# Greater Heretaunga and Ahuriri Land and Water Management Collaborative Stakeholder (TANK) Group

TANK

## Meeting 23:
## 20 September 2016

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REGIONAL COUNCIL

# Karakia

# Agenda

| | |
|---|---|
| 10:00am | Welcome, karakia, notices, meeting record |
| 10:15am | Update on HNorth Water Contamination and its relevance to TANK |
| 10.30am | SedNET modelling |
| 11.45pm | Sediment and erosion mitigation options and strategies |
| **12:30pm** | **LUNCH** |
| 1:15pm | Waitangi Estuary – state and trends; and impact on values |
| 2:30pm | Translating Mana Whenua Values to Attributes for the Ngaruroro Awa |
| **3:30pm** | **COFFEE BREAK** |
| 3:40pm | Updates from Working Groups |
| 3:45pm | Agenda for next meeting |
| 3:50pm | Revised Work Programme |
| **~4:00pm** | **FINISH** |

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# Meeting objectives

1. Understand estuary state in relation to freshwater inputs

2. Receive information about modelled land use effects on water quality – pastoral catchments and sources of;
   - Sediment – Sednet
   - Phosphorus - Overseer

3. Discuss sediment and erosion mitigation options and strategies

4. Build on the values/attributes work of the TANK Group by receiving the findings of the *Translating mana whenua values to attributes for the Ngaruroro awa* engagement project

# Action points

| ID | Action item | Person responsible | Status |
|---|---|---|---|
| 22.1 | Include amenity value for the “All surface water” values. | Mary-Anne | Completed |
| 22.2 | Further refinement of values information to come as Maori values and attributes work considered alongside TANK Group work to date. | | Being presented today (meeting #23) |
| 22.3 | Project team updating work programme to ensure work programme sufficiently detailed. | | Being presented today (meeting #23) |
| 22.4 | There is a need for further discussion to refine the Group understanding and position in relation to swimming water quality and related mahinga kai management | | To be discussed at later meeting/s |
| 22.5 | Check Cawthron report in relation to clarity and turbidity needs of native fish | Nathan Burkpile/ Mary-Anne | In progress |
| 22.6 | HBRC will organise an opportunity for TANK members to go on a fieldtrip. | | Options being discussed today |

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# Sediment modelling in the TANK catchments

## Where from, where to and how much?

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# The SedNet model

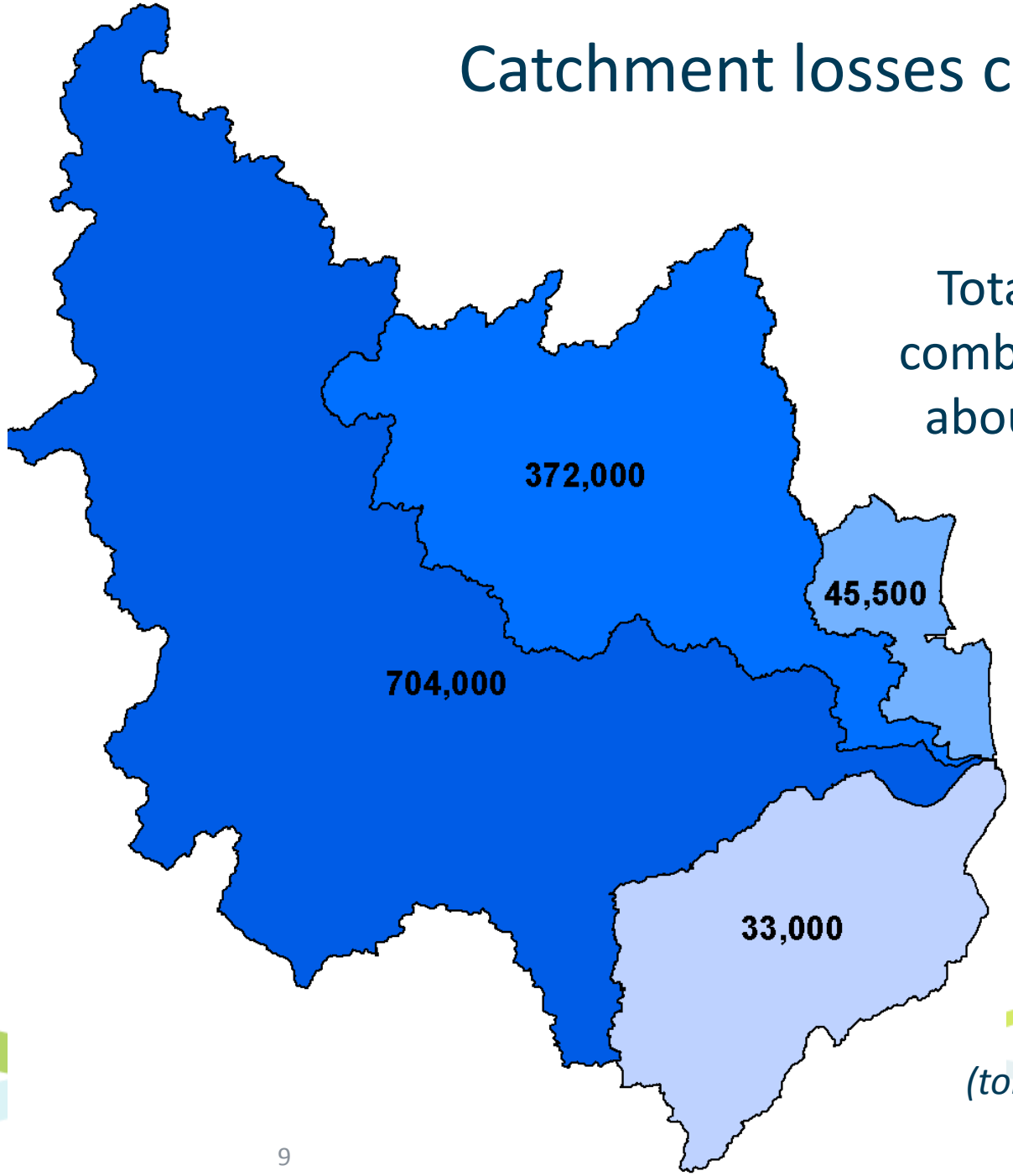
- Comprised of several sub models
- Models takes into account;
  - Land slope
  - Land cover
  - River flows
  - River bank erosion
  - Sediment deposition on river beds & banks
- Calibrated with ‘real’ data

# What can the model do?

SedNet modelling can help:

- Identify sources of sediment
- Calculate area of land vulnerable to sediment generation?
- How much sediment is coming from these areas?
- Calculate how much comes from catchments, sub catchments and even farms
- Predict sediment particle size
- Predict what happens when stock are excluded

# Catchment losses can be quantified

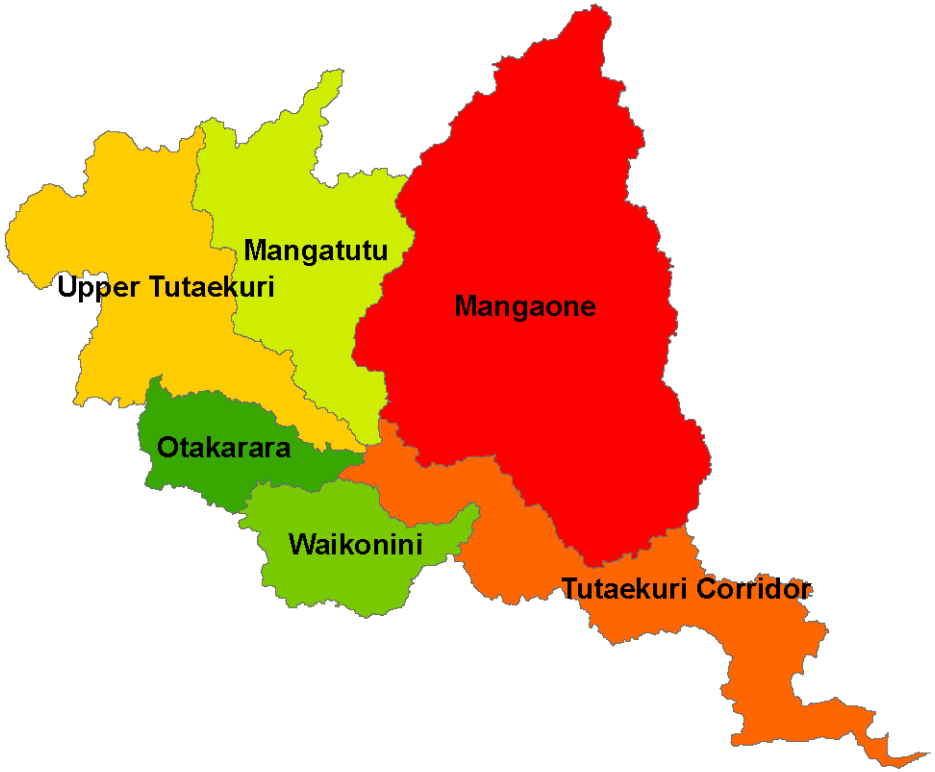



Total sediment loss from combined TANK catchments about 1.16 million tonnes each year

*(tonnes/year)*

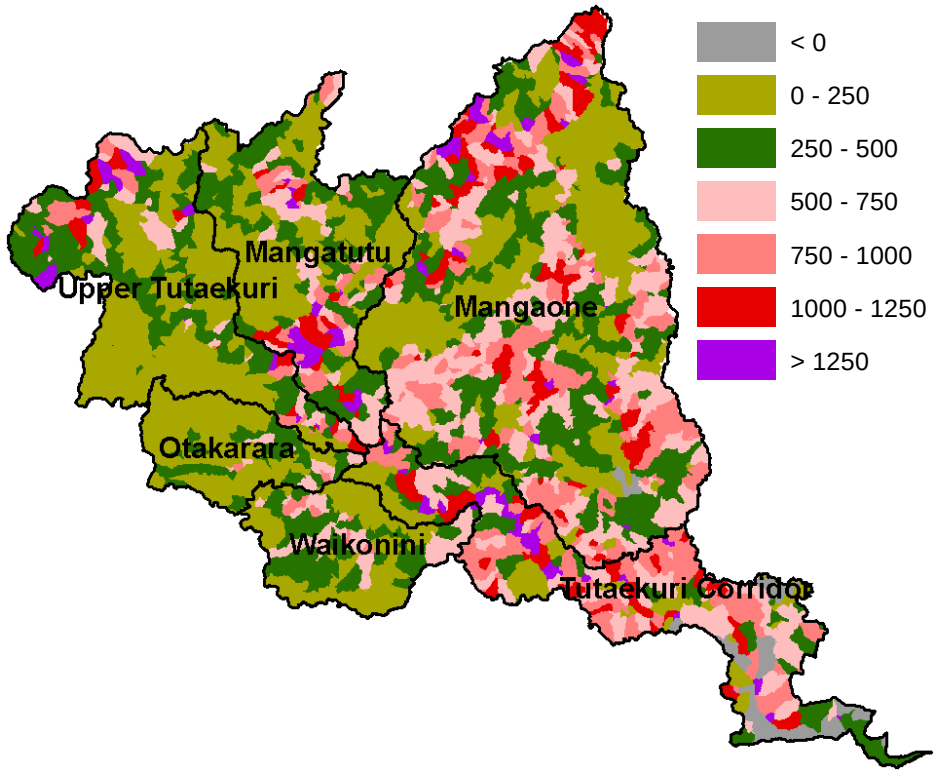
# Tutaekuri catchment - load v yield

## Total load (t/yr)




| Tutaekuri Sub-catchments | Sediment loss (tonnes) |
|---|---|
| Mangaone | 171,884 |
| Tutaekuri Corridor | 71,635 |
| Upper Tutaekuri | 51,569 |
| Mangatutu | 50,554 |
| Waikonini | 17,578 |
| Otakarara | 9,072 |
| Tutaekuri Catchment Total sediment loss (Tonnes/ year) | 372,292 |

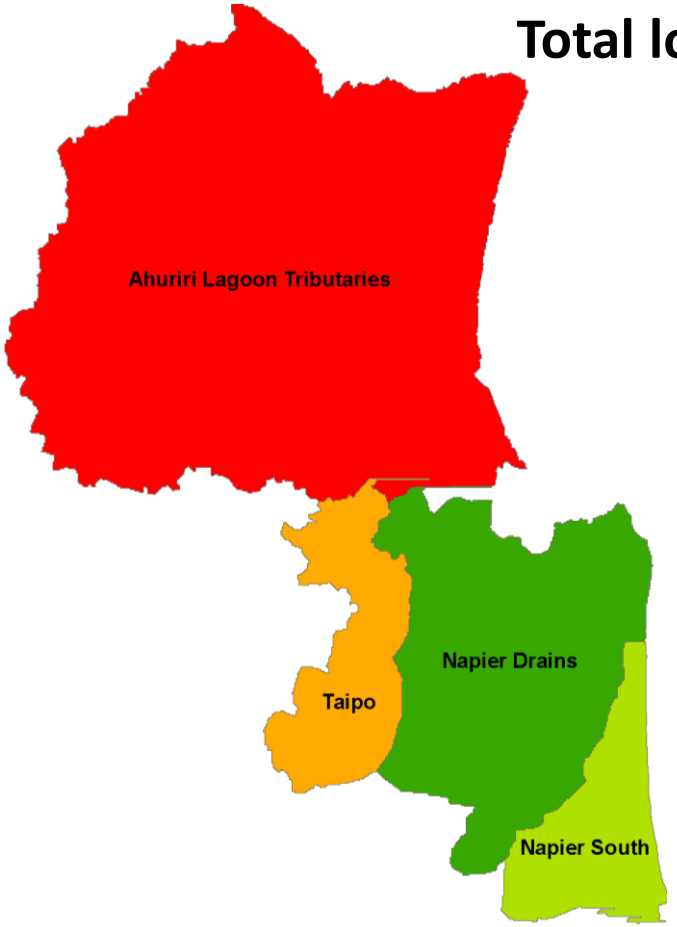
## Total yield (t/km$^2$/yr)




| Sub-catchment | Yield (t/km2/yr) |
|---|---|
| Tutaekuri Corridor | 547 |
| Mangaone | 507 |
| Mangatutu | 418 |
| Upper Tutaekuri | 383 |
| Waikonini | 301 |
| Otakarara | 192 |
| Average yield | 450 |

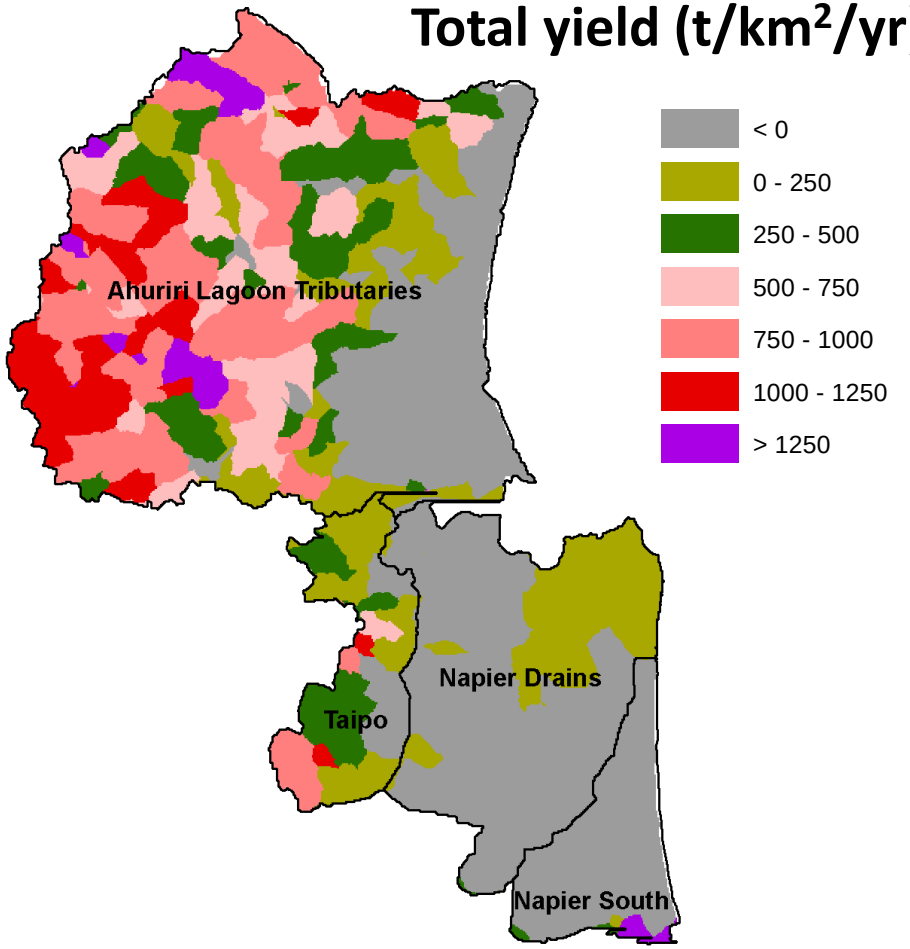
# Ahuriri catchment - load v yield

## Total load (t/yr)




| Ahuriri Sub-catchments | Sediment loss (tonnes) |
|---|---|
| Ahuriri Lagoon Tributaries | 45,379 |
| Taipo | 4,011 |
| Napier South | -474 |
| Napier Drains | -3,436 |
| Ahuriri Catchment Total sediment loss (Tonnes / year) | 45,480 |

