Healthy Rivers
PLAN FOR CHANGE

Wai Ora
HE RAUTAKI WHAKAPAIPAI

MANIAPOTO MAORI TRUST BOARD
A muri kia mau ki tena kia mau ki te kawau maro, whanake ake, whanake ake

RAUKAWA CHARITABLE TRUST
TE POARI MANAAKI O RAUKAWA

TŪWHARETOA
MĀORI TRUST BOARD

TE ARAWA RIVER
IWI TRUST

Waikato Raupatu River Trust

Waikato
REGIONAL COUNCIL
Te Kaunihera ā Rohe o Waikato

Scenario Modelling: Round 2 Evaluation

Overview

Goals

- Evaluate relative economic impacts of different scenarios
- Farm, catchment, regional, and national impacts
- Integrate data from TLG research streams
- Indicate broad distributional impacts
- Inform the integrated assessment

How the model works…

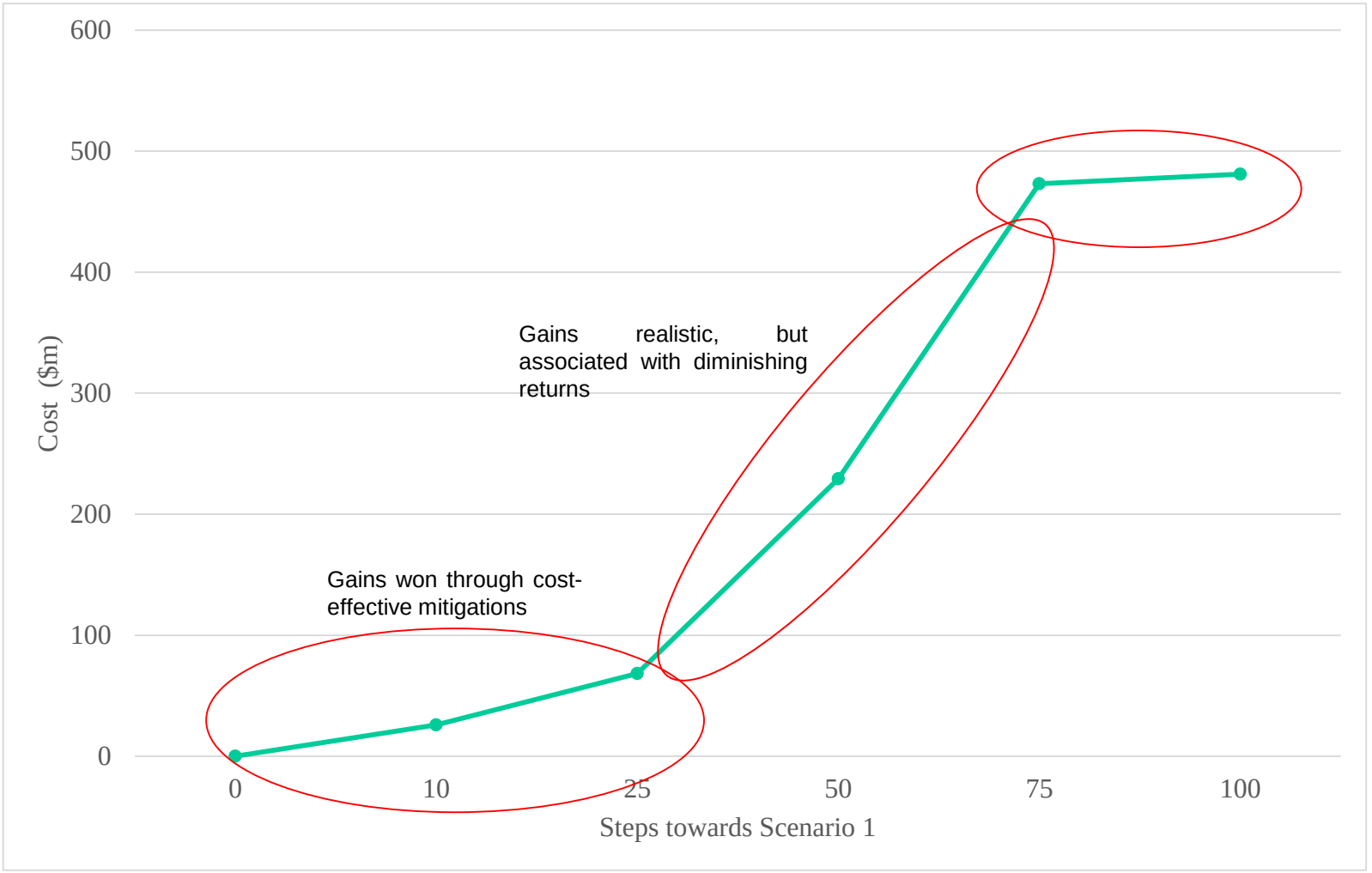
- Scenarios define limits
- We set limits in the water
- The model searches among all ‘possible ways’ of reaching these goals
- Identifies the best in terms of least cost
- ‘Possible ways’ set out by model inputs
- Extensive data collection and review

Key insights: Constrained land-use change

Steps towards Scenario 1

- Evaluate 10, 25, 50, 75, and 100% steps from current state towards S1
- E.g. a step of 10% towards Scenario 1 means all limits move 10% from their current state to S1 state
- Provide guidance to steps on time path of change
- A 100% step is consistent with S1

Catchment-level annual profit



Cost:	3%	7%	25%	52%	53%

Impacts on annual profit (% change)

	10%	25%	50%	75%	100%
Dairy	-7	-10	-12	-27	-27
Drystock	4	-4	-4	-19	-18
Hort.	2	-3	-25	-148	-155
Forest	8	9	8	11	10

