	0.8	0.6	1.4	0.7	0.6
95th Percentile (mg/L)	177.6	169.5	146.1	129.9	129.4	72.2	53.7	137.8	67.6	53.7
Median (% change from Baseline)		7.2%	-6.9%	-18.0%	-17.6%	-50.7%	-64.0%	-12.9%	-54.6%	-64.0%
95th Percentile (% change from Baseline)		-4.6%	-17.7%	-26.9%	-27.1%	-59.4%	-69.7%	-22.4%	-61.9%	-69.7%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Kopuaranga River at Stuarts

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

Summary

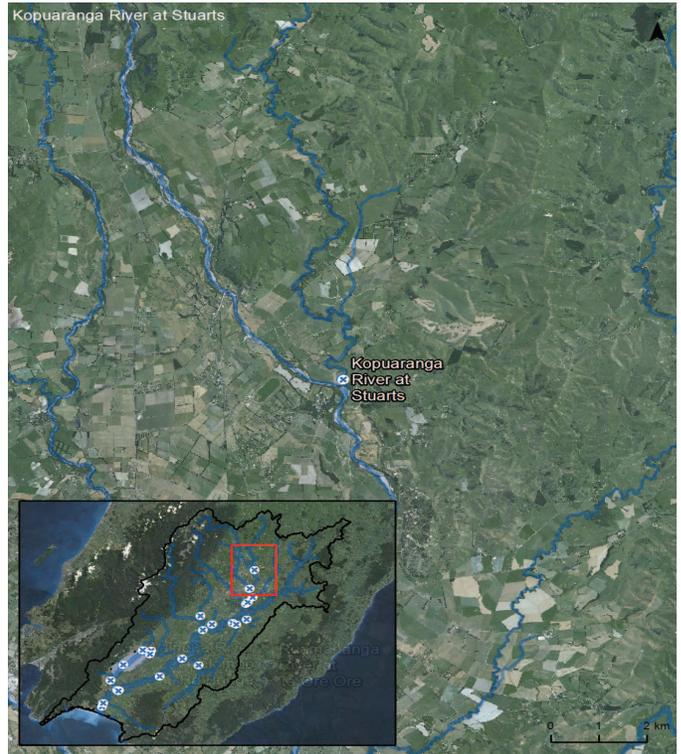
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

Kopuaranga River at Stuarts has an upstream catchment area of ~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 2080, no land is retired and only 2 ha of pole planting is >10 years old and considered to reduce SSC loads. Stock exclusion is the primary mechanism for reduced SSC. The combined mitigations decrease the 50th and 95th SSC percentiles up to 7.9% and 7.7%, respectively, by BAU 2080.

In Silver and Gold scenarios, there is a considerable increase in land retirement and pole planting in the catchment. Land retirement is up to 1,068 ha or 6.4% of the catchment at a rate of ~16.9 ha/yr from 2017, and pole planting peaks at 899 ha or 5.3% of the catchment at a planting rate of ~ 14.2 ha/yr from 2017. Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8-6.4% on dairy landuses, and 20.7% on sheep and beef. The effects of the combined mitigations on dairy and sheep and beef land uses results in a noticeable decrease of both the Silver and Gold median and 95th percentiles of up to -52% 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	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	0	353	1068	0	1068	1068
Pole Planting	0	2	2	0	526	899	0	526	899

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

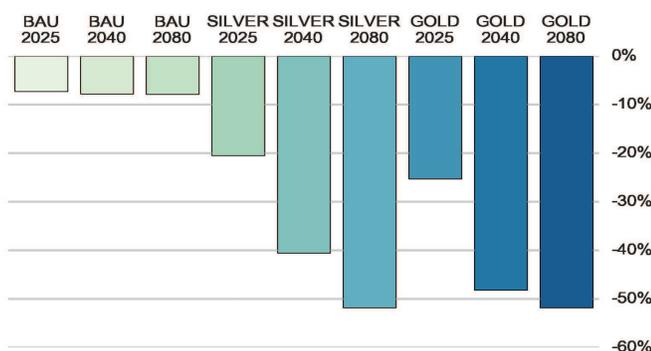
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

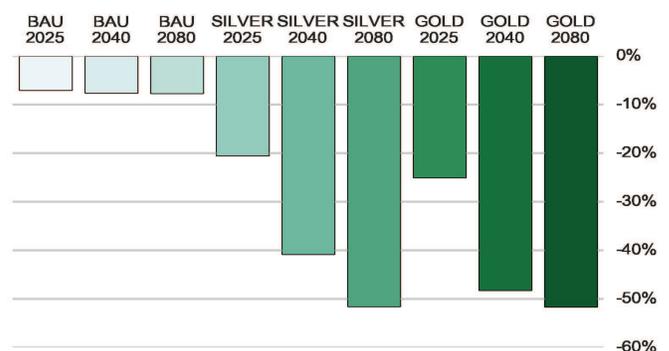
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	14.0	13.0	12.9	12.9	11.1	8.3	6.8	10.5	7.3	6.8
95th Percentile (mg/L)	298.1	277.2	275.5	275.3	237.0	176.5	144.3	223.4	154.5	144.3
Median (% change from Baseline)		-7.2%	-7.8%	-7.9%	-20.5%	-40.5%	-51.8%	-25.2%	-48.1%	-51.8%
95th Percentile (% change from Baseline)		-7.0%	-7.6%	-7.7%	-20.5%	-40.8%	-51.6%	-25.1%	-48.2%	-51.6%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Makahakaha Stream at Mouth