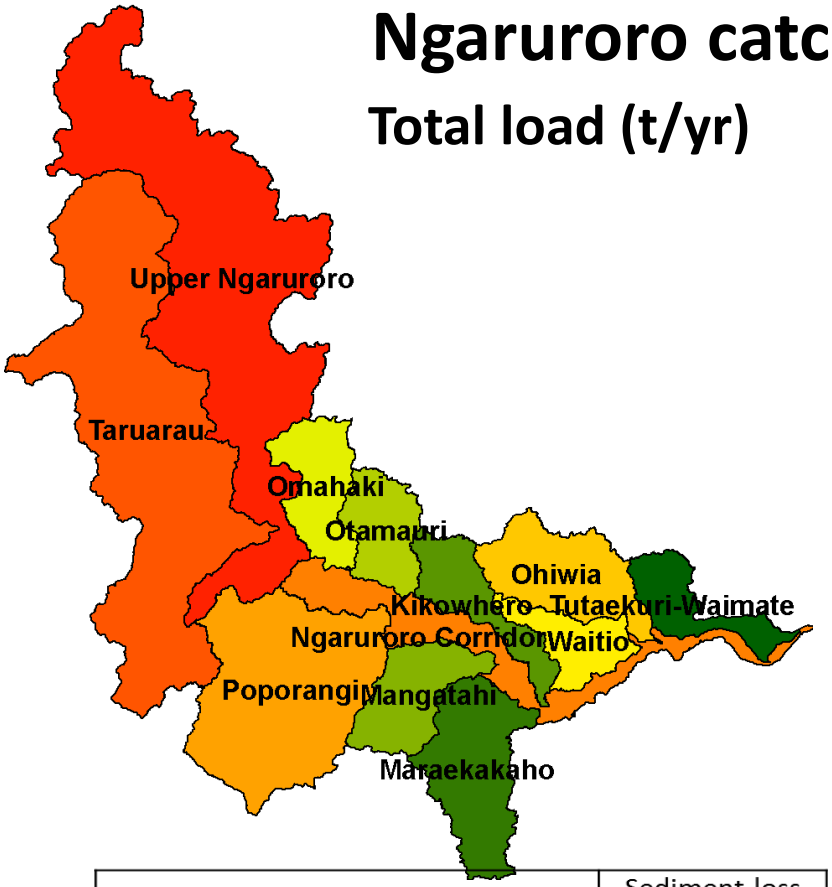
## Total yield (t/km²/yr)




| Sub-catchment | Yield (t/km2/yr) |
|---|---|
| Ahuriri Lagoon Tributaries | 509 |
| Taipo | 318 |
| Napier South | -43 |
| Napier Drains | -105 |
| Average yield | 310 |

# Ngaruroro catchment - load v yield

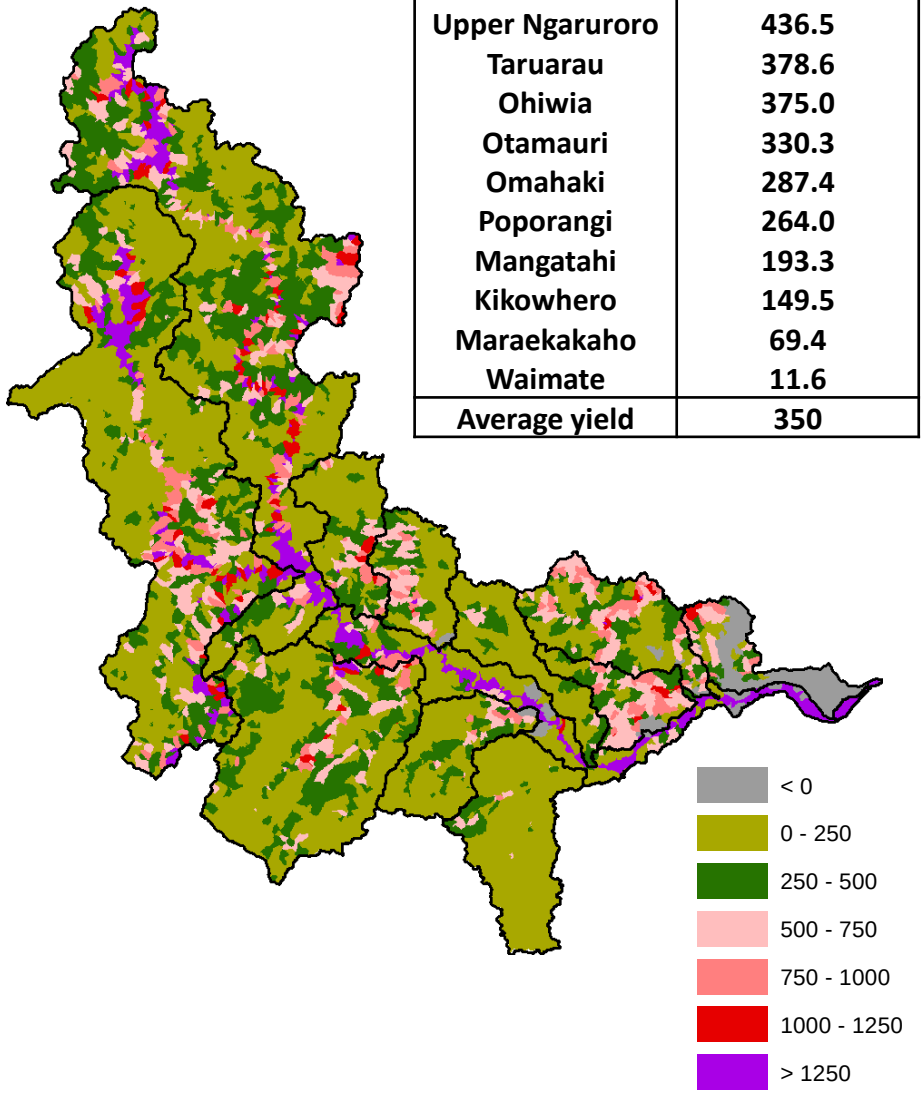
## Total load (t/yr)




| Ngaruroro Sub-catchments | Sediment loss (tonnes) |
|---|---|
| Upper Ngaruroro | 229,620 |
| Taruarau | 187,585 |
| Ngaruroro Corridor | 80,099 |
| Poporangi | 67,796 |
| Ohiwia | 39,114 |
| Waitio | 24,283 |
| Omahaki | 21,289 |
| Otamauri | 20,646 |
| Mangatahi | 14,855 |
| Kikowhero | 9,824 |
| Maraekakaho | 8,497 |
| Tutaekuri-Waimate | 632 |
| Ngaruroro Catchment Total sediment loss (Tonnes /year) | 704,240 |

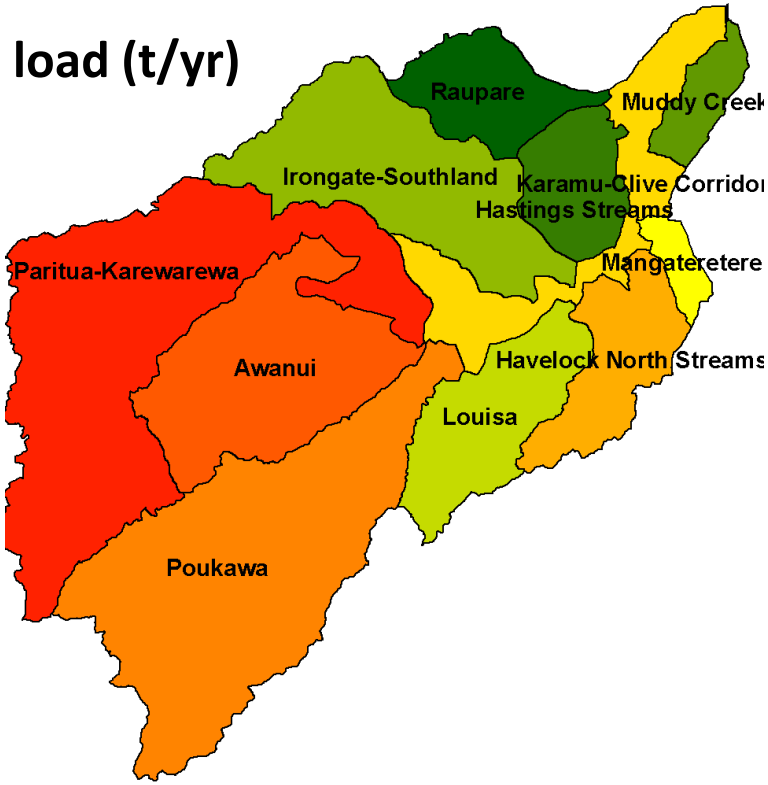
## Total yield (t/km²/yr)

| Sub-catchment | Yield (t/km2/yr) |
|---|---|
| Ngaruroro Corridor | 658.1 |
| Waitio | 467.3 |
| Upper Ngaruroro | 436.5 |
| Taruarau | 378.6 |
| Ohiwia | 375.0 |
| Otamauri | 330.3 |
| Omahaki | 287.4 |
| Poporangi | 264.0 |
| Mangatahi | 193.3 |
| Kikowhero | 149.5 |
| Maraekakaho | 69.4 |
| Waimate | 11.6 |
| Average yield | 350 |



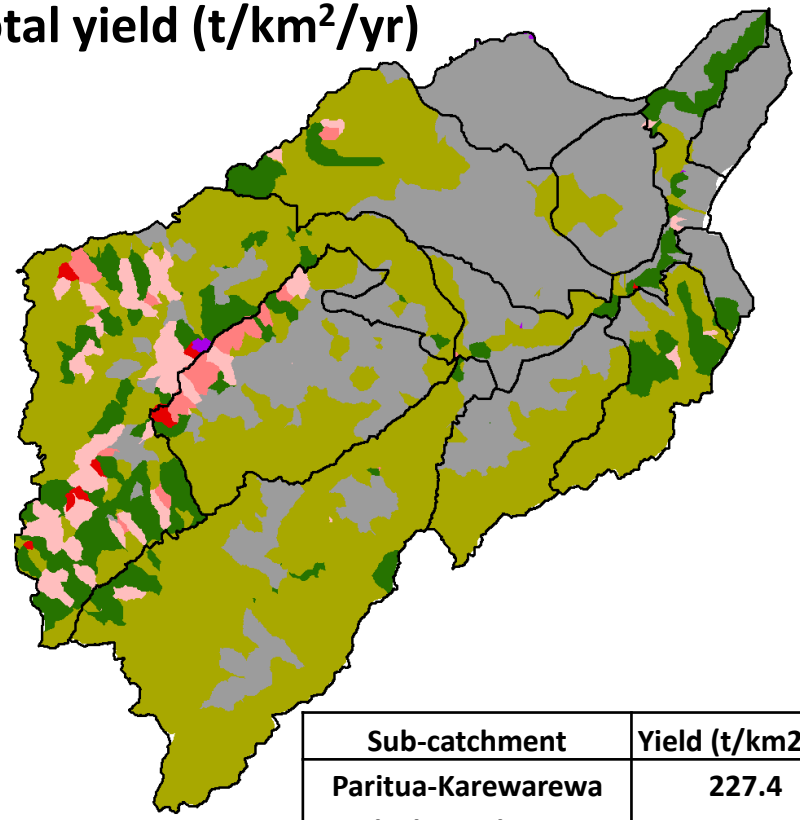
# Karamu catchment - load v yield

## Total load (t/yr)




| Karamu Sub-catchments | Sediment loss (tonnes) |
|---|---|
| Paritua-Karewarewa | 27,293 |
| Awanui | 5,807 |
| Poukawa | 4,748 |
| Havelock North Streams | 3,328 |
| Karamu-Clive Corridor | 1,058 |
| Mangateretere | -148 |
| Louisa | -238 |
| Irongate-Southland | -521 |
| Muddy Creek | -1,726 |
| Hastings Streams | -2,398 |
| Raupare | -4,201 |
| Karamu Catchment Total sediment loss (Tonnes / year) | 33,001 |

## Total yield (t/km²/yr)

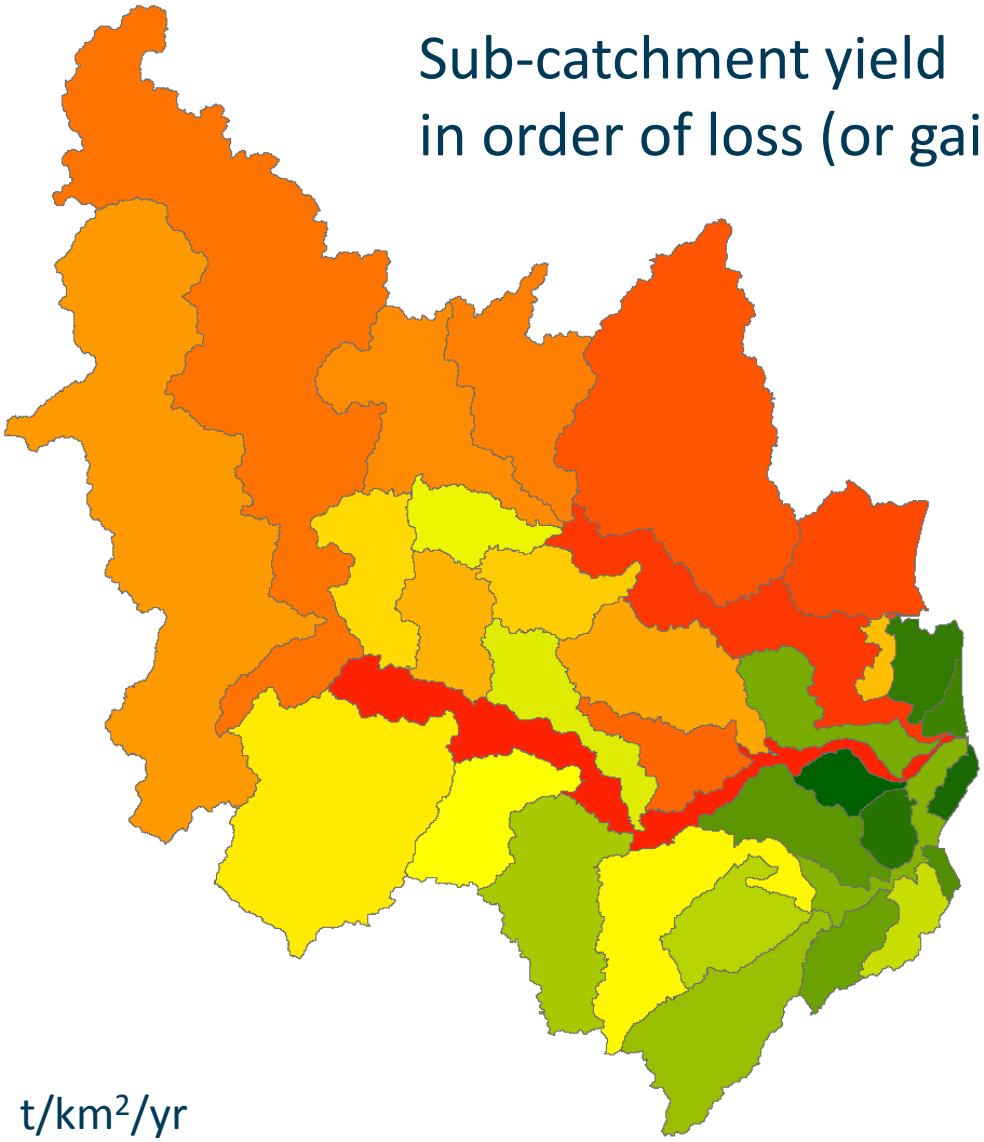


t/km²/yr

- < 0
- 0 - 250
- 250 - 500
- 500 - 750
- 750 - 1000
- 1000 - 1250
- > 1250

| Sub-catchment | Yield (t/km2/yr) |
|---|---|
| **Paritua-Karewarewa** | **227.4** |
| **Havelock North** Streams | **121.4** |
| **Awanui** | **94.2** |
| **Poukawa** | **43.0** |
| **Karamu-Clive Corridor** | **28.7** |
| **Louisa** | **-6.8** |
| **Irongate-Southland** | **-8.4** |
| **Mangateretere** | **-24.9** |
| **Hastings Streams** | **-113.9** |
| **Muddy Creek** | **-163.1** |
| **Raupare** | **-177.5** |
| **Average yield** | **60** |