Annual cost of mitigations ($m)

	10%	25%	50%	75%	100%
Fencing	0	1	2	8	9
Effluent	0	0	0	2	2
Plans	0	0	9	41	47
Municipal	0	0	10	40	40
Industrial	1	2	92	95	95
Wetlands	14	24	53	68	66

Conversion (% of total sector land)

	10%	25%	50%	75%	100%
Dairy to S&B	-3	-5	-6	-7	-5
Dairy to Forest	-3	-2	-2	-2	-2
S&B to Forest	-1	-3	-3	-3	-3
Hort. to S&B	-2	-3	-7	-8	-1

Change in production (%)

	10%	25%	50%	75%	100%
Dairy	-8	-12	-13	-23	-22
S&B	3	1	2	-4	-5
Hort.	-4	-6	-16	-47	-44
Timber	8	10	8	11	11

Adoption of discrete mitigations (%)

	10%	25%	50%	75%	100%
2-ponds	84	88	85	96	96
Low-rate	0	1	1	13	14
Fencing	13	16	21	48	53
Buffers	5	7	10	29	33
Stand-off	11	20	28	76	83
Sed. plans	0	0	4	21	24
IPM	71	77	71	71	76
Wetlands	20	41	69	77	75

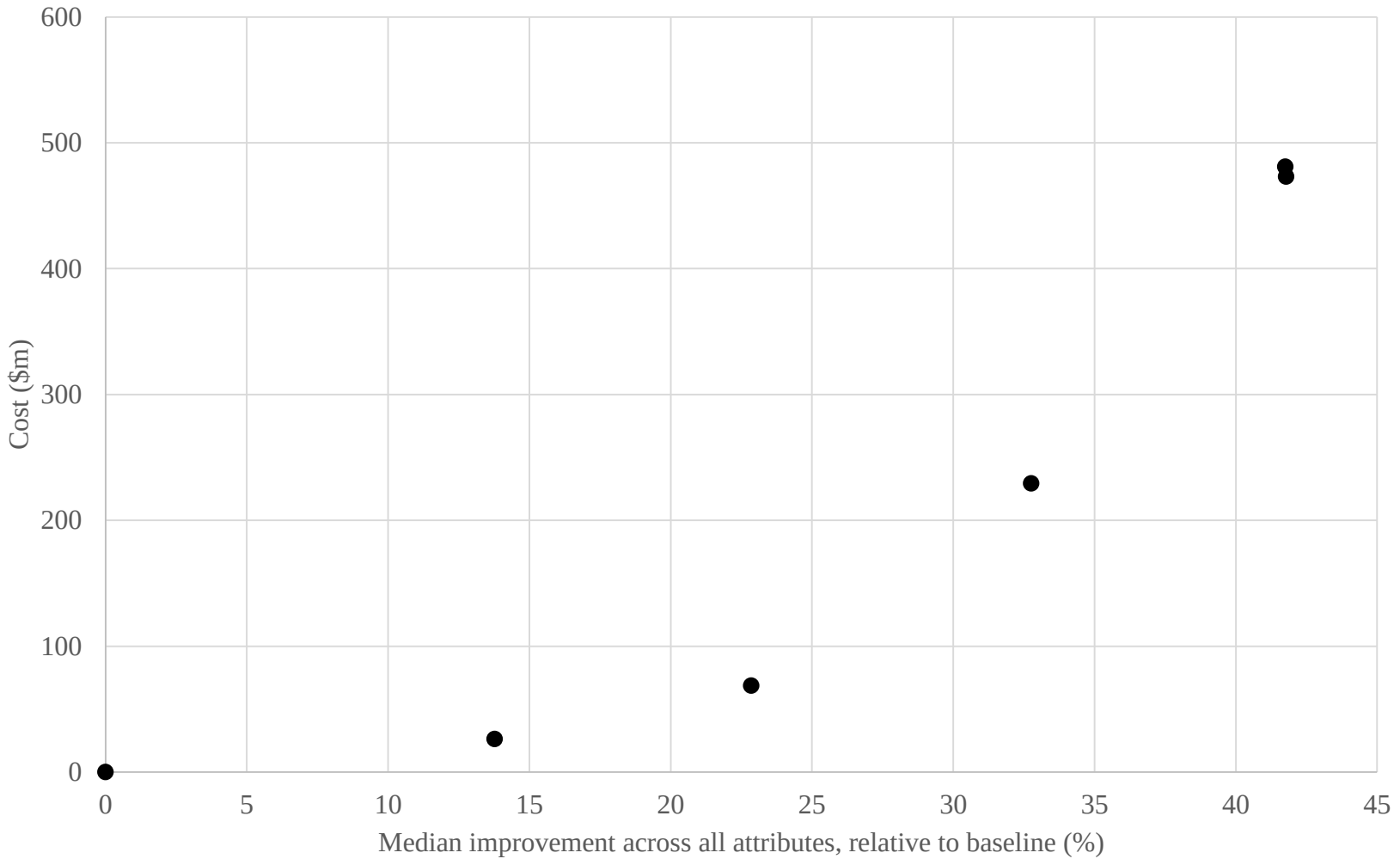
Breaches of limits (% of sites)

	10%	25%	50%	75%	100%
Med Chl	0	0	0	22	44
Max Chl	0	0	0	22	56
TN	0	11	33	33	67
TP	0	0	0	22	44
Med Ni	2	2	2	3	5
95th Ni	2	2	2	3	15
Med EC	0	0	0	0	0
95th EC	0	3	8	36	61
Clarity	3	3	10	17	19