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

Summary

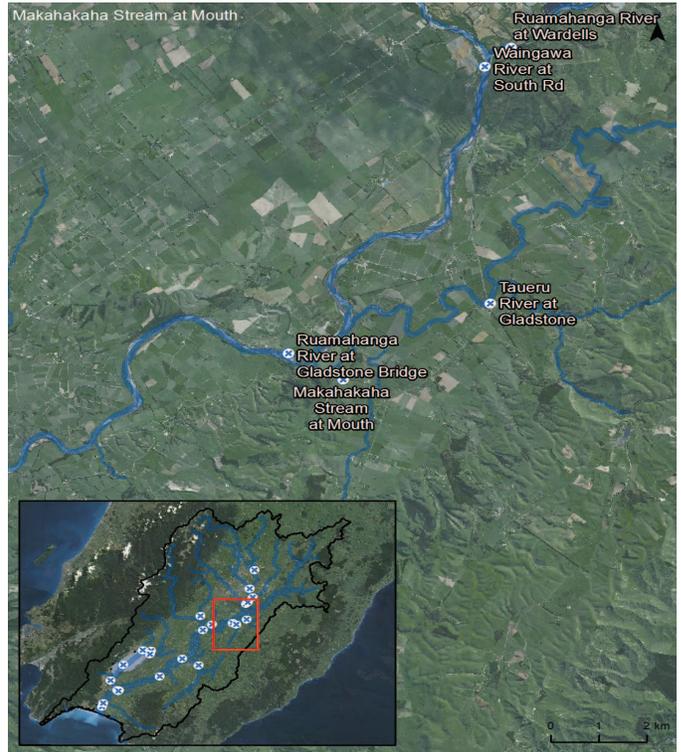
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

Makahakaha Stream Mouth has an upstream catchment area of ~6,192 ha. 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. In BAU 2080, up to 3 ha of pole planting occurs that is >15 years old. No land is retired during BAU. Stock exclusion is the primary reason for reduced SSC loads, and with the combined mitigations both the 50th and 95th SSC percentiles decrease by up to 13.8% by BAU 2080.

In Silver and Gold scenarios, pole planting does not increase from 3 ha in BAU, but the amount of retired land increases to 341 ha or 5.5% of the catchment, equivalent to a rate of ~6 ha/yr from 2017. Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. These combined effects on a catchment dominated by farming landuses results in a decrease in both the 50th and 95th SSC percentiles by up to 43.5% 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	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	0	218	341	0	341	341
Pole Planting	0	3	3	0	3	3	0	3	3

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

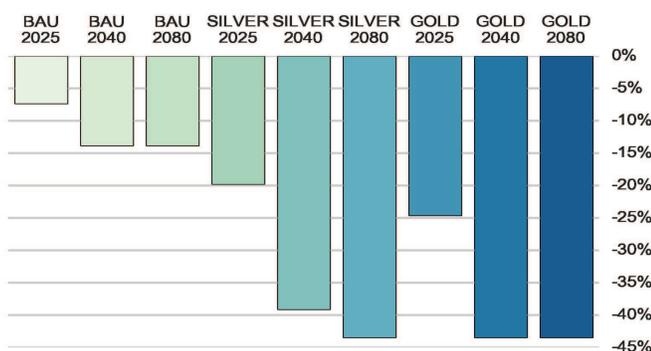
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

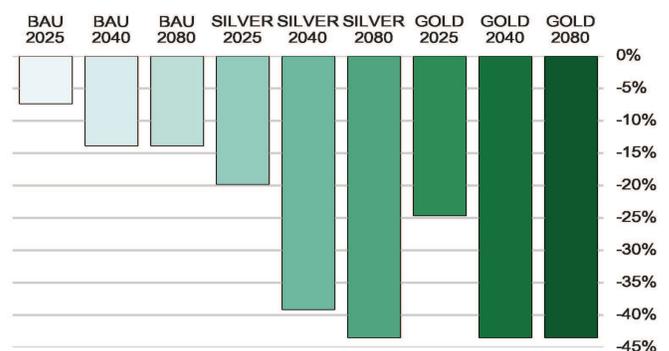
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	22.7	21.0	19.5	19.5	18.2	13.8	12.8	17.1	12.8	12.8
95th Percentile (mg/L)	213.4	197.7	183.9	183.9	171.2	130.0	120.7	160.9	120.7	120.7
Median (% change from Baseline)		-7.4%	-13.8%	-13.8%	-19.8%	-39.1%	-43.5%	-24.6%	-43.5%	-43.5%
95th Percentile (% change from Baseline)		-7.4%	-13.8%	-13.8%	-19.8%	-39.1%	-43.5%	-24.6%	-43.5%	-43.5%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Mangatarere River at SH2