# Sub-catchment yield in order of loss (or gain)

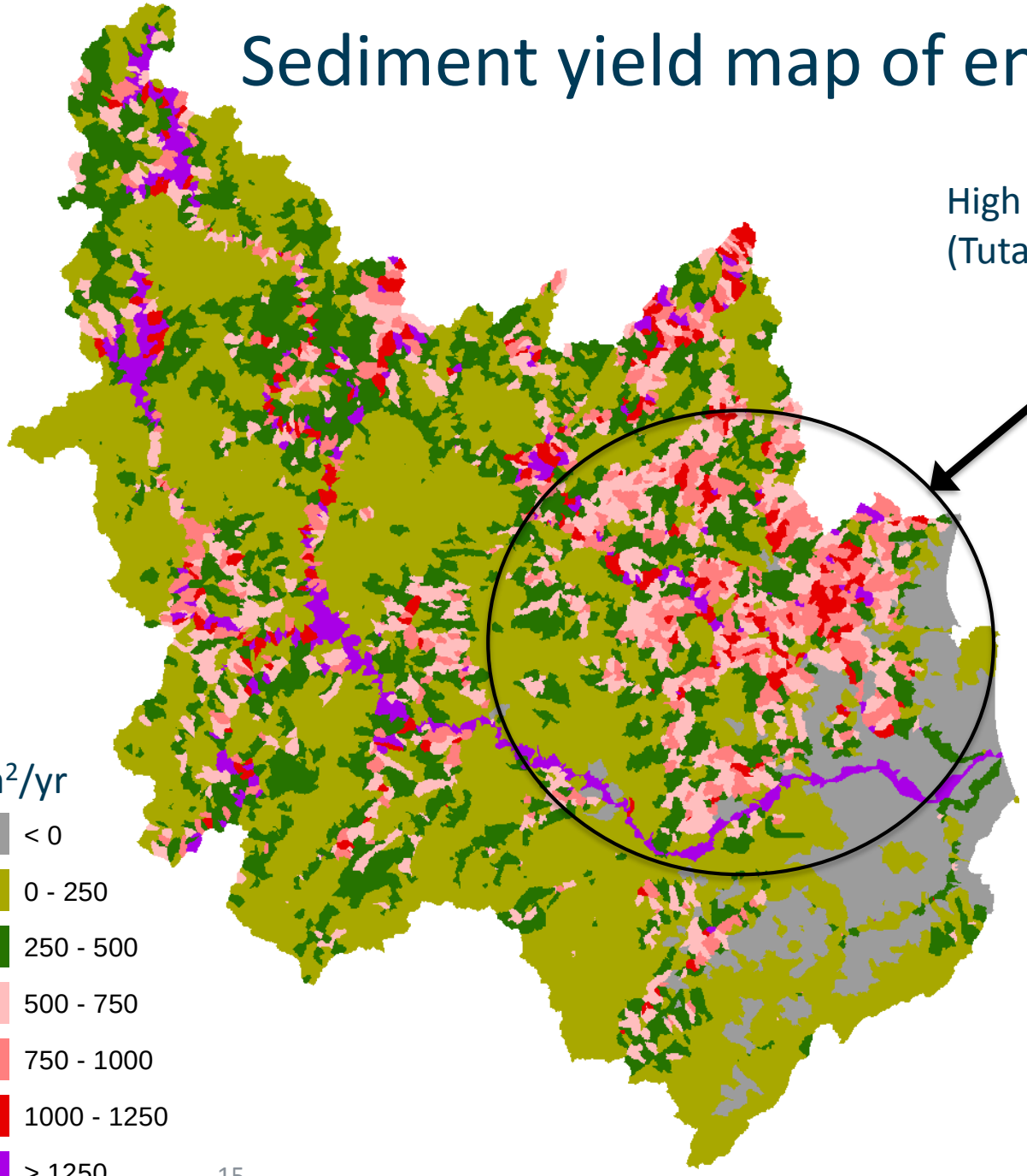


t/km$^2$/yr

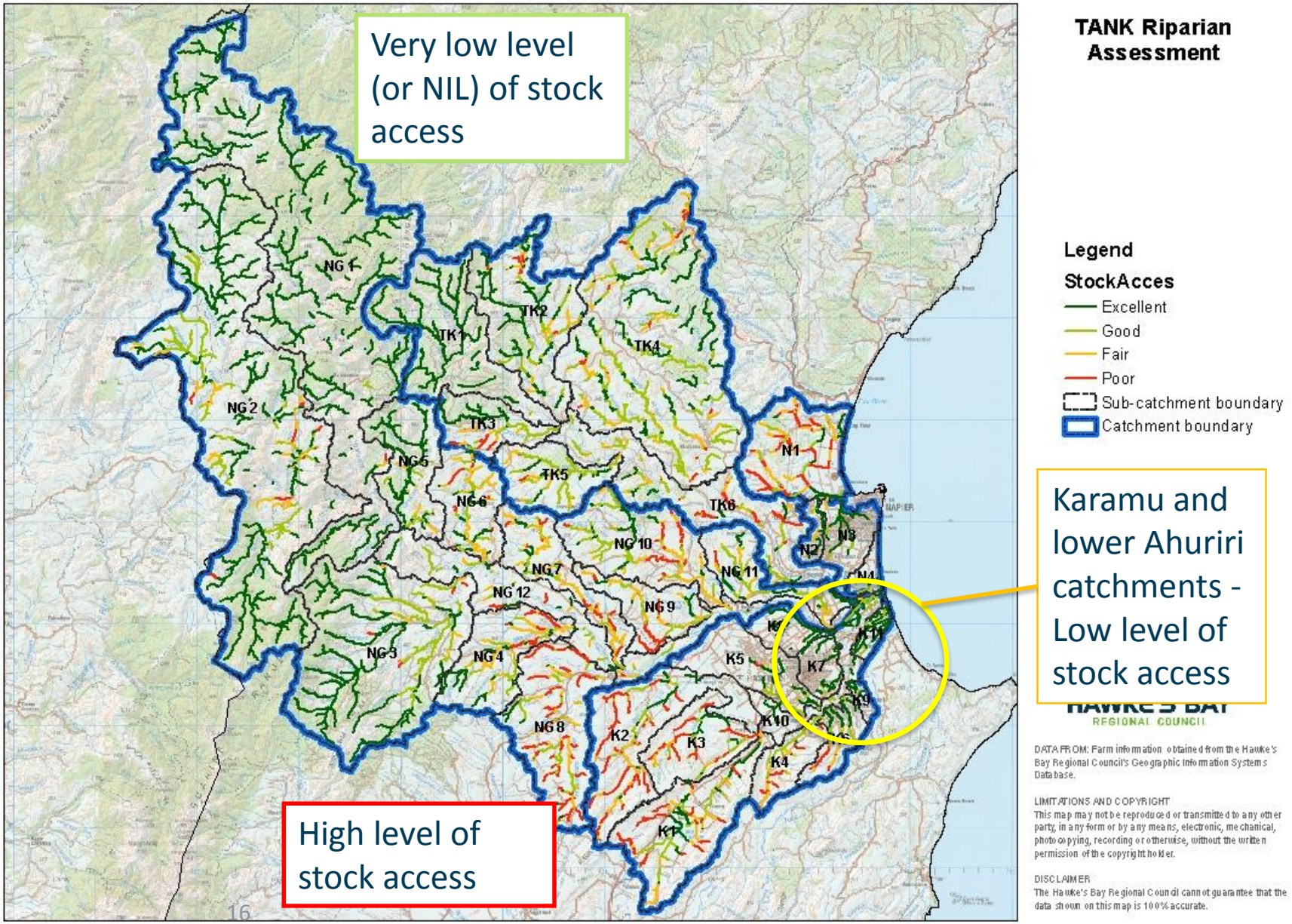
| | | | | | |
|---|---|---|---|---|---|
| -177 | -8 | 94 | 264 | 378 | 508 |
| -163 | -6 | 121 | 287 | 383 | 547 |
| -113 | 11 | 149 | 300 | 417 | 658 |
| -104 | 28 | 192 | 318 | 436 | |
| -42 | 42 | 193 | 330 | 467 | |
| -24 | 69 | 227 | 374 | 506 | |

| TANK subcatchment | Yield t/km2/yr |
|---|---|
| Raupare | -178 |
| Muddy Creek | -163 |
| Hastings Streams | -114 |
| Napier Drains | -105 |
| Napier South | -43 |
| Mangateretere | -25 |
| Irongate-Southland | -8 |
| Louisa | -7 |
| Tutaekuri-Waimate | 12 |
| Karamu-Clive Corridor | 29 |
| Poukawa | 43 |
| Maraekakaho | 69 |
| Awanui | 94 |
| Havelock North Streams | 121 |
| Kikowhero | 150 |
| Otakarara | 192 |
| Mangatahi | 193 |
| Paritua-Karewarewa | 227 |
| Poporangi | 264 |
| Omahaki | 287 |
| Waikonini | 301 |
| Taipo | 318 |
| Otamauri | 330 |
| Ohiwia | 375 |
| Taruarau | 379 |
| Upper Tutaekuri | 383 |
| Mangatutu | 418 |
| Upper Ngaruroro | 437 |
| Waitio | 467 |
| Mangaone | 507 |
| Ahuriri Lagoon Tributaries | 509 |
| Tutaekuri Corridor | 547 |
| Ngaruroro Corridor | 658 |

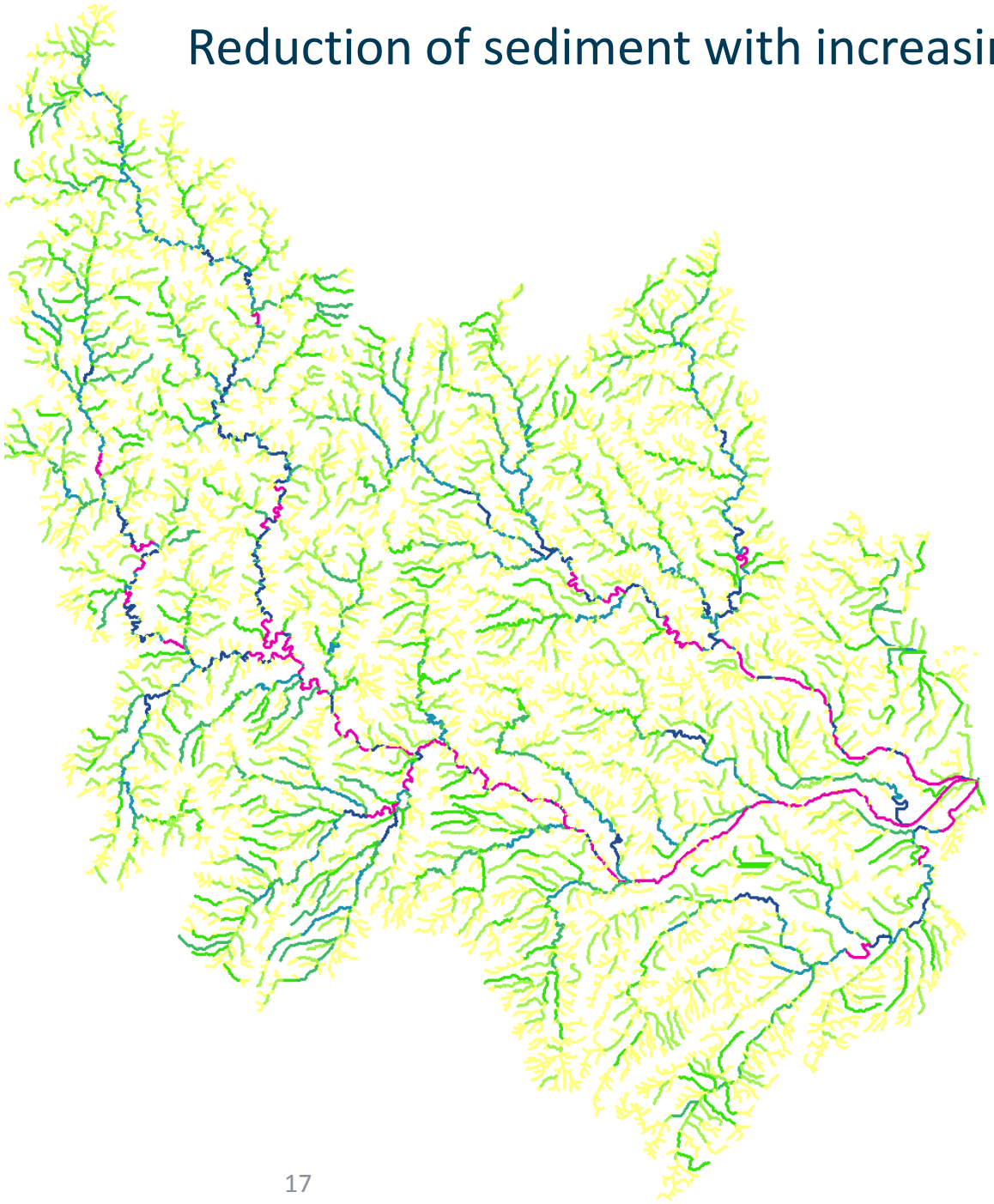
# Sediment yield map of entire TANK area