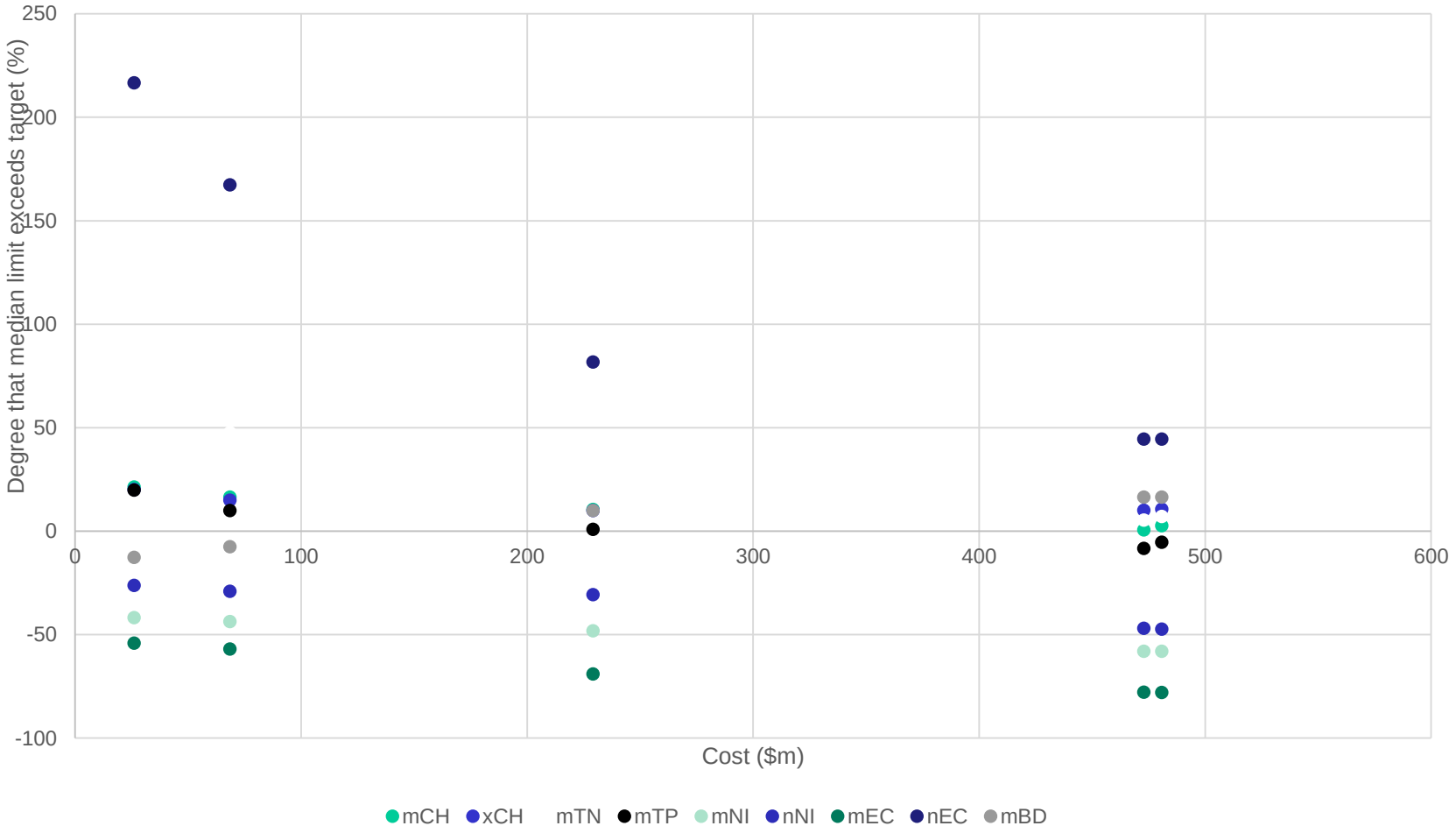
Scenario 1 limits met (% of sites)

	10%	25%	50%	75%	100%
Med Chl	22	22	44	44	56
Max Chl	11	22	33	33	44
TN	11	11	22	33	33
TP	33	44	44	56	56
Med Ni	79	85	87	95	95
95th Ni	67	69	74	84	84
Med EC	100	100	100	100	100
95th EC	26	30	36	39	39
Clarity	29	48	62	67	81