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

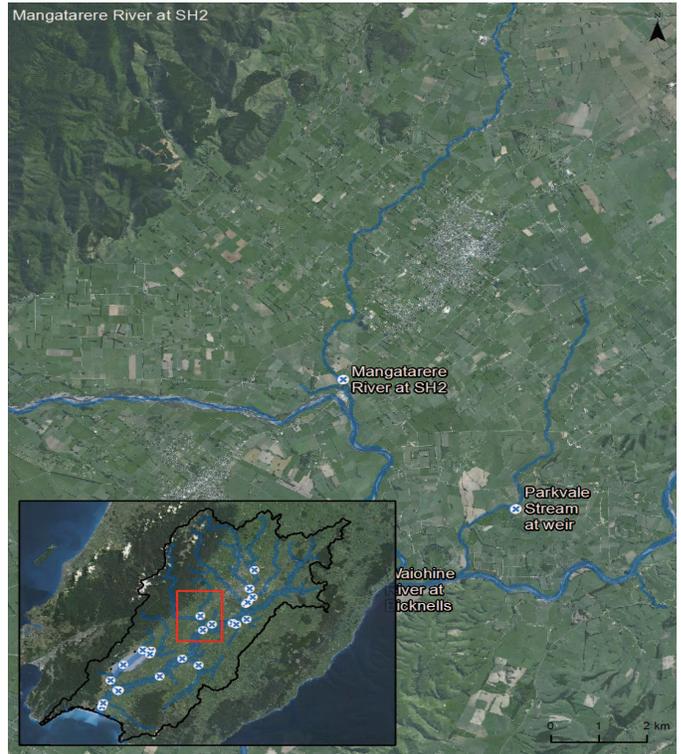
Summary

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

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

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 SSC percentiles decrease 29.3% and 23.4% by 2080. While no land retirement occurs in this catchment in all scenarios, 784 ha of pole planted land is mature by 2080 and will contribute to reduced SSC loads (6.6% of catchment at a planting rate of ~12.5 ha/yr since 2017). In Silver and Gold scenarios, pole planting has increased to 1,526 ha of mature trees by 2080 (12.7% of the catchment at a planting rate of ~24.2 ha/yr since 2017). Tier 2 mitigations such as constructed wetlands lead to further decreases in suspended sediment load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. Land treatment of the Carterton WWTP (100%) is considered to remove all SSC from discharged water. These combined effects decrease Silver and Gold median and 95th percentiles by 41.4% and 36.6%, respectively in 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	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
Pole Planting	0	0	784	0	1467	1526	0	1467	1526

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

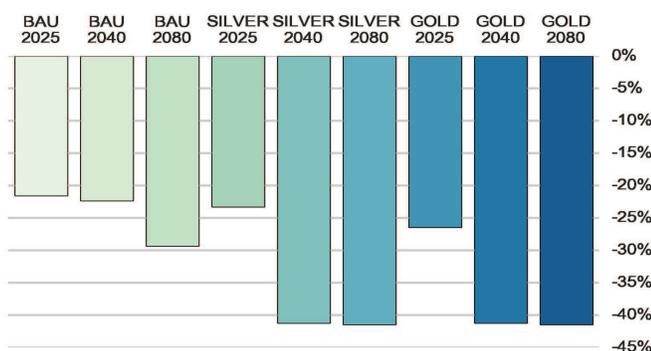
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

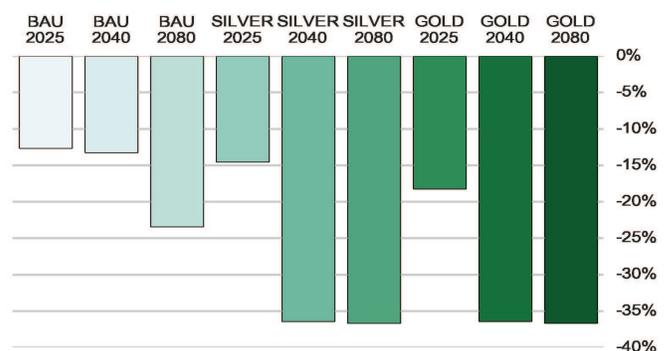
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	4.4	3.5	3.4	3.1	3.4	2.6	2.6	3.2	2.6	2.6
95th Percentile (mg/L)	152.6	133.3	132.3	116.8	130.4	97.1	96.7	124.8	97.1	96.7
Median (% change from Baseline)		-21.6%	-22.3%	-29.3%	-23.3%	-41.2%	-41.4%	-26.5%	-41.2%	-41.4%
95th Percentile (% change from Baseline)		-12.6%	-13.3%	-23.4%	-14.5%	-36.4%	-36.6%	-18.2%	-36.4%	-36.6%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Otukura Stream at Mouth

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

Summary

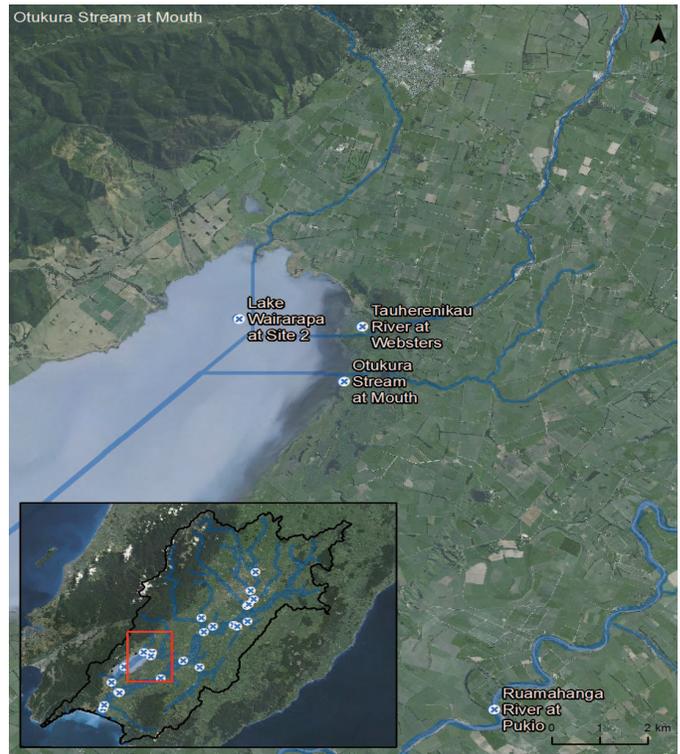
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from NZSedNet. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the NZSedNet hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in NZSedNet. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