# Stock access in the TANK area



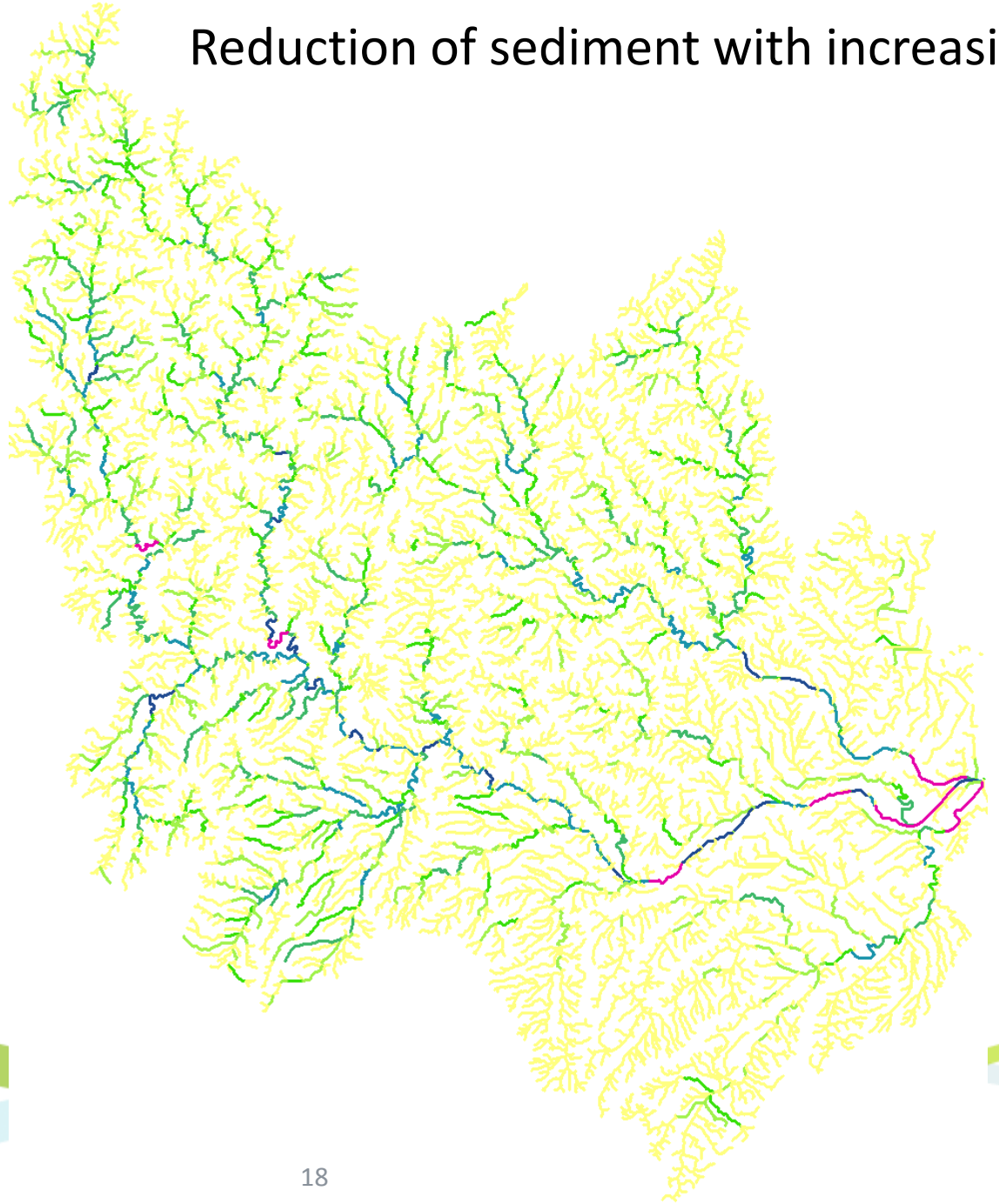
# Reduction of sediment with increasing stock exclusion




Current estimated sediment loss from TANK through river bank erosion;

**222,425 tonnes per year**

# Reduction of sediment with increasing stock exclusion



**With 100% fencing tonnes/Year**

- < 10
- > 10 - 25
- > 25 - 50
- > 50 - 100
- > 100 - 250
- > 250 - 500
- > 500

Estimated sediment loss from TANK through river bank erosion with 100% increase in fencing;

50,916 tonnes per year

77% reduction from current

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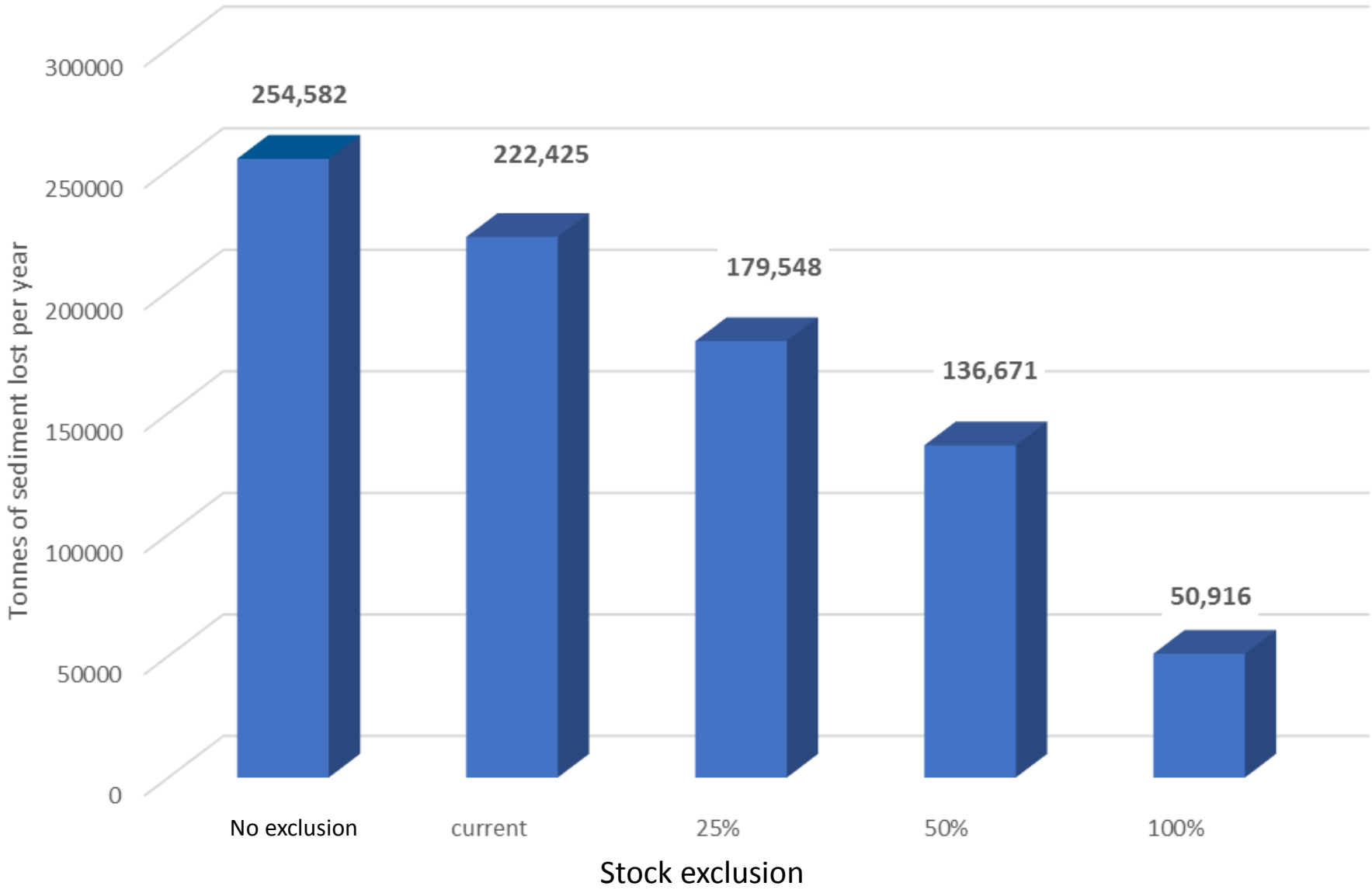
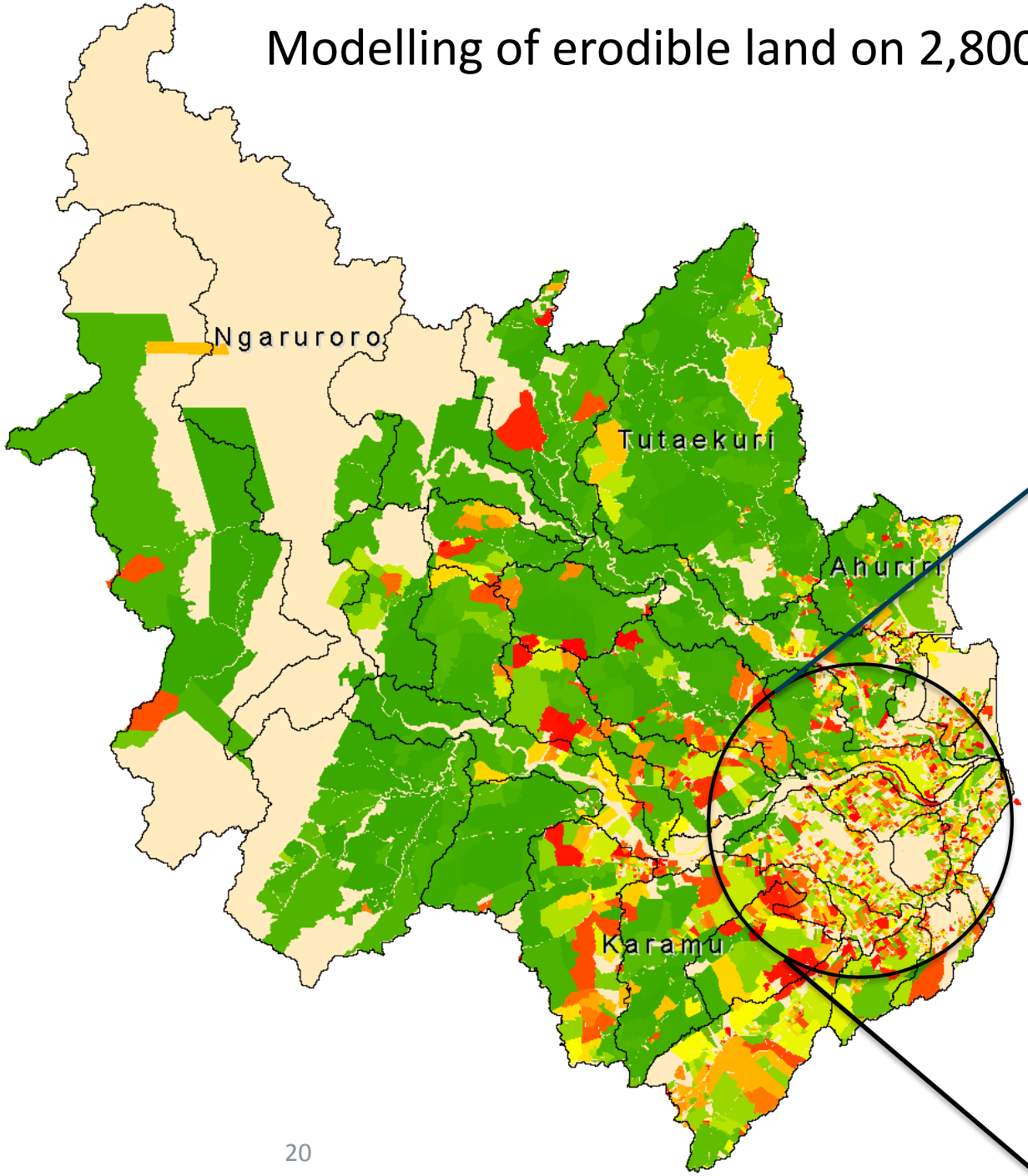
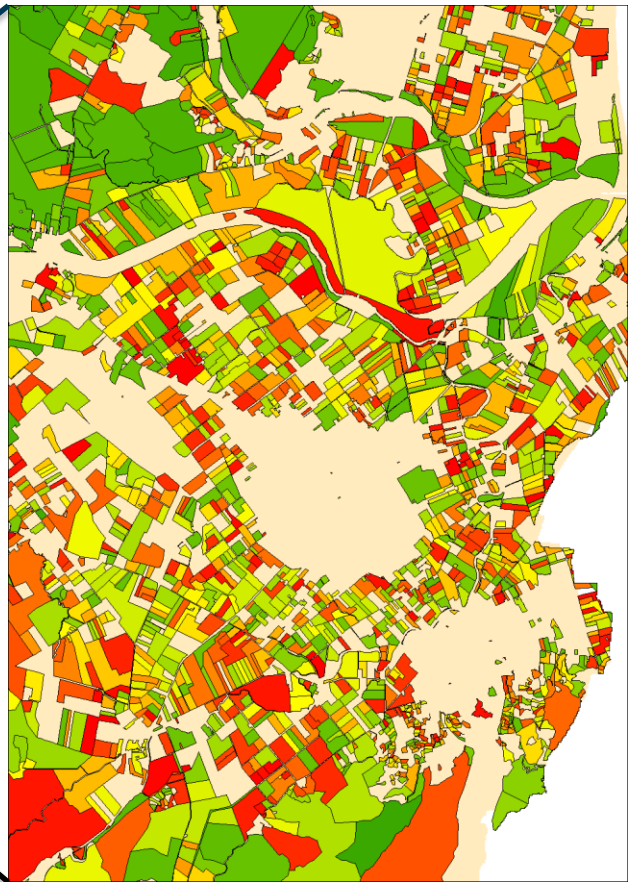

Reduction in sediment loss with increasing stock exclusion
Tonnes of sediment lost per year
300000
250000
200000
150000
100000
50000
0
254,582
222,425
179,548
136,671
50,916
No exclusion
current
25%
50%
100%
Stock exclusion

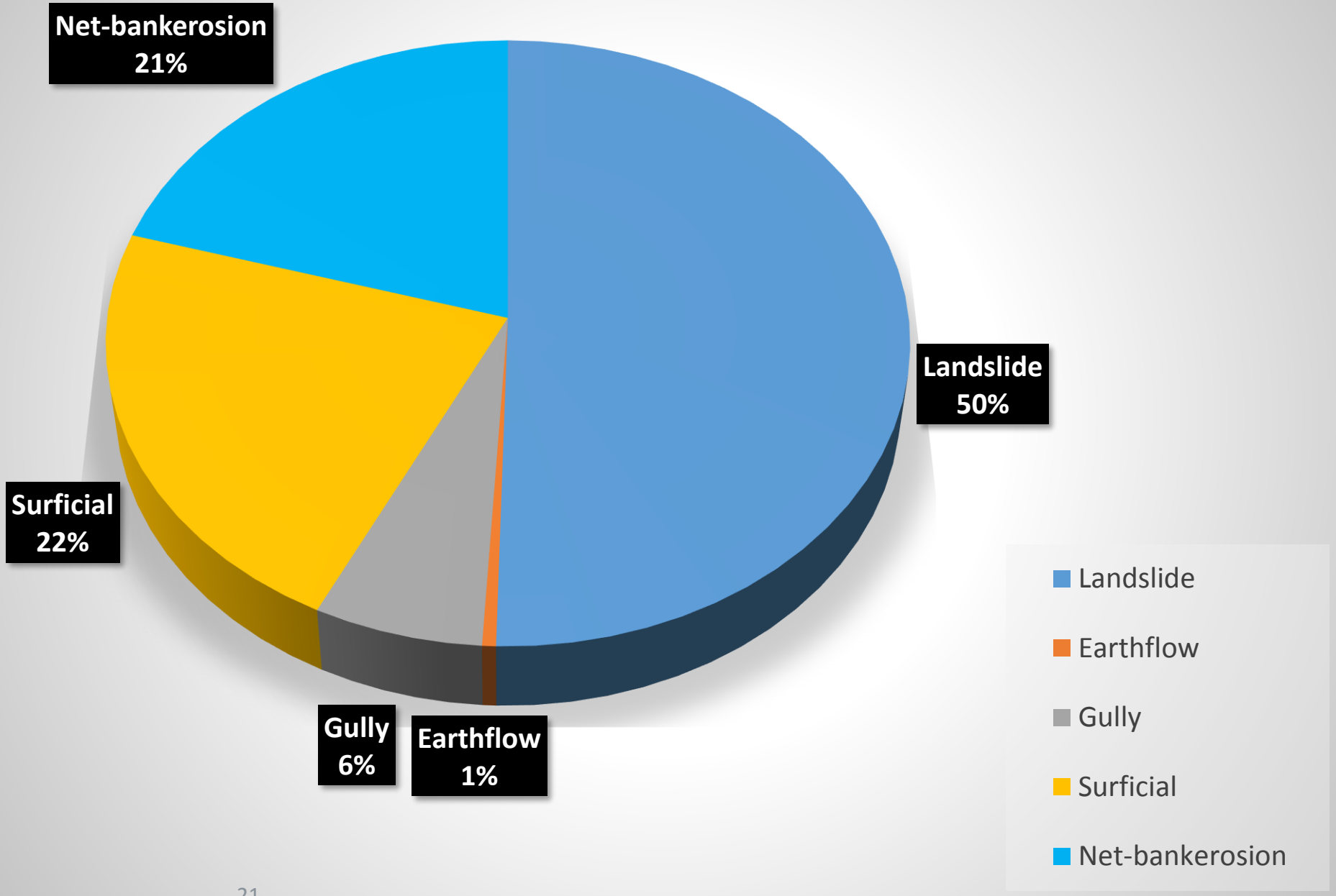
# Modelling of erodible land on 2,800 farms in TANK.