Improvement, relative to current state



Improvement, relative to S1 limit

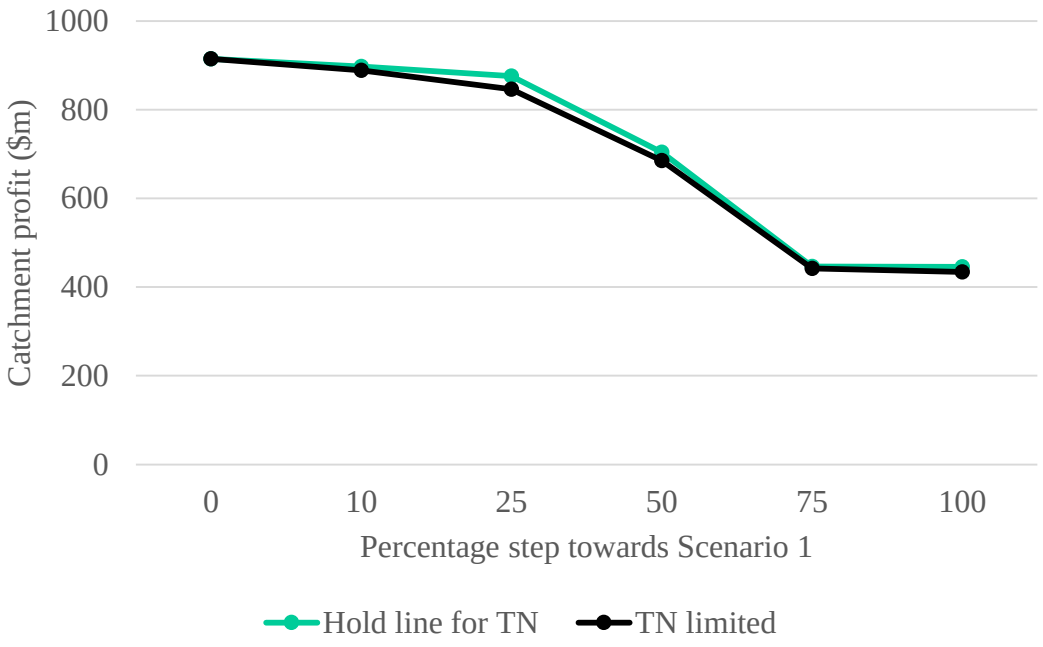


Steps: 10% 25% 50% 75% 100%

Key insights:
TN held at or below current state

Key findings

- Little difference between curves
- Major TN decrease regardless
- P miti. have low efficacy (FP & IPM)
- Effective mitigations focus on many cont. (de-int., fences, PS, EOF)



Regional economic impacts: Constrained land-use change

Regional economic model

- Catchment-level model estimates ‘direct’ impacts
- ‘Direct’ impacts include:
  - Changes to farm systems, land-owner incomes, and outputs to processors
  - Expenditures/ revenues for land conversion
  - Expenditures for land improvement e.g. wetlands, riparian fencing
  - Point-source upgrades
- Regional model shows how direct impacts ‘ripple’ through an economy
- Regional model includes supply-chain effects
- 107 key industries, aggregated to 16 for reporting

Regional impacts

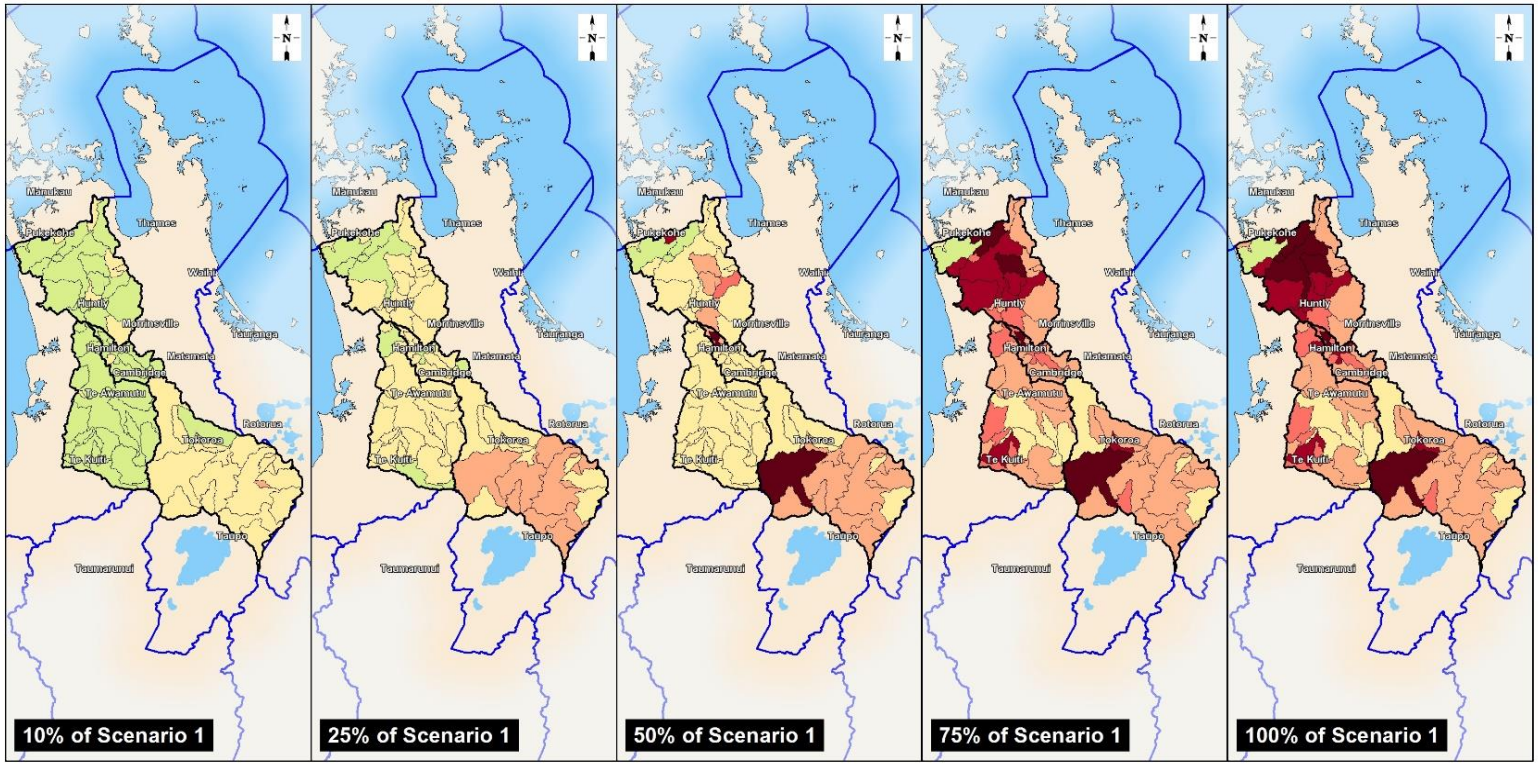
Industry	Value-added ($m)			Employment (MEC)		
	10%	25%	50%	10%	25%	50%
Horticulture	-2	-3	-10	-94	-122	-253
Sheep, beef, and grain	5	-5	-17	98	-122	-109
Dairy farming	-73	-101	-127	-1,008	-1,309	-1,450
Forestry	8	9	8	70	78	70
Other primary	0	0	1	0	-2	5
Agriculture and forestry support	-4	-5	-5	-65	-96	-98
Meat and meat product manufacturing	4	3	3	36	21	21
Dairy product manufacturing	-31	-41	-46	-104	-138	-154
Wood and paper manufacturing	8	8	8	58	64	58
Other manufacturing	-1	-2	-3	-8	-14	-29
Utilities	0	-1	6	-2	-4	13
Construction	1	1	-6	14	17	-88
Wholesale and retail trade	-2	-3	-6	-44	-73	-127
Transport	-1	-2	-2	-11	-18	-22
Professional/administrative services	-1	-2	7	-24	-36	95
Local and central government	0	-1	-1	-6	-11	-19
Other services	-10	-18	-29	-107	-189	-304
Total loss relative to baseline	**-101**	**-164**	**-221**	**-1,198**	**-1,954**	**-2,389**