Otukura Stream at Mouth has an upstream catchment area 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 2080, there is no land retirement or pole planting. Despite this, stock exclusion/riparian planting (tier 1) alone can result in large reductions in this catchment in SSC which is evident in the decreases in the 50th and 95th SSC percentiles of 65.2% and 50.5%. This is due to the large portion of sediment load being derived from net bank erosion in this lowland catchment, with tier 1 mitigations having a greater effect than they would on upland/steeper catchments.

In Silver and Gold scenarios, there is a marginal increase in land retirement and pole planting. Land retired is 1 ha and pole planting peaks at 12 ha. The small amount of retirement and pole planting is due to the flat slopes and land classifications within the catchment not being identified as a priority for sediment control set out by the scenarios. Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8-6.4% on dairy landuses, and 20.7% on sheep and beef. The effects of the combined mitigations result in a significant decrease of the Silver and Gold median and 95th SSC percentiles of up to 69.0% and 72.8%, respectively, 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	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	0	1	0	1	1
Pole Planting	0	0	0	0	1	12	0	1	12

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

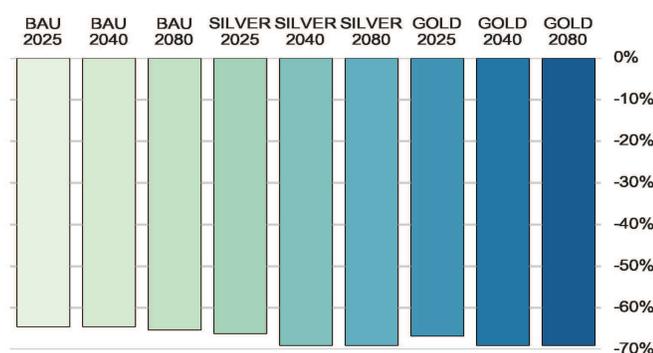
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

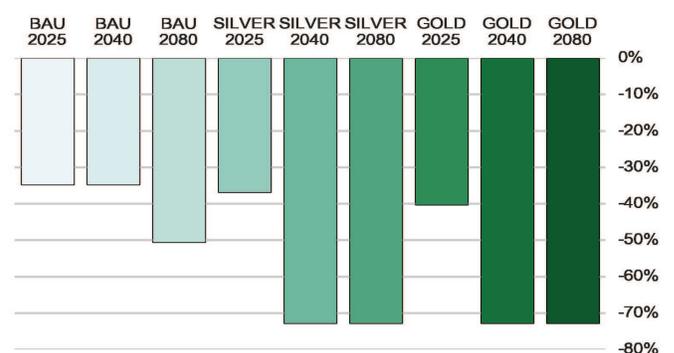
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
95th Percentile (mg/L)	16.9	11.0	11.0	8.4	10.7	4.6	4.6	10.1	4.6	4.6
Median (% change from Baseline)		-64.5%	-64.5%	-65.2%	-66.1%	-69.0%	-69.0%	-66.7%	-69.0%	-69.0%
95th Percentile (% change from Baseline)		-34.7%	-34.7%	-50.5%	-36.8%	-72.8%	-72.8%	-40.3%	-72.8%	-72.8%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Parkvale Stream at weir

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

Introduction

This fact sheet presents results generated from modelling nine scenarios for the Ruamāhanga Catchment. The results are compared to the baseline model, with a focus on the change in concentrations in the median and 95th percentiles. Suspended Sediment Concentration (SSC) 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.

Summary

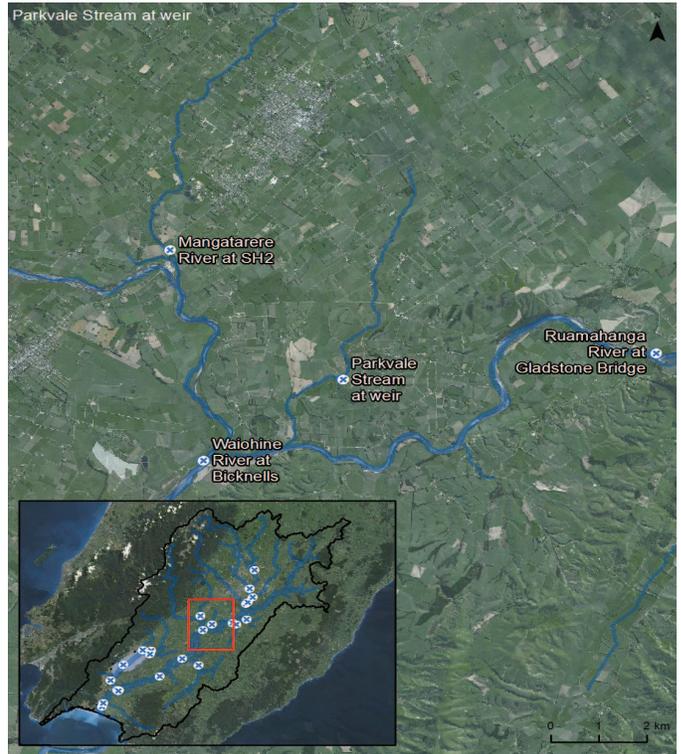
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from NZSedNet. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the NZSedNet hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in NZSedNet. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

Parkvale Stream at Weir has an upstream 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, no land is retired and 1 ha of pole planting is >15 years old and considered to reduce SSC loads. Despite limited land retirement and pole planting in this catchment in BAU 2080, stock exclusion/riparian planting (tier 1) can result in significant reductions in SSC loads, evident with decreases of the 50th and 95th SSC percentiles by up to 58.1% and 59.7%, respectively. This is due to the lowland catchment having a high proportion of its sediment load derived from net bank erosion (rather than hillslope erosion), meaning fencing/planting has a more significant impact when compared to an upland, steeper catchment.