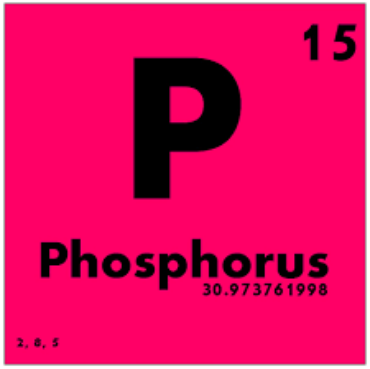

Only an indication of the amount of highly erodible land and <u>not</u> bad practice



# Breakdown of erosion types in TANK



# Linking sediment and phosphorus




- Binds strongly to soil particles/sediment
- Phosphorus is usually found as phosphate under normal environmental conditions
- Can be released under certain environmental conditions e.g. low oxygen environments
- Causes algal blooms and other plant growth in rivers.



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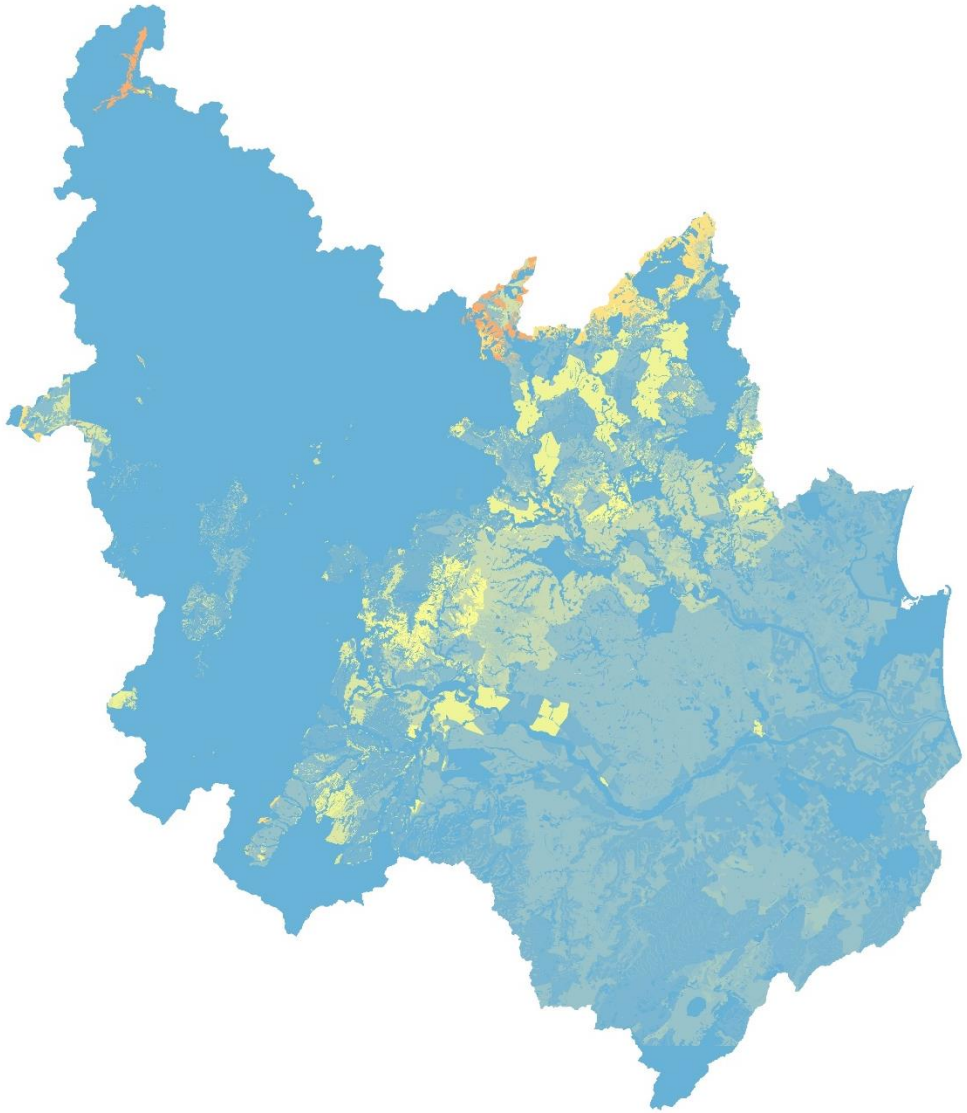
# Modelled Phosphorus loss across the TANK Catchments



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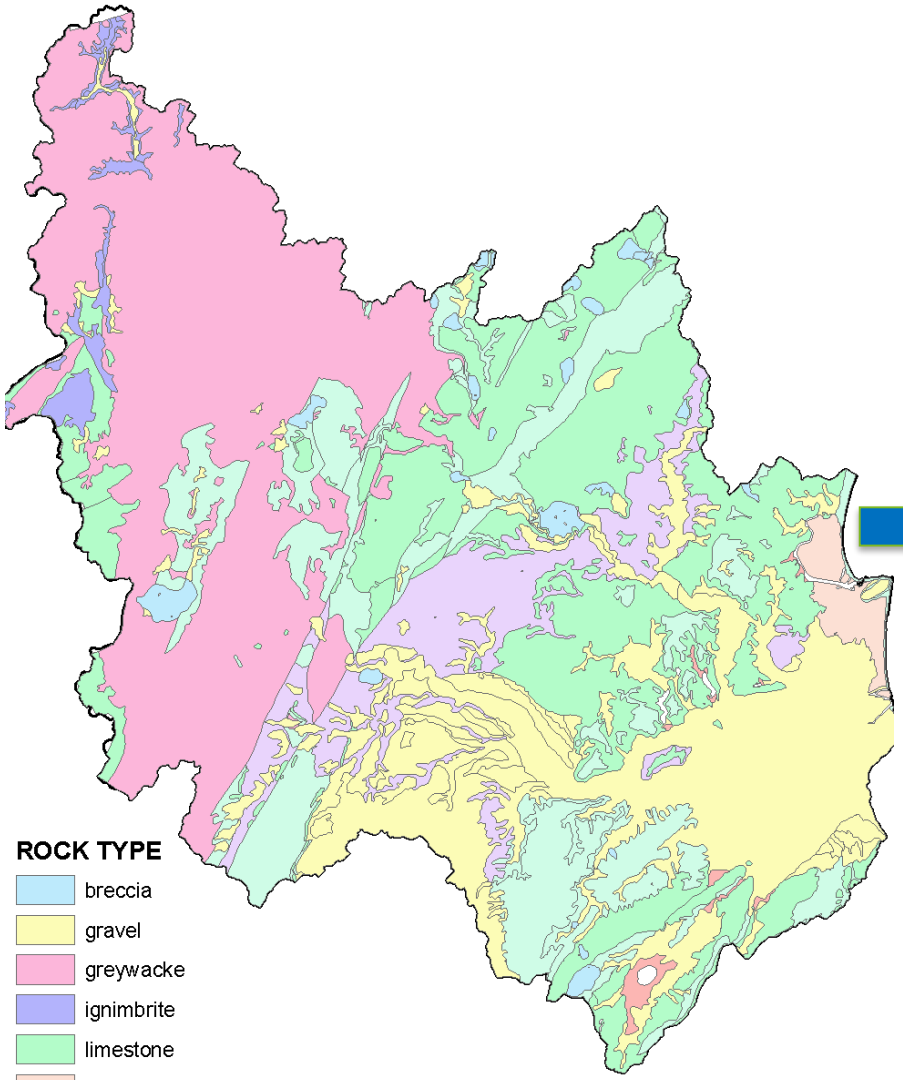
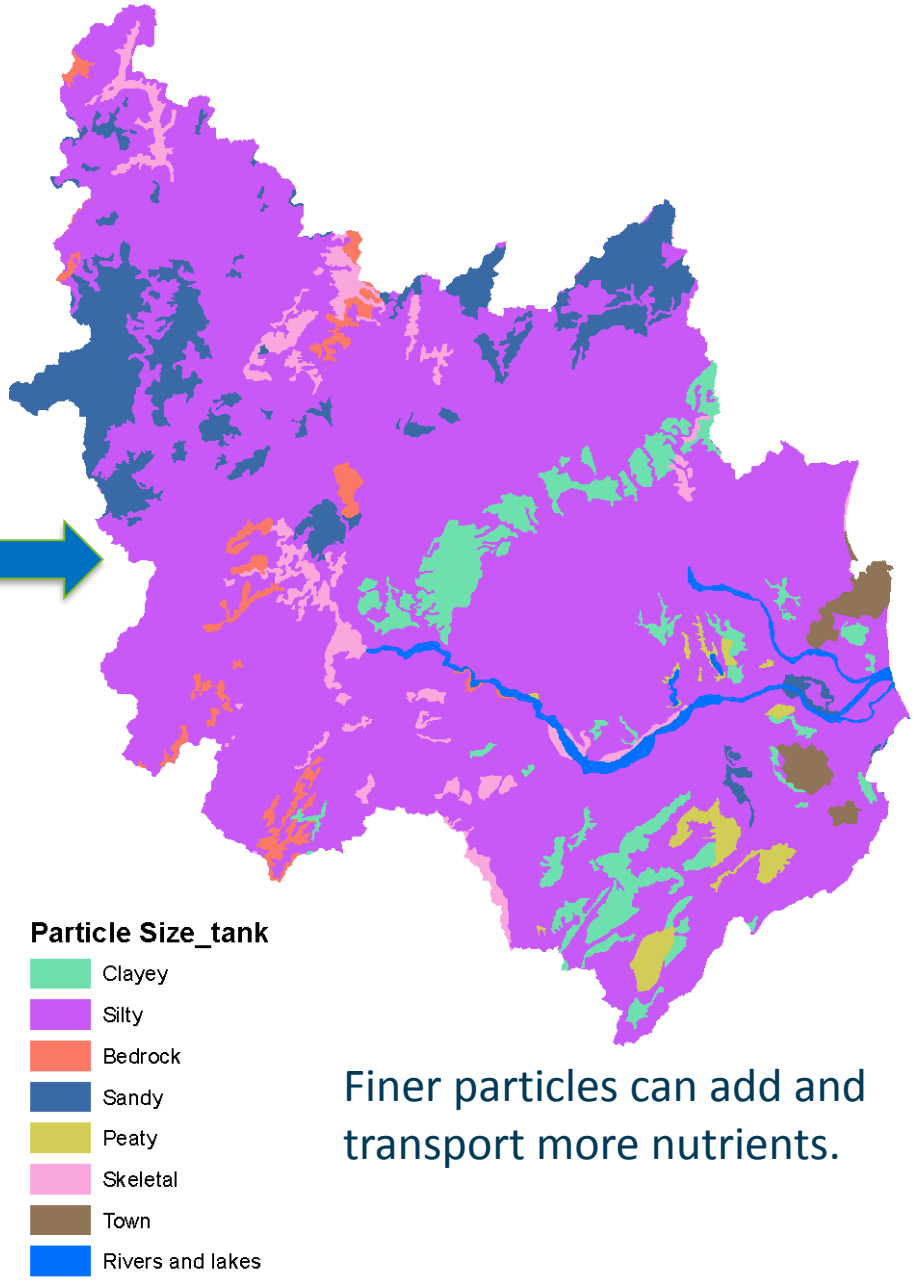
# Predicted sediment particle size and geology across the TANK Catchments




Finer particles can add and transport more nutrients.

# Conclusions

- Increasing stock exclusion can have a large effect
- About 50% of sediment is generated from land slides
- Reduce sediments and nutrients to rivers and estuary will be reduced
- SedNet can work at multi level resolution (catchment, sub-catchment or farm)
- How do you want SedNet to work for you?

# Erosion

1. Intro to erosion
2. HB context
3. Types of erosion and mitigation
4. Online tool

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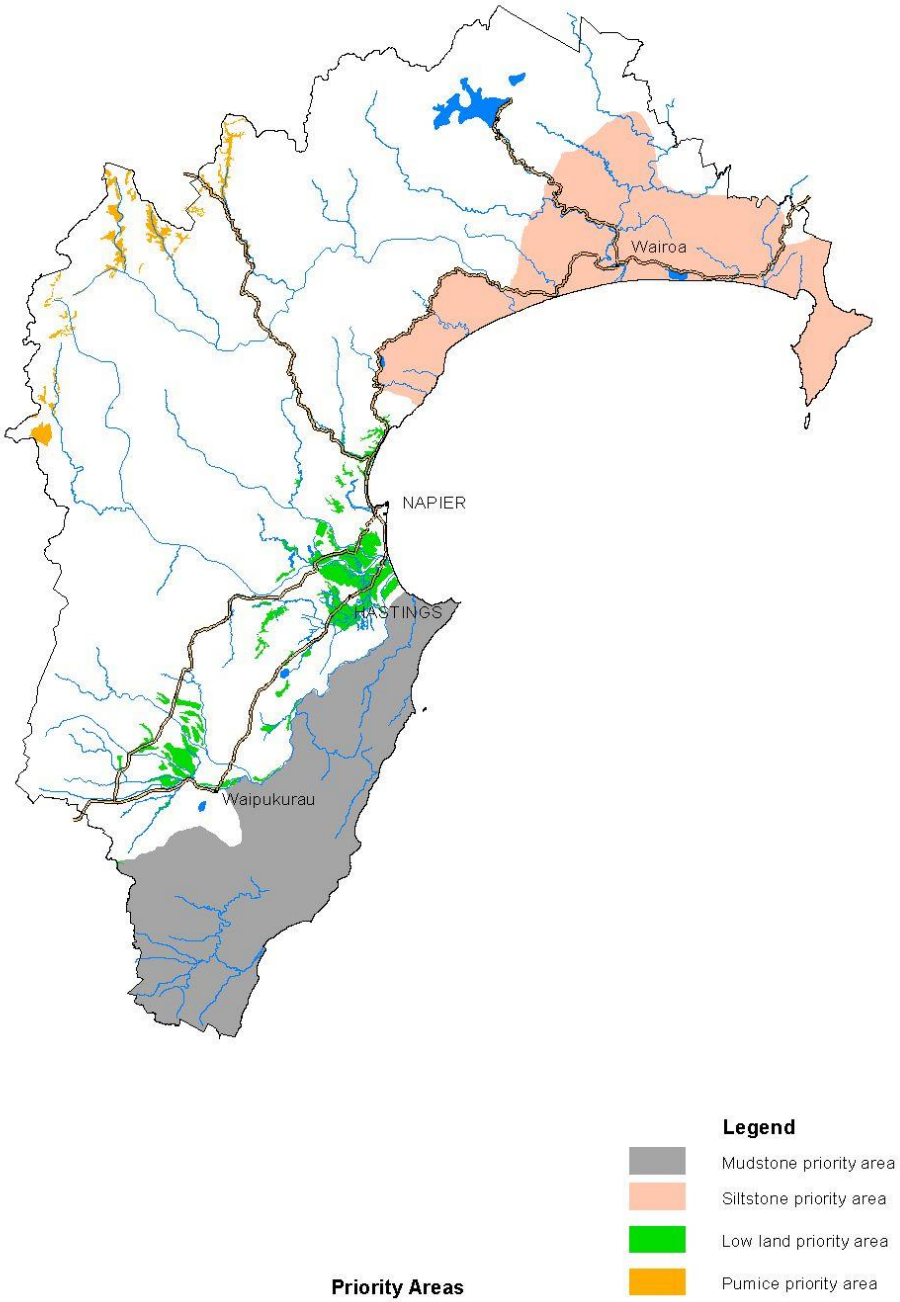
# Erosion 101

- Natural process accelerated
- Highly influenced by geology (type & extent)
- Damage to infrastructure and environment
- Long term loss of production and natural capital

# The Hawke's Bay Context




www.abovehawkesbay.co.nz

# Natural Disasters or Normal events

Hawke's Bay

- 55 of the last 100 years had at least 1 rain event >100mm
- 9 years had events of >200mm
- 53 storms similar to Bola in last 7200yrs, 7 even larger.
- 1400 storms in sediment record
- Storm frequency 1 in 5 yrs for all storms. 1 in 53 years for large storms