National impacts

Industry	Value-added ($m)			Employment (MEC)		
	10%	25%	50%	10%	25%	50%
Horticulture	-3	-6	-13	-133	-201	-362
Sheep, beef, and grain	7	-7	-19	123	-152	-141
Dairy farming	-113	-153	-184	-1,347	-1,760	-1,944
Forestry	11	12	11	83	90	81
Other primary	-1	-1	-1	-4	-12	-9
Agriculture and forestry support	-10	-15	-16	-198	-296	-314
Meat and meat product manufacturing	8	4	4	74	42	40
Dairy product manufacturing	-49	-64	-72	-182	-241	-269
Wood and paper manufacturing	12	13	12	102	112	102
Other manufacturing	-12	-18	-41	-96	-164	-434
Utilities	-2	-4	2	-7	-11	4
Construction	0	0	-12	5	-3	-182
Wholesale and retail trade	-9	-15	-24	-153	-252	-414
Transport	-6	-11	-14	-76	-125	-159
Professional/administrative services	-11	-17	7	-169	-267	44
Local and central government	-2	-4	-6	-28	-48	-71
Other services	-31	-51	-71	-270	-456	-656
Total loss relative to baseline	**-212**	**-339**	**-438**	**-2,276**	**-3,742**	**-4,684**

Spatial impacts: Constrained land-use change

Change in profit across zones



Change in total profit within a subcatchment (%)
Land-use constrained to be within historical patterns

Created by: A Jeffries
Projection: NZTM
Map Date: 11/09/2015
Model Data Date: 11/09/2015

Map Status: Version 1
Request No.: 30794
Workspace name: 30794_Change_in_Total_Profit.gws

0 50 100 150 200 250
Kilometres
Scale - 1:2,100,000 at A3

A3

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Legend

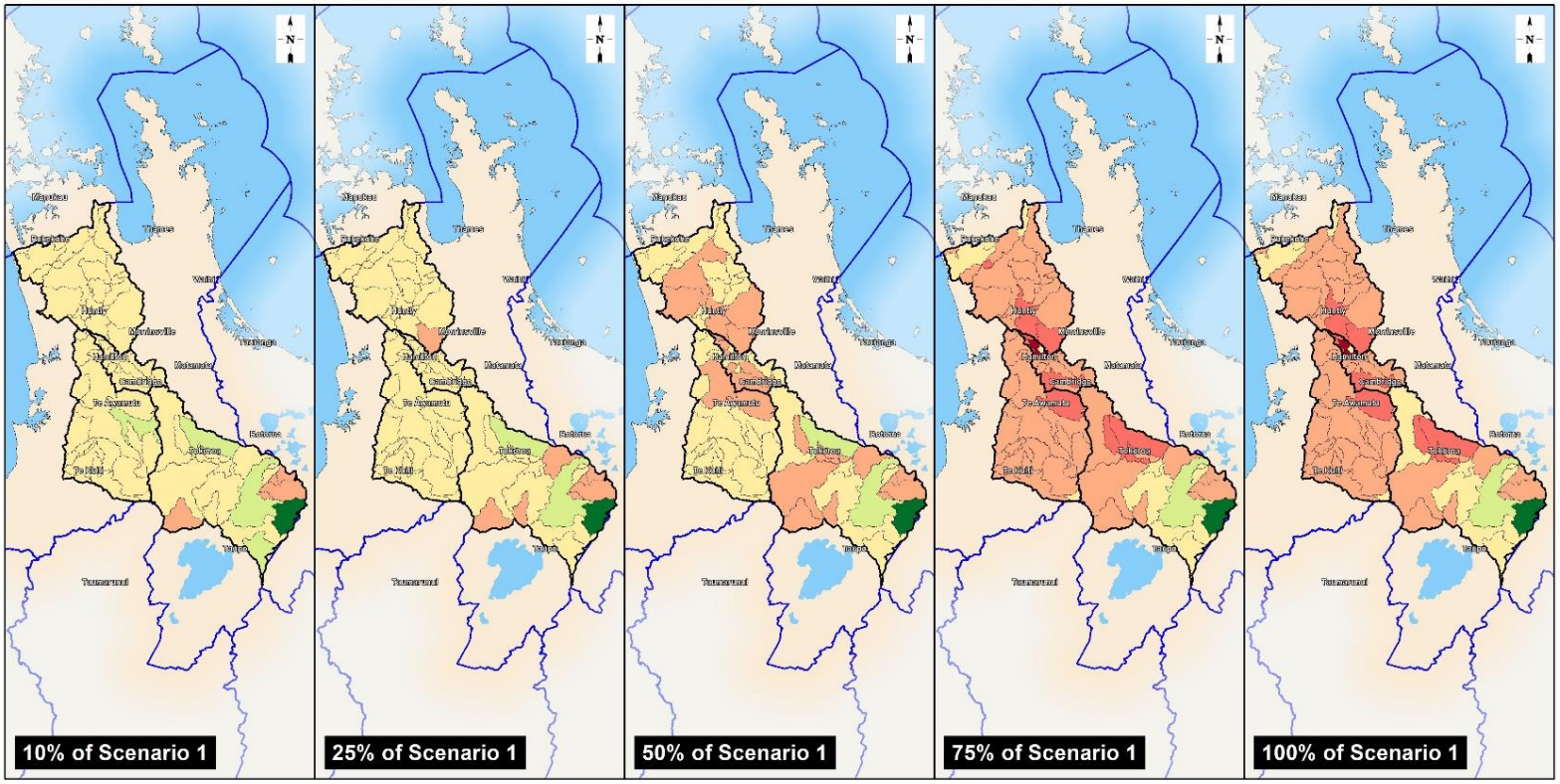
Change in total profit (%)
- >100%
- >75% to 100%
- >50% to 75%
- >25% to 50%
- >0% to 25%
- 0% (no change)
- <0% to -25%
- <-25% to -50%
- <-50% to -75%
- <-75% to -100%
- <-100%
- Freshwater management unit boundaries
- Waikato regional boundary