In Silver and Gold scenarios, there is no land retirement as is the case in BAU, and a significant increase in pole planting. Pole planting peaks at 1,284 ha or 25.7% of the catchment, equivalent to a planting rate of ~20.3 ha/yr from 2017. Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8-6.4% on dairy landuses, and 20.7% on sheep and beef. In a catchment of primarily dairy and sheep and beef land uses, the effects of the combined mitigations result in a significant decrease of the Silver and Gold median and 95th SSC percentiles of up to 74.8% and 75.5%, respectively, 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	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
Pole Planting	0	1	1	0	41	1284	0	41	1284

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

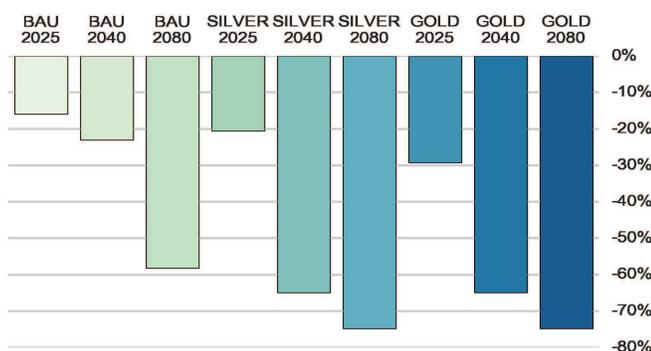
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

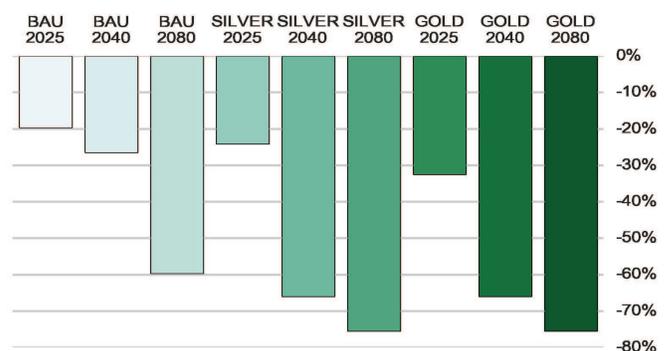
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	1.6	1.3	1.2	0.7	1.3	0.6	0.4	1.1	0.6	0.4
95th Percentile (mg/L)	57.6	46.3	42.3	23.2	43.7	19.6	14.1	38.9	19.6	14.1
Median (% change from Baseline)		-15.9%	-23.0%	-58.1%	-20.5%	-64.9%	-74.8%	-29.3%	-64.9%	-74.8%
95th Percentile (% change from Baseline)		-19.6%	-26.5%	-59.7%	-24.1%	-65.9%	-75.5%	-32.5%	-65.9%	-75.5%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Ruamahanga River at Gladstone Bridge

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

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. Suspended Sediment Concentration (SSC) 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.

Summary

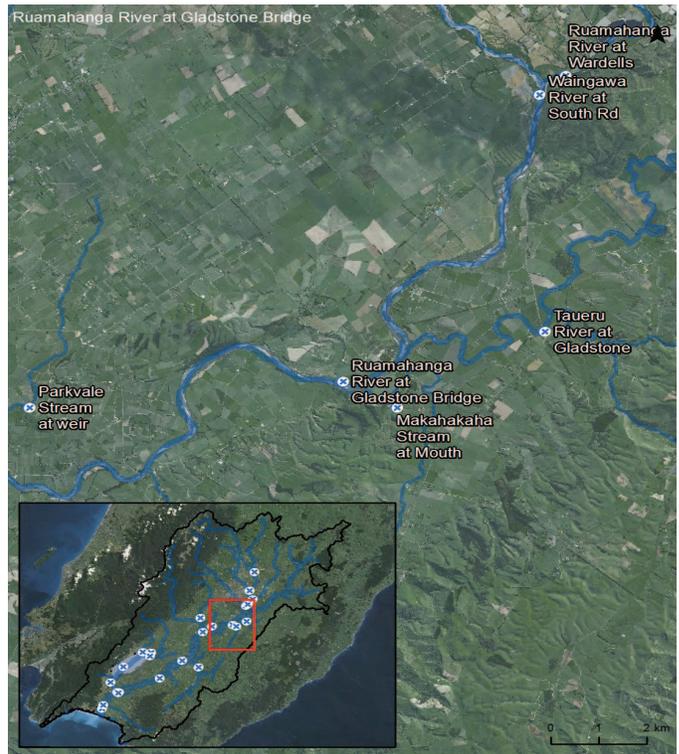
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

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. In BAU 2080, the amount of land retired is 164 ha of mature trees (>10 years) or 0.12% of the catchment at a rate of ~2.6 ha/yr from 2017, and up to 3,146 ha of pole planted land or 2.3% of catchment has occurred at a planting rate of ~50 ha/yr from 2017 is mature (>10 years), contributing to reduced SSC loads. Stock exclusion and increasing land treatment of the Masterton Waste Water Treatment Plant (WWTP) of up 80% by 2040 and 100% by 2080 will further reduce sediment loads. 50th and 95th percentiles decrease up to 20.7% and 26.0% by BAU 2080.