Conversion of forest to scrub and fern
Increased erosion by 60%

Conversion to pasture
Increased erosion 800-1700%. (8-17X)

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# Forestry

- Pakuratahi Land use study
- 12 years paired catchment study

- Pasture had 3-4 X sediment loss of forested catchment
- After harvest 2-3 X sediment loss compared with grass
- 2-3 years after harvest, back to pre-harvest levels
- Over 12 years total yield from catchment was 1.5 x more on pasture

- More vegetation = less erosion

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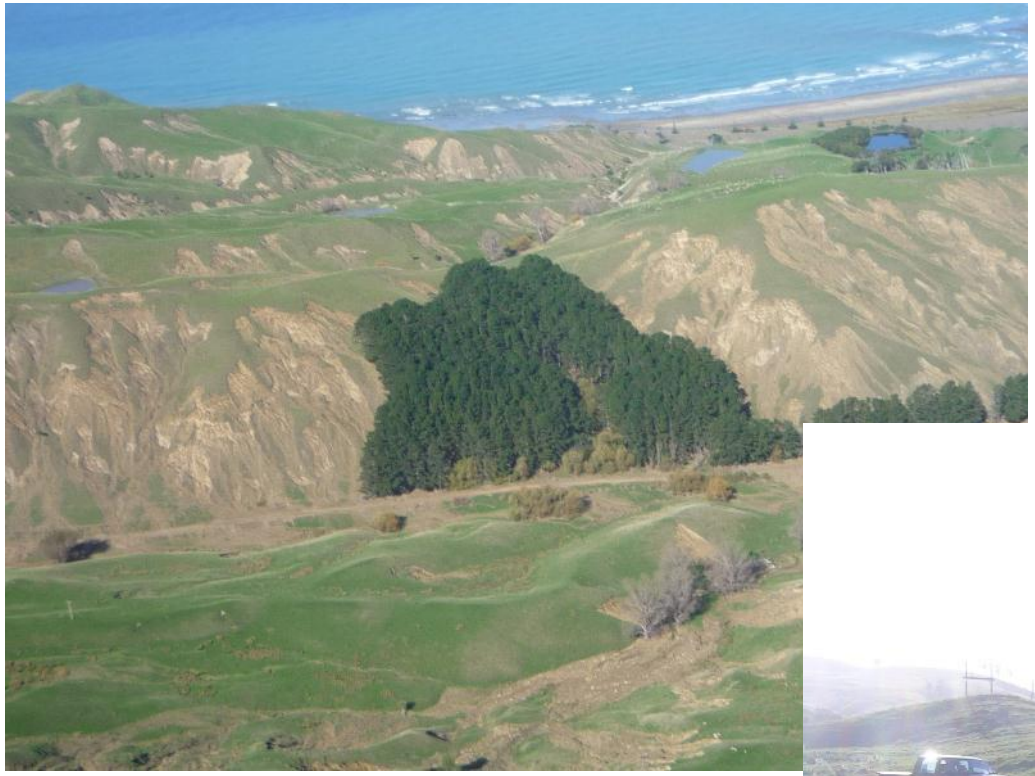
# Slips and slumps



# Gully (degrade)



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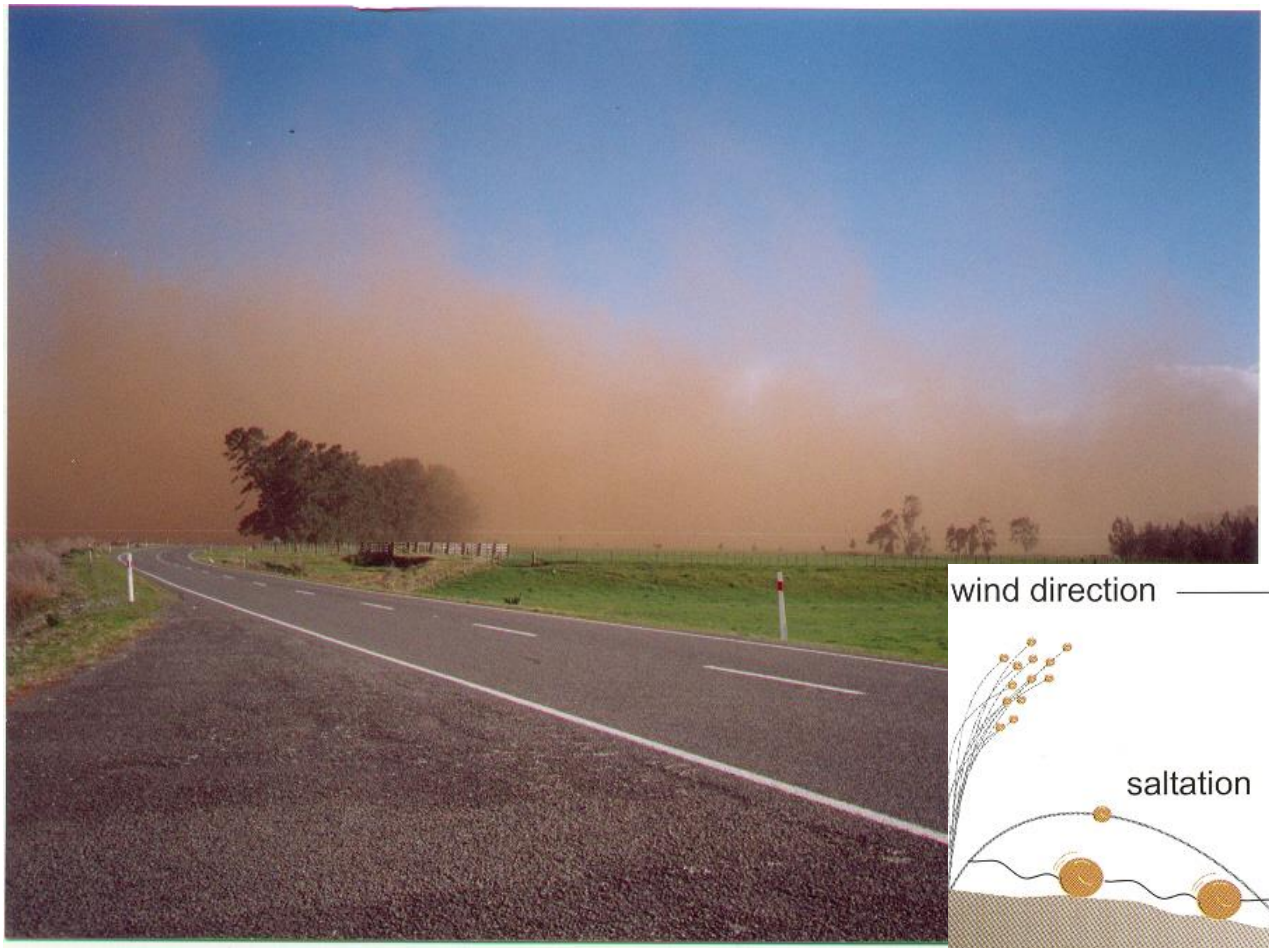
# Gullies (tunnel)

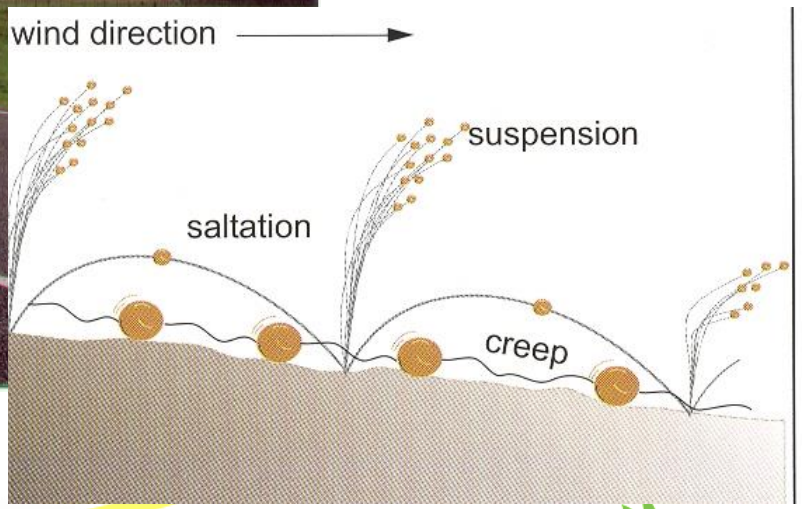
# Streambank erosion

# Earthflow

# Sheet

# Wind





# Stock



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# Other

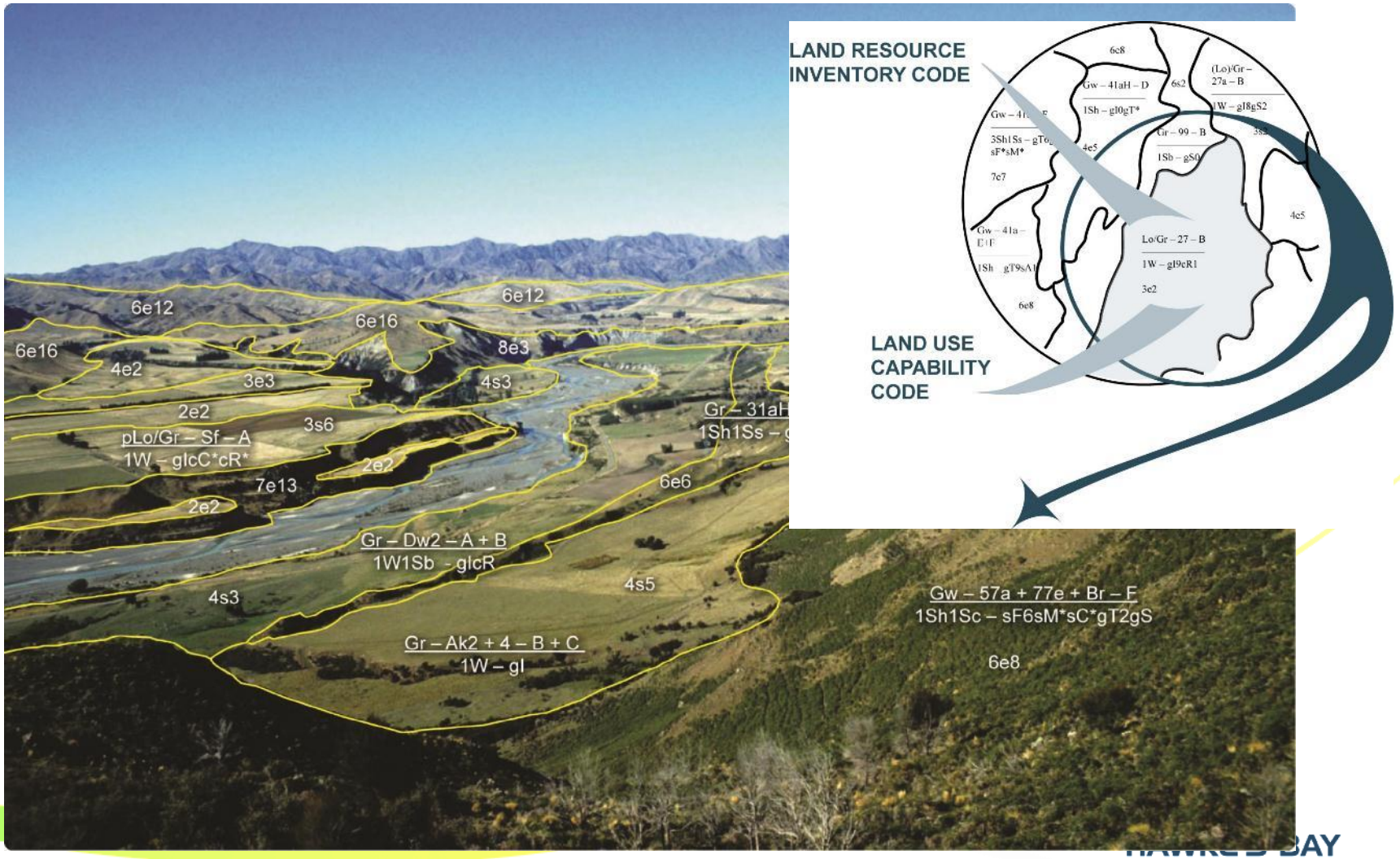
# What do we do?

- More vegetation
- Less time or area with exposed soil
- Some structures

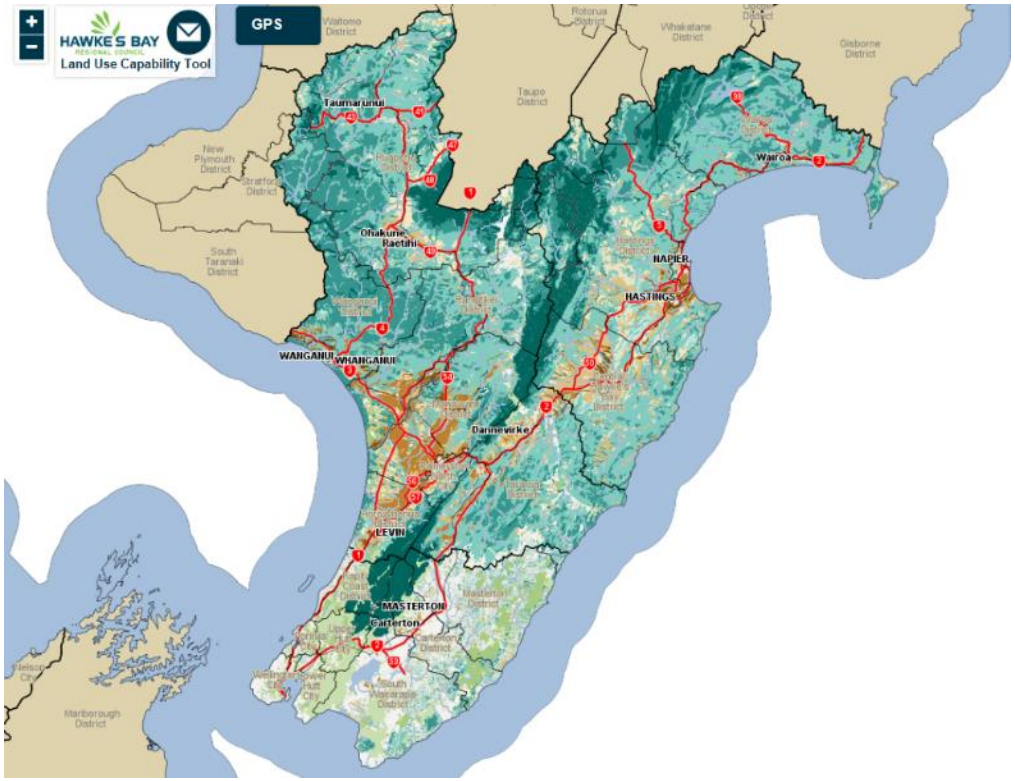
- Fencing costs vary $3,  $18-20,  $36/m (deer)
- Space planted poles $800/ha at 30-50 trees/ha
- Effectiveness 78-95% reduction in slips compared with pasture