Acknowledgements and Disclaimers

These preliminary results have been prepared by the Technical Leaders Group as a discussion document for the use by the Collaborative Stakeholder Group for the Healthy Rivers: Wai Ora project. Data should be considered draft only.

Digital Boundary Data sourced from Statistics New Zealand.

Reductions in nitrogen load (%)



Change in load of nitrogen within a subcatchment (%)
Land-use constrained to be within historical patterns

Created by: RMG
Projection: NZTM
Map Date: 14/09/2015
Model Data Date: 11/09/2015

Map Status: Version 1
Request No.: 30794
Workspace name:
30794_Change in load of nitrogen.mxd

0 50 100 150 200 250
Kilometres
Scale - 1:2,100,000 at A3

A3

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Legend
Change in load of nitrogen within a subcatchment (%)

- 0%
- <0% to -25%
- <-25% to -50%
- <-50% to -75%
- <-75% to -100%
- <-100%
- >0% to 25%
- >25% to 50%
- >50% to 75%
- >75% to 100%
- >100%
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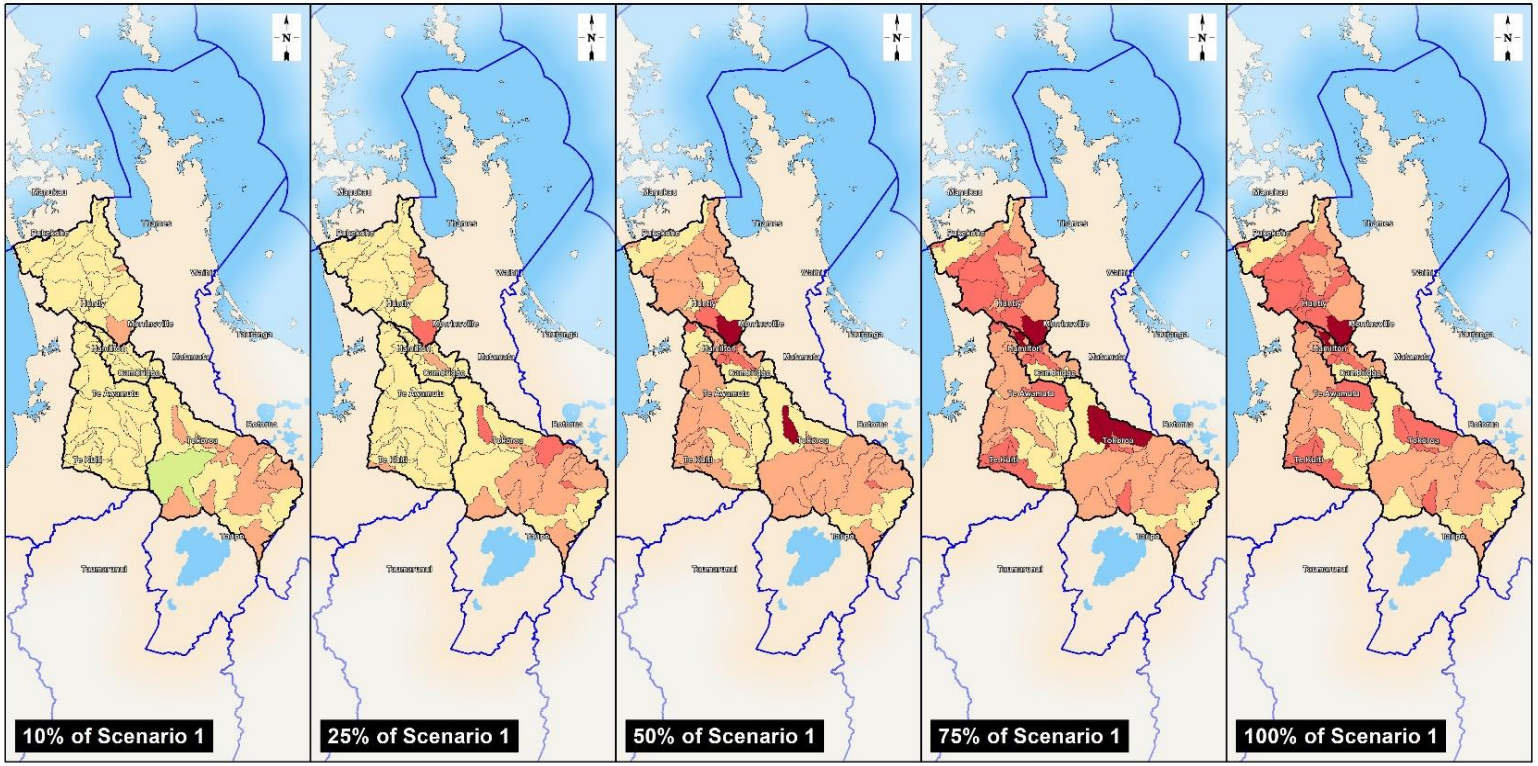
Reductions in phosphorus load (%)