Silver and Gold scenarios lead to a significant increase in pole planting by 2080, peaking at 16,750 ha or 12.5% of the catchment. This is equivalent to space planting upstream of the reporting point at a rate of ~266 ha/yr from 2017. Land retirement also rises to 6,340 ha or 4.7% of the catchment area at a rate of ~100 ha/yr from 2017. Tier 2 mitigations such as constructed wetlands lead to further decreases in suspended sediment load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. Masterton WWTP has 100% land treatment in these scenarios, removing all SSC WWTP load. These combined effects decrease Silver and Gold median and 95th percentiles by 43.0% and 49.8%, respectively in 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	0	164	0	2468	6340	0	6340	6340
Pole Planting	0	707	3146	0	5387	16750	0	5387	16750

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

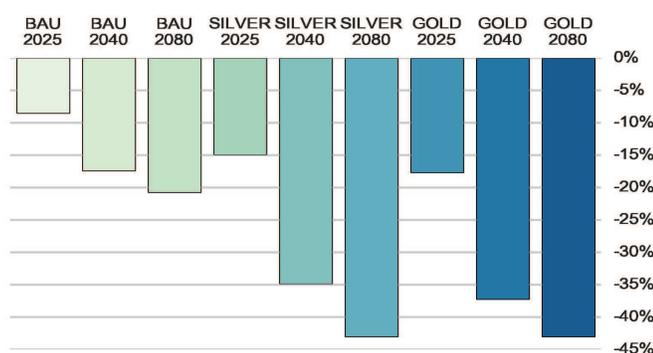
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

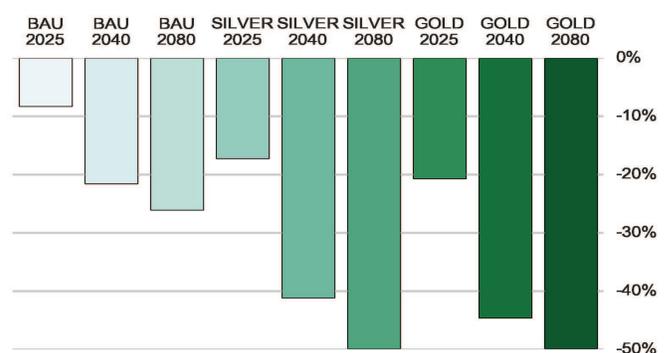
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	26.7	24.4	22.1	21.2	22.7	17.4	15.2	22.0	16.8	15.2
95th Percentile (mg/L)	438.0	401.9	343.7	324.0	362.7	258.0	219.7	347.4	242.7	219.7
Median (% change from Baseline)		-8.5%	-17.4%	-20.7%	-14.9%	-34.8%	-43.0%	-17.7%	-37.2%	-43.0%
95th Percentile (% change from Baseline)		-8.2%	-21.5%	-26.0%	-17.2%	-41.1%	-49.8%	-20.7%	-44.6%	-49.8%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Ruamahanga River at Pukio

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

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. Suspended Sediment Concentration (SSC) 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.

Summary

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

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

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. Land retirement of 271 ha of mature trees (>10 years) occurs by 2080 (0.11% of the catchment at a rate of ~4.3 ha/yr since 2017) while up to 5,759 ha of pole planted land is mature by 2080 and will contribute to reduced SSC loads (2.3% of catchment at a planting rate of ~91.5 ha/yr since 2017). Stock exclusion and increasing land treatment of Waste Water Treatment Plants (WWTP) at Masterton, Carterton, Martinborough and Greytown also influence SSC reductions simulated at Pukio. 50th and 95th SSC percentiles decrease up to 19.8% and 20.8% by BAU 2080.

Silver and Gold scenarios lead to a significant increase in pole planting, peaking at 27,669 ha by 2080 (11.2% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~440 ha/yr from 2017. Land retirement also rises to 10,812 ha (4.4% of catchment at a planting rate of ~172 ha/yr from 2017). Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. 100% land treatment of four WWTP's occurs in these scenarios, removing all SSC WWTP load. These combined effects decrease Silver and Gold median and 95th percentiles by 41.2% and 43.4%, respectively in 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	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	0	107	271	0	5376	10812	0	10812	10812
Pole Planting	0	926	5759	0	8990	27669	0	8995	27669

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

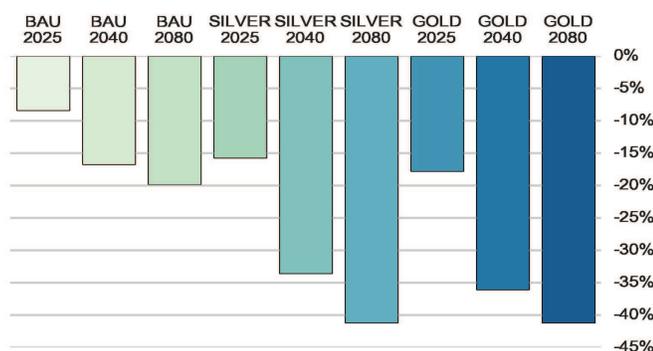
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