# Land Use Capability

Its not just for calculating nitrogen leaching allowances…



# An on line tool to help with soil conservation recommendations




http://maps.hbrc.govt.nz/IntraMaps/MapControls/RegionalLUCTool/index.html

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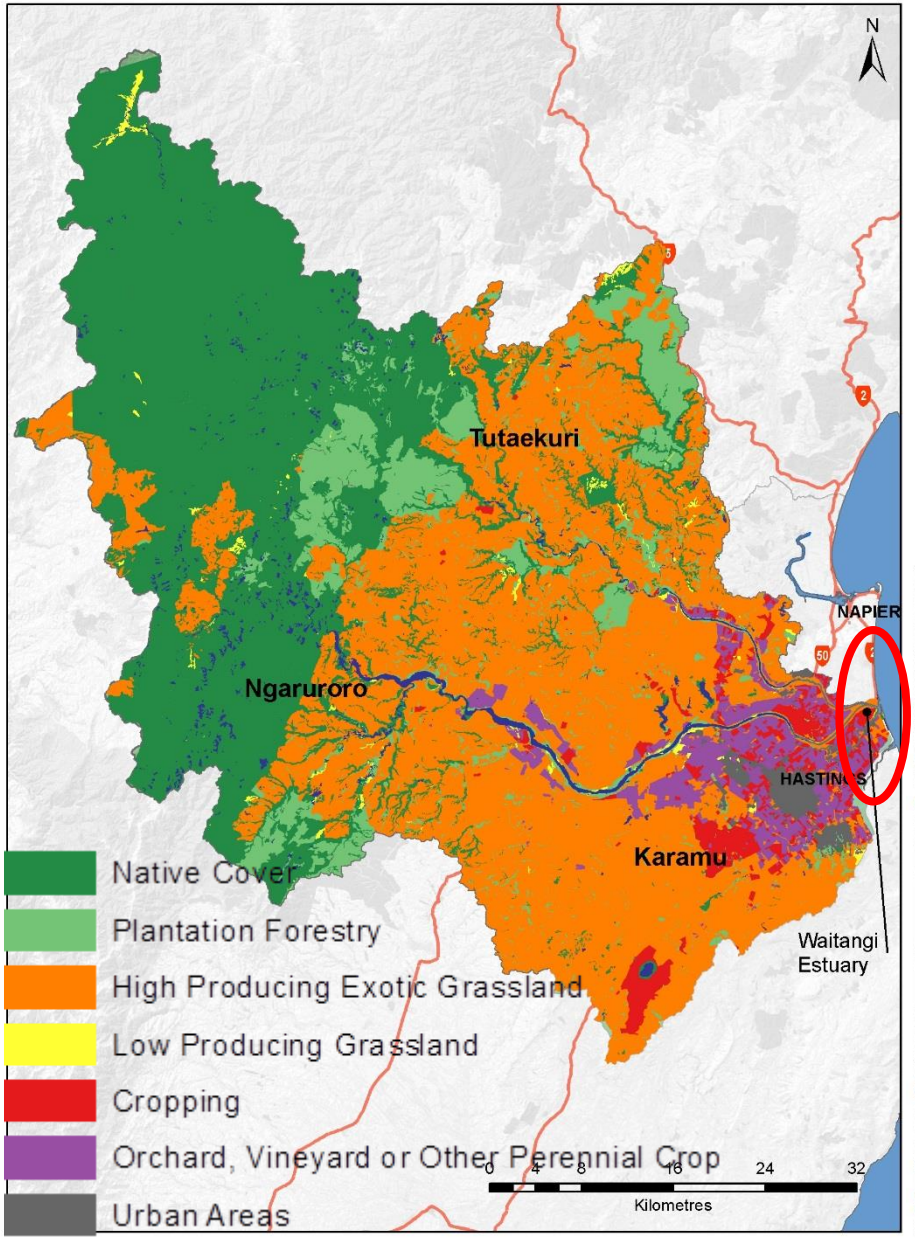
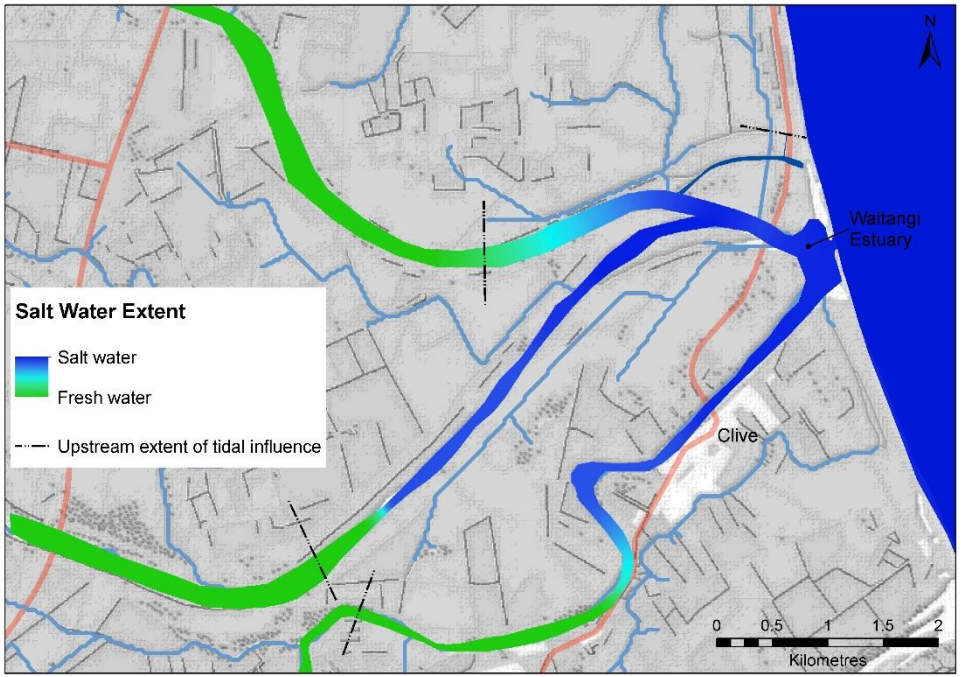
# Using SedNet in decision making

- **How else might SedNet inform the Group?**

# Waitangi Estuary

# The Waitangi Estuary



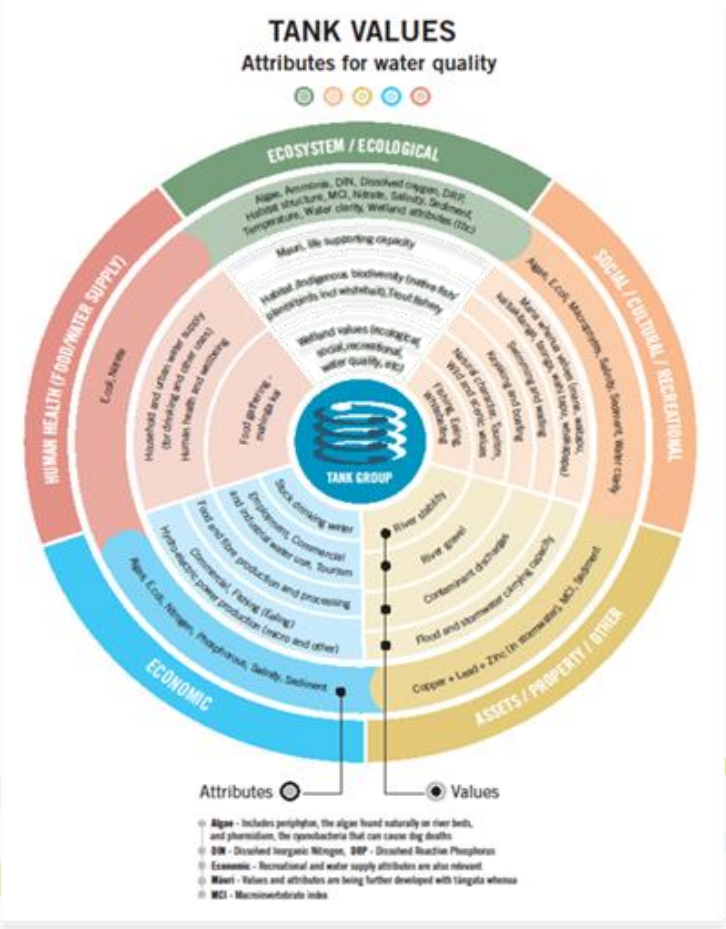
# The Waitangi Estuary Values

Habitat/ indigenous biodiversity

Mauri, Life supporting capacity

Wetland values

Food gathering – Mahinga kai




Fishing, Eeling, Whitebaiting

Human health and wellbeing

Swimming and recreation

Tourism

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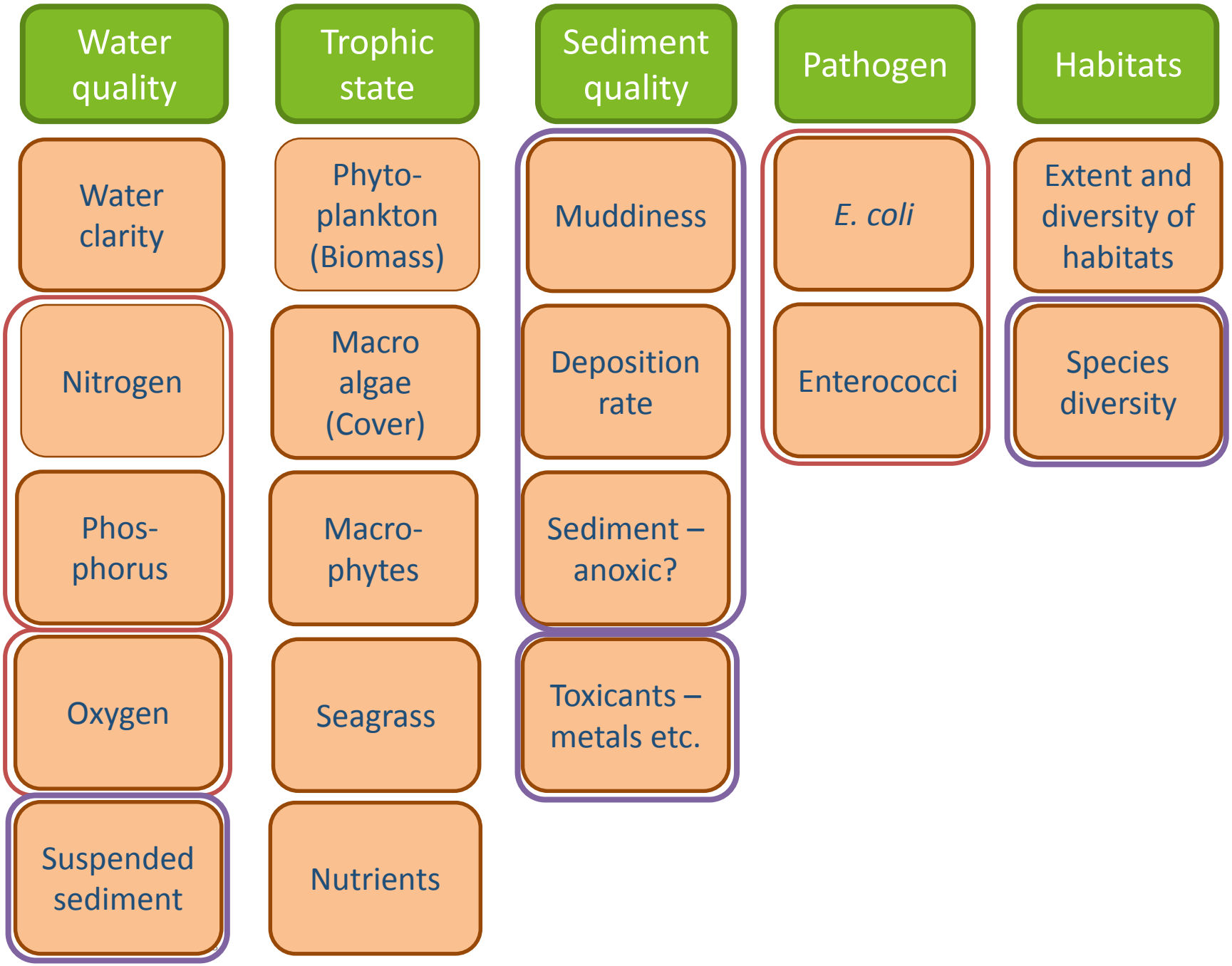
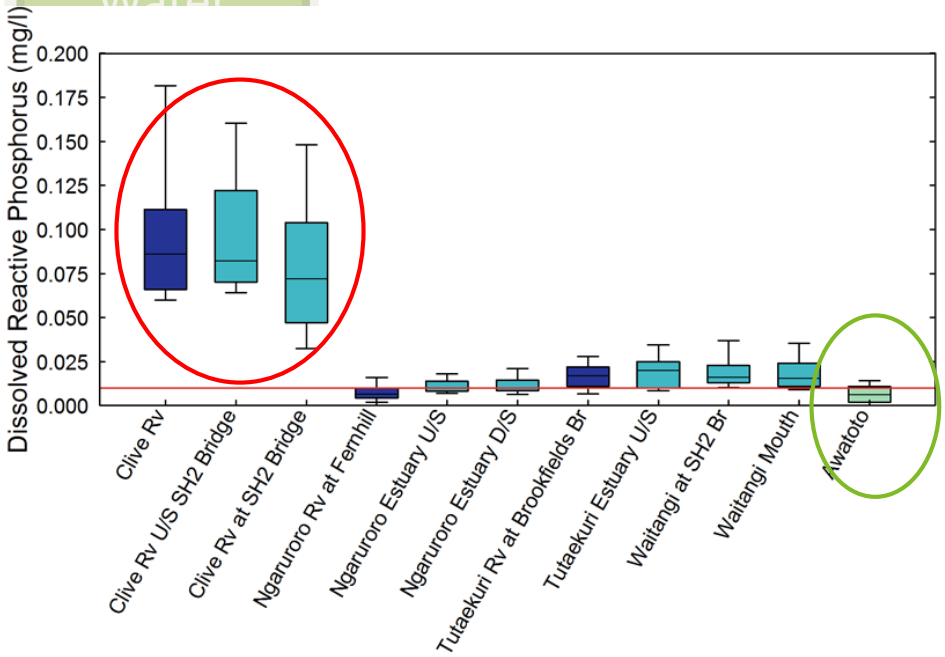
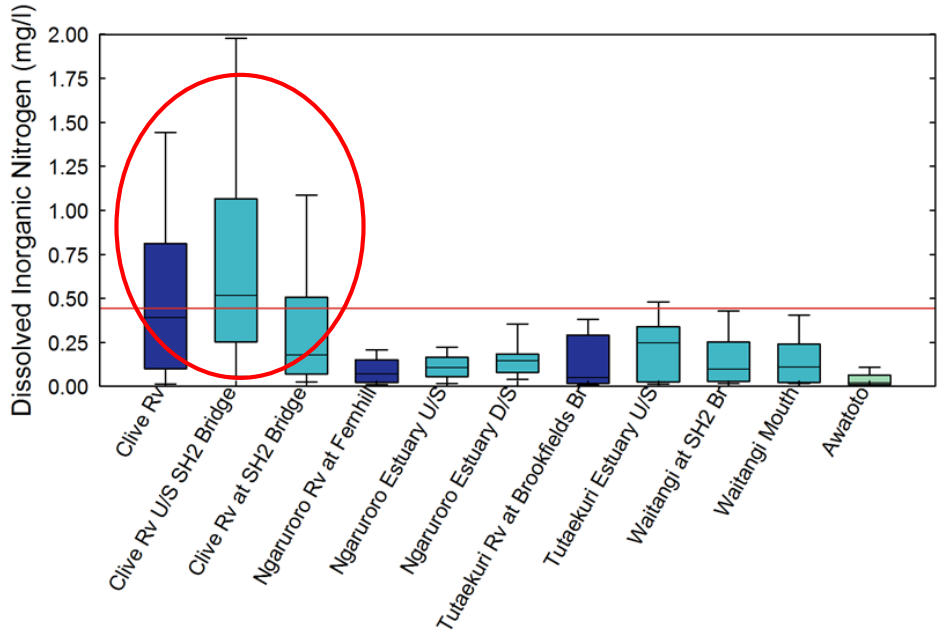

Water quality
Trophic state
Sediment quality
Pathogen
Habitats
Water clarity
Phyto-plankton (Biomass)
Muddiness
*E. coli*
Extent and diversity of habitats
Nitrogen
Macro algae (Cover)
Deposition rate
Enterococci
Species diversity
Phos-phorus
Macro-phytes
Sediment – anoxic?
Oxygen
Seagrass
Toxicants – metals etc.
Suspended sediment
Nutrients