Change in load of phosphorus within a subcatchment
Land-use constrained to be within historical patterns

Created by: RMG
Projection: NZTM
Map Date: 14/09/2015
Model Data Date: 11/09/2015

Map Status: Version 1
Request No.: 30794
Workspace name: 30794_Change_in_load_of_phosphorus.gws

0 50 100 150 200 250
Kilometres
Scale - 1:2,100,000 at A3

A3

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Legend
Change in load of phosphorus within a subcatchment

- 0%
- <0% to -25%
- <-25% to -50%
- <-50% to -75%
- <-75% to -100%
- <-100%
- >0% to 25%
- >25% to 50%
- >50% to 75%
- >75% to 100%
- >100%
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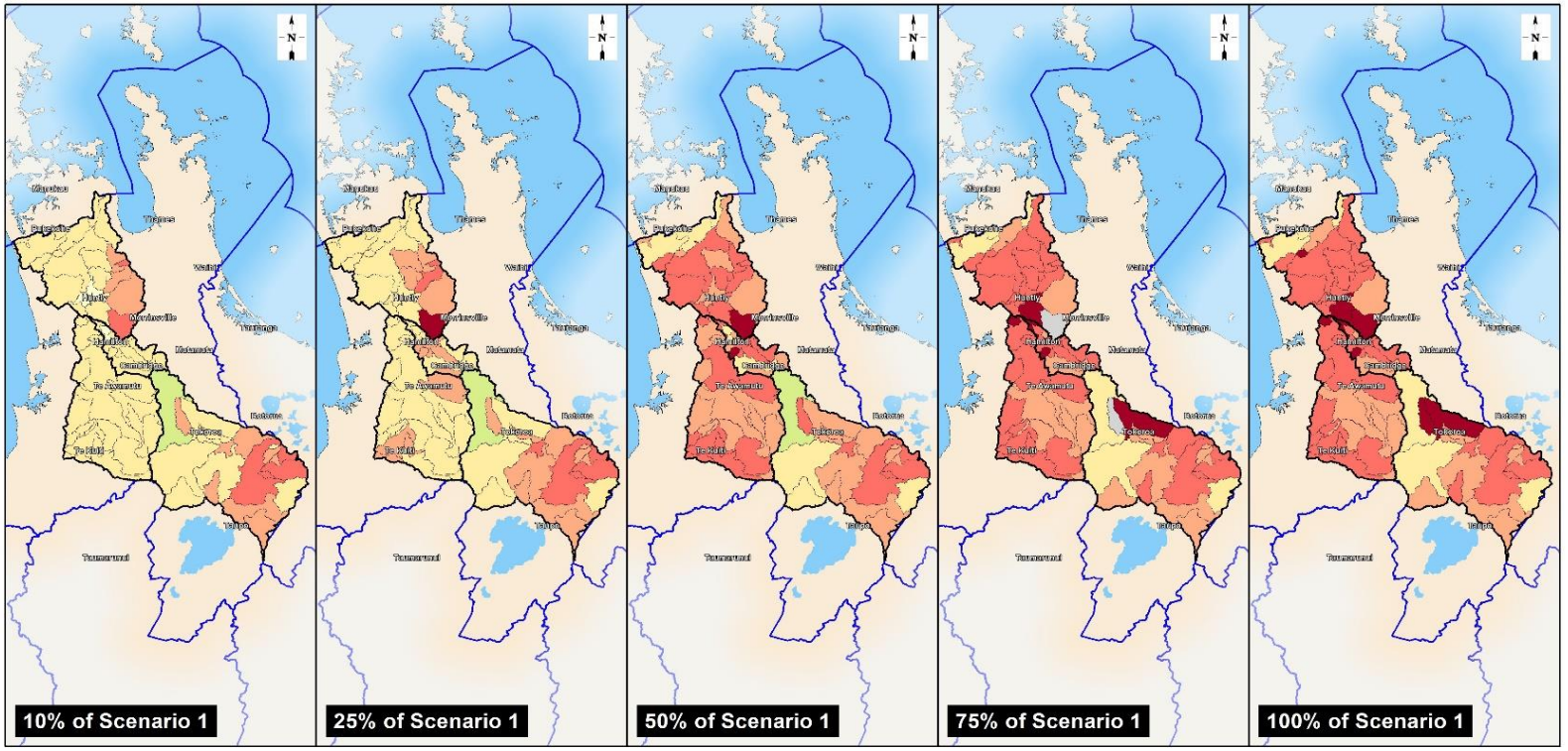
Reductions in microbial load (%)