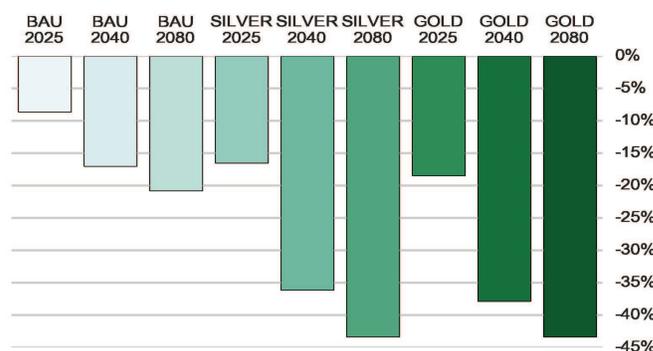
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	20.3	18.6	16.9	16.2	17.1	13.5	11.9	16.7	13.0	11.9
95th Percentile (mg/L)	317.6	290.3	263.6	251.7	265.2	202.9	179.9	259.0	197.4	179.9
Median (% change from Baseline)		-8.4%	-16.7%	-19.8%	-15.7%	-33.5%	-41.2%	-17.8%	-36.1%	-41.2%
95th Percentile (% change from Baseline)		-8.6%	-17.0%	-20.8%	-16.5%	-36.1%	-43.4%	-18.5%	-37.9%	-43.4%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Ruamahanga River at Te Ore Ore

Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

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. Suspended Sediment Concentration (SSC) 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.

Summary

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

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

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. Land retirement of 52 ha of mature trees (>10 years) occurs by 2080 (0.16% of the catchment at a rate of ~0.8 ha/yr since 2017) while only 3 ha of pole planted land is mature by 2080 and contributing to reduced SSC loads. Stock exclusion also contributes to reduced SSC due to bank stabilisation, with the combined mitigations decreasing 50th and 95th SSC percentiles up to 9.2% and 9.6% by BAU 2080.

Silver and Gold scenarios lead to a significant increase in pole planting, peaking at 2,423 ha of mature trees by 2080 (7.8% of the catchment). This is equivalent to space planting upstream of this reporting point at a rate of ~38.5 ha/yr from 2017. Land retirement also rises to 1,244 ha (4.0% of catchment at a rate of 19.7 ha/yr from 2017). Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. These combined effects decrease Silver and Gold median and 95th percentiles by 33.7% and 30.8%, respectively in 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	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	0	52	0	451	1244	0	1244	1244
Pole Planting	0	2	3	0	1015	2423	0	1015	2423

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

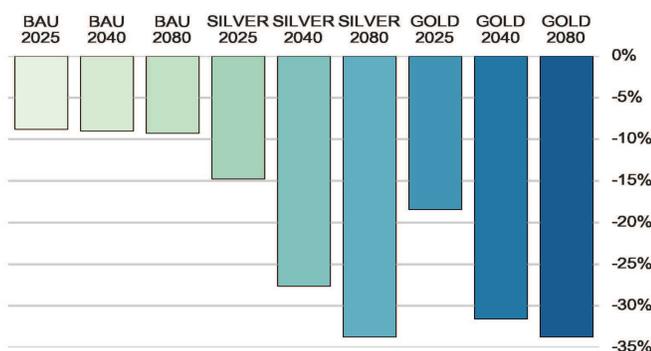
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

Scenario Results

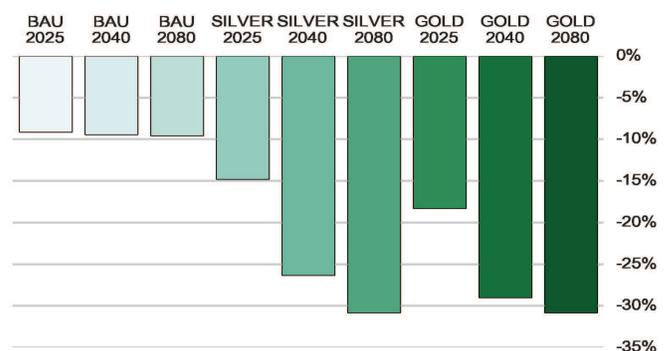
Table 3. Water quality statistics

Statistic	Baseline	BAU 2025	BAU 2040	BAU 2080	SILVER 2025	SILVER 2040	SILVER 2080	GOLD 2025	GOLD 2040	GOLD 2080
Median (mg/L)	20.9	19.0	19.0	18.9	17.8	15.1	13.8	17.0	14.3	13.8
95th Percentile (mg/L)	305.1	277.3	276.4	276.0	260.1	224.9	211.1	249.3	216.7	211.1
Median (% change from Baseline)		-8.8%	-9.0%	-9.2%	-14.7%	-27.6%	-33.7%	-18.4%	-31.6%	-33.7%
95th Percentile (% change from Baseline)		-9.1%	-9.4%	-9.6%	-14.8%	-26.3%	-30.8%	-18.3%	-29.0%	-30.8%

Median (% change from Baseline)



95th Percentile (% change from Baseline)



Ruamahanga River at U/S Lake Wai Outlet Suspended Sediment Concentration (SSC)

Revision 1 DRAFT
Date: 2017-11-10

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. Suspended Sediment Concentration (SSC) 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.