# Nutrients

Water

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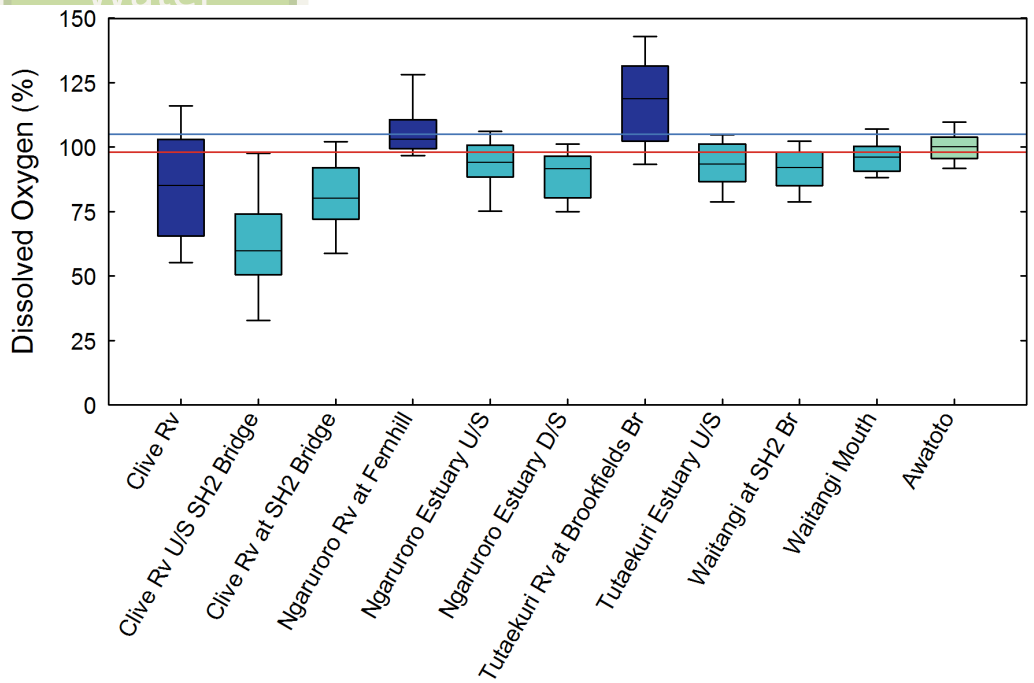
# Dissolved oxygen

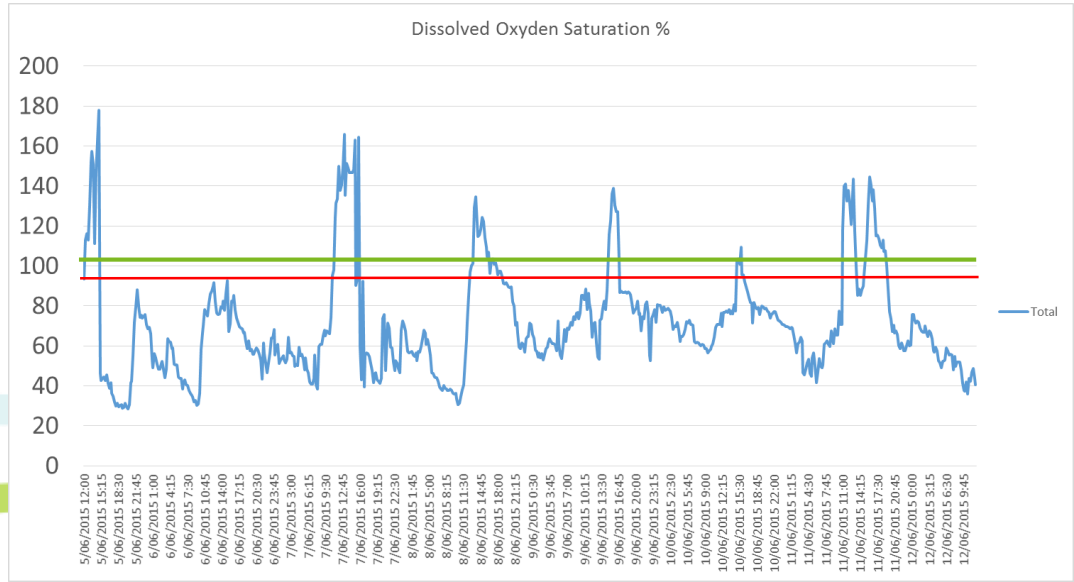
Water



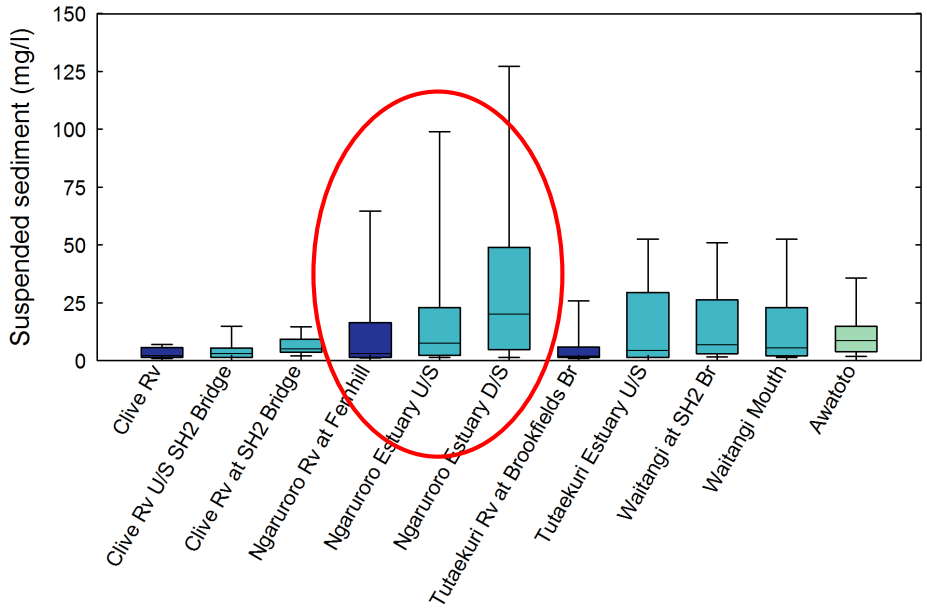

phorus

Oxygen

Suspended sediment



# Suspended sediment

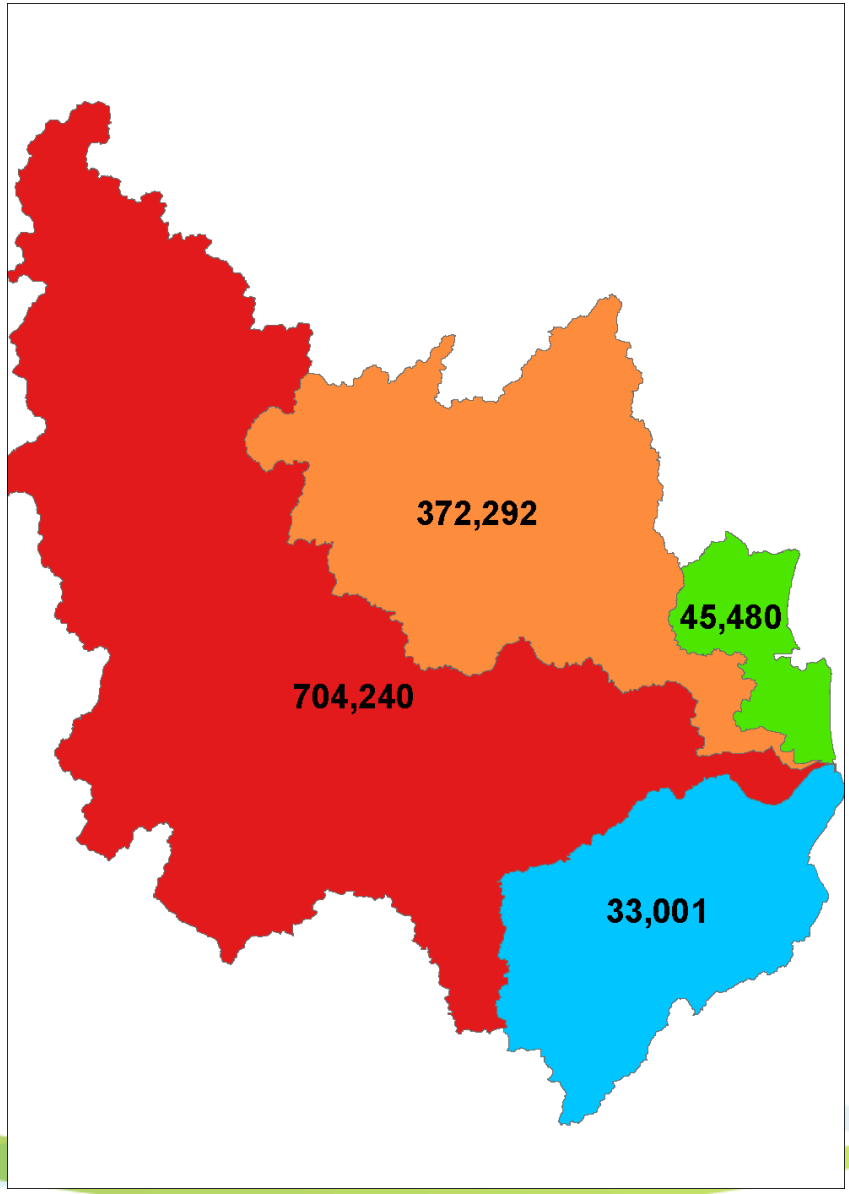



Phos-phorus

Oxygen

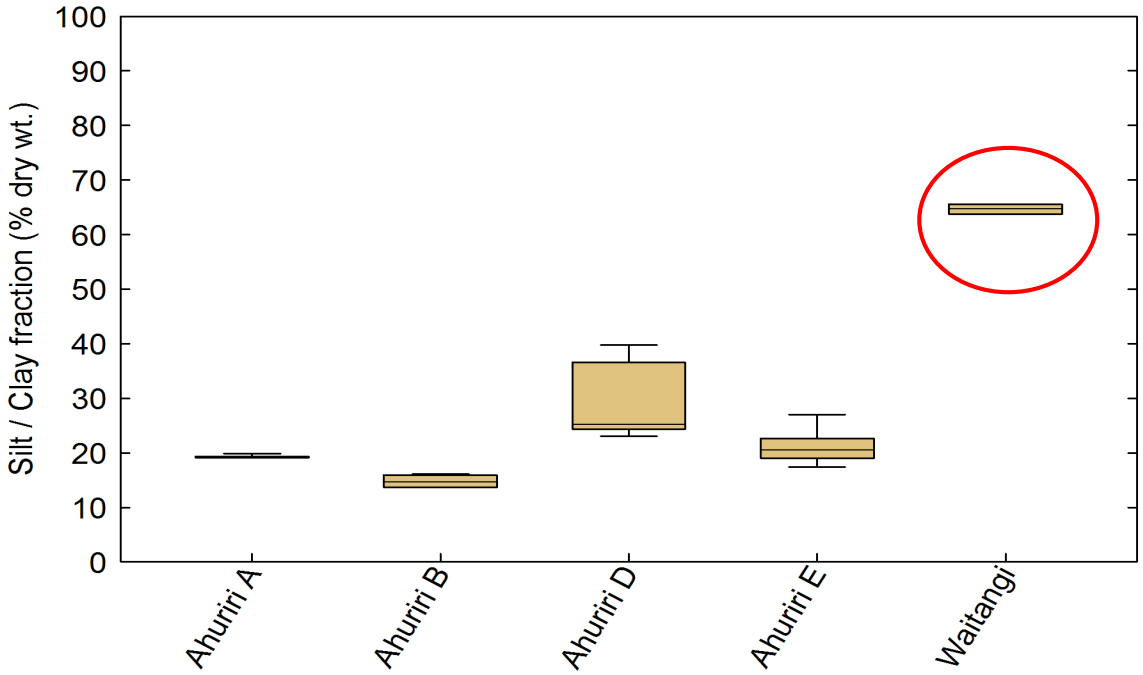
Suspended sediment

# Sediment sources



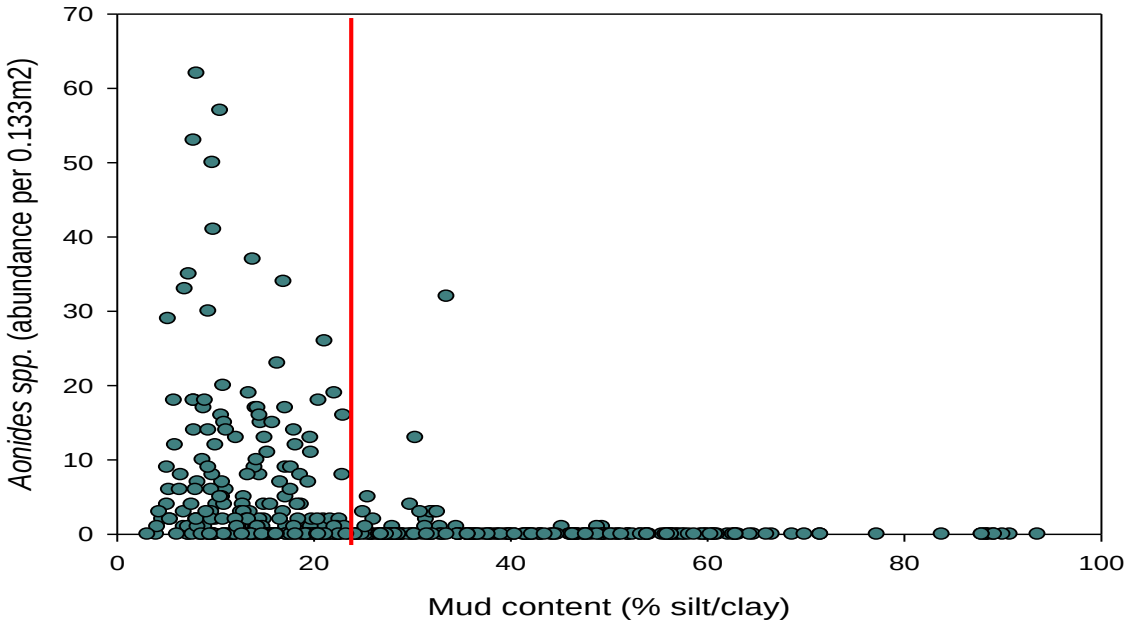

Total sediment loss of 1.1 million tonnes per year

# Deposited sediment




anoxic?

# Fine sediment = changes in ecology

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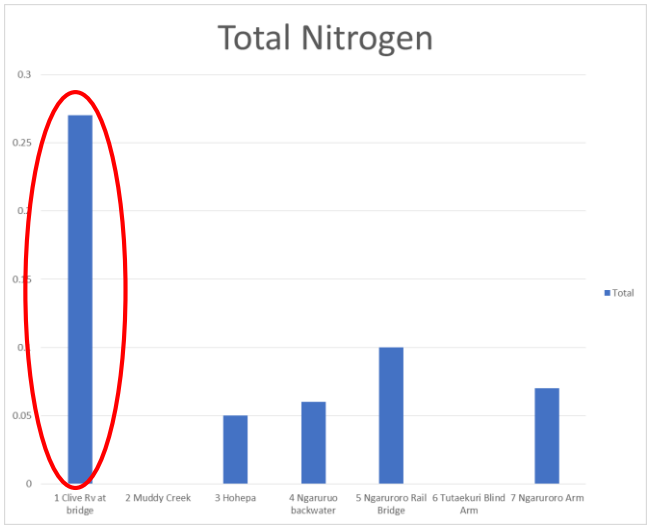
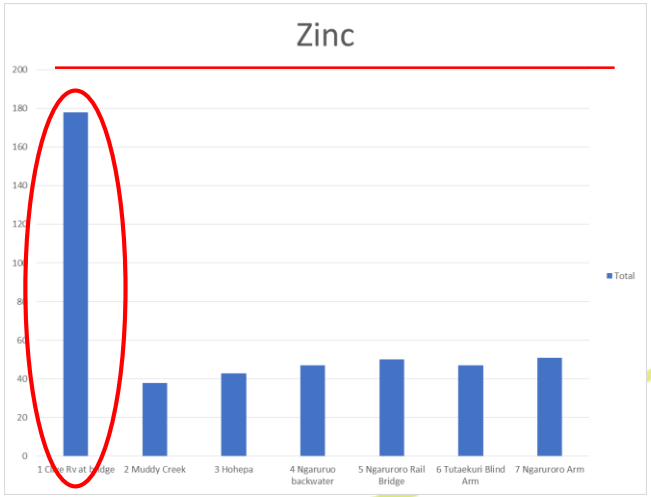