Change in microbial load within a subcatchment (%)
Land-use constrained to be within historical patterns

Created by: RMG
Projection: NZTM
Map Date: 14/09/2015
Model Data Date: 11/09/2015

Map Status: Version 1
Request No.: 30794
Workspace name:
30794_Change_in_microbial_load.gws

0 50 100 150 200 250
Kilometres
Scale - 1:2,100,000 at A3

A3

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Legend
Change in microbial load within a subcatchment (%)

- 0%
- <0% to -25%
- <-25% to -50%
- <-50% to -75%
- <-75% to -100%
- <-100%
- >0% to 25%
- >25% to 50%
- >50% to 75%
- >75% to 100%
- >100%
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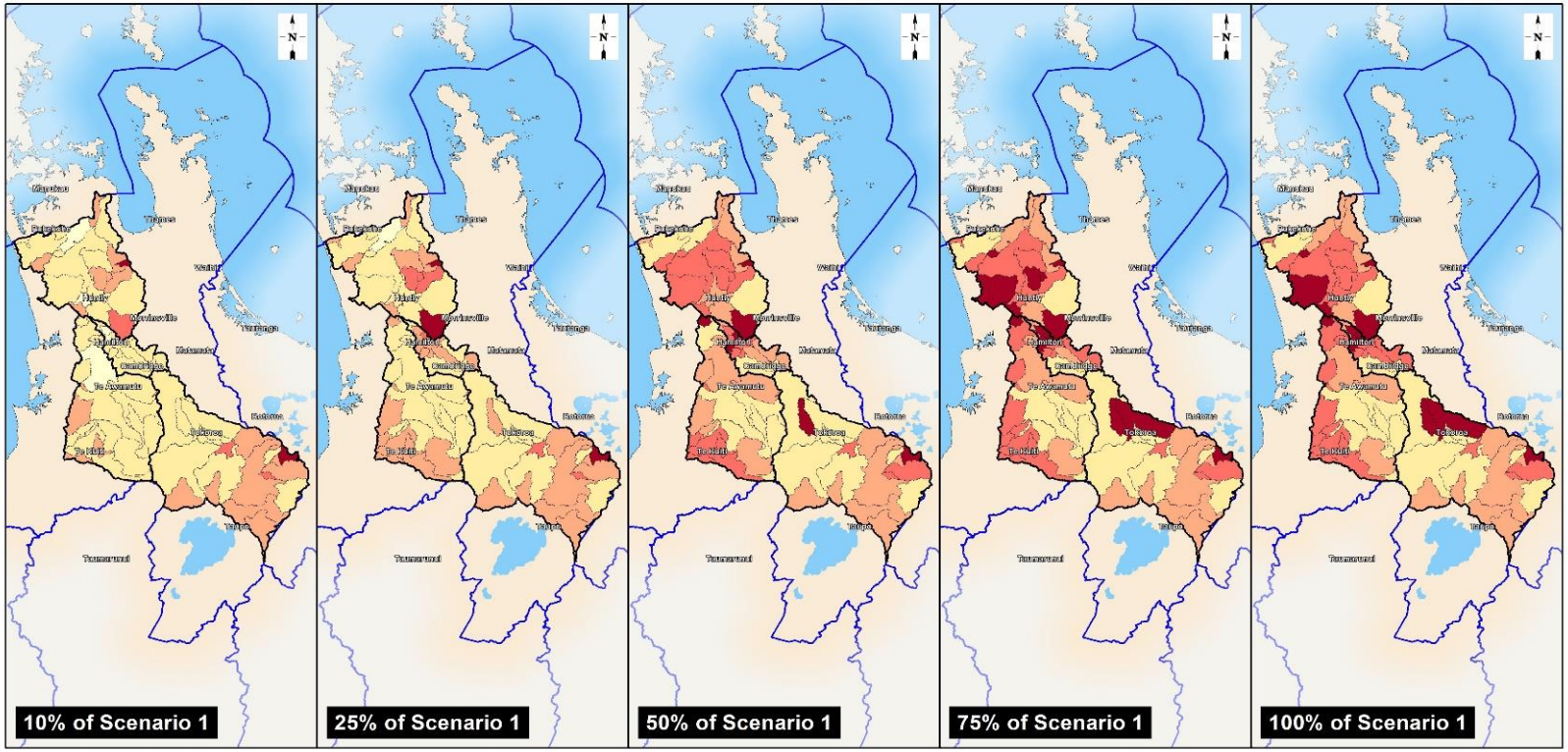
Reductions in sediment load (%)



Change in sediment load within a subcatchment (%)
Land-use constrained to be within historical patterns

Created by: RMG
Projection: NZTM
Map Date: 14/09/2015
Model Data Date: 11/09/2015

Map Status: Version 1
Request No.: 30794
Workspace name: 30794_Change_in_sediment_load.gws

0 50 100 150 200 250
Kilometres
Scale - 1:2,100,000 at A3

A3

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Legend
Change in sediment load within a subcatchment (%)

- 0%
- <0% to -25%
- <-25% to -50%
- <-50% to -75%
- <-75% to -100%
- <-100%
- >0% to 25%
- >25% to 50%
- >50% to 75%
- >75% to 100%
- >100%
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Conclusions

- Integrated model used to assess steps towards S1
- Catchment-level costs increase sharply for steps >25%
- Regional- and national-level costs increase sharply for steps >50%
- Economic implications vary across sub-catchments, FMUs, region, and NZ
- All water-quality aspirations of S1 still unmet