Summary

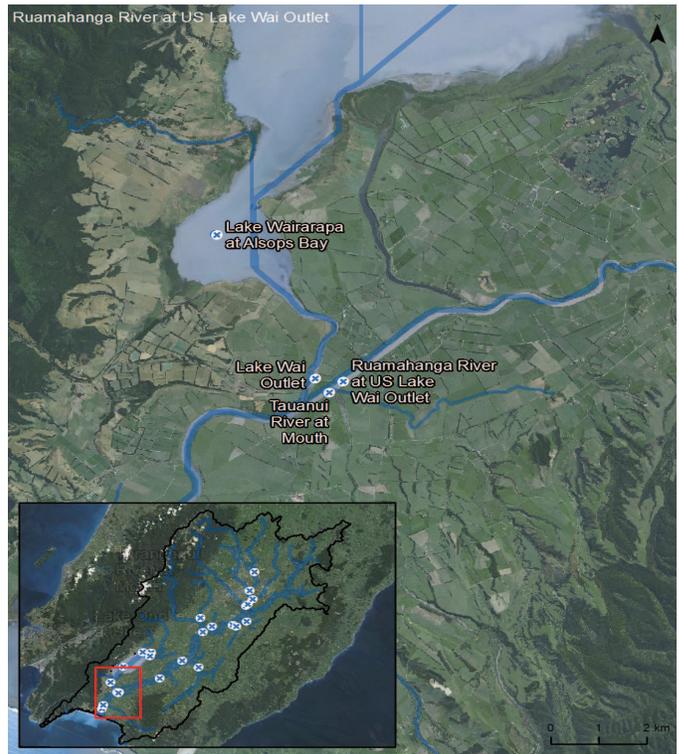
See Table 1, 2, and 3 for reference to the statistics presented in the summary below.

The mitigations applied in scenario modelling have various influences on sediment loads generated from SedNetNZ. Retiring land results in changes of landuse classes to 'native bush', with a large decrease in sediment load. Pole planting reduces erosion on the SedNetNZ hillslope layer at the relevant landuse by 70% when trees are mature (>15 years old). Stock exclusion and riparian planting result in an ~80% reduction in sediment load generated from a net bank erosion layer in SedNetNZ. This reduction has been applied at tier 1 (rather than tier 3) in modelling, with the effects of this captured in BAU, Gold and Silver.

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. Land retirement of 271 ha of mature trees (>10 years) occurs by 2080 (0.1% of the catchment at a rate of ~4.3 ha/yr since 2017) while 5,759 ha of pole planted land is mature by 2080 and contributing to reduced loads (2.3% of the catchment at a rate of 91.4 ha/yr from 2017). Stock exclusion and 80–100% land treatment of four Waste Water Treatment Plants (Masterton, Carterton, Greytown and Martinborough) also contributes to reduced SSC loads, with the combined mitigations decreasing 50th and 95th SSC percentiles up to 19.1% and 20.1% by BAU 2080.

Silver and Gold scenarios lead to an increase in pole planting, peaking at 28,724 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 ~455.5 ha/yr from 2017. Land retirement also rises to 11,092 ha (4.4% of catchment at a rate of 176 ha/yr). Tier 2 mitigations such as constructed wetlands lead to further decreases in SSC load of 5.8–6.4% on dairy landuses, and 20.7% on sheep and beef. Coupled with 100% land treatment of the four WWTP's, these combined effects decrease Silver and Gold median and 95th percentiles by 41.6% and 43.1%, respectively in 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	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	0	107	271	0	5634	11092	0	11092	11092
Pole Planting	0	926	5759	0	8991	28724	0	8996	28724

*Retirement is effective for SSC at >10 years. Pole planting is effective at >15 years. Area given here is not reflective of the total area planted in the catchment.

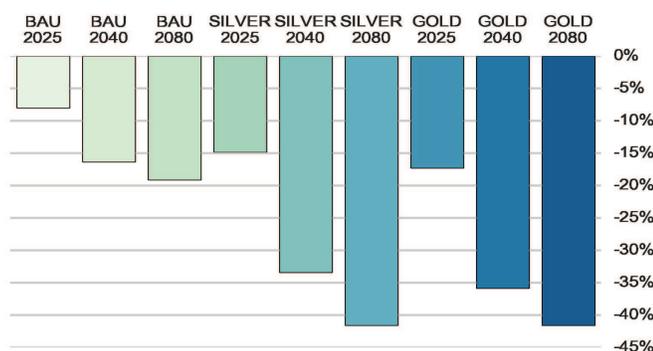
Disclaimer: This fact sheet should be read in conjunction with the report "I2090000_RP_Rua_Scenarios_Ecological_Health_Rev1", which provides further details on the scenario modelling, mitigations, assumptions and limitations. The results presented are based off modelling outputs and may not be an exact match to the observed data, which is dependent on the flow and water quality calibration achieved at various modelling sites.

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)	15.3	14.1	12.8	12.4	13.0	10.2	8.9	12.6	9.8	8.9
95th Percentile (mg/L)	302.1	276.3	251.4	241.5	254.9	195.8	171.9	248.6	188.3	171.9
Median (% change from Baseline)		-8.0%	-16.4%	-19.1%	-14.8%	-33.4%	-41.6%	-17.3%	-35.8%	-41.6%
95th Percentile (% change from Baseline)		-8.5%	-16.8%	-20.1%	-15.6%	-35.2%	-43.1%	-17.7%	-37.7%	-43.1%

Median (% change from Baseline)



95th Percentile (% change from Baseline)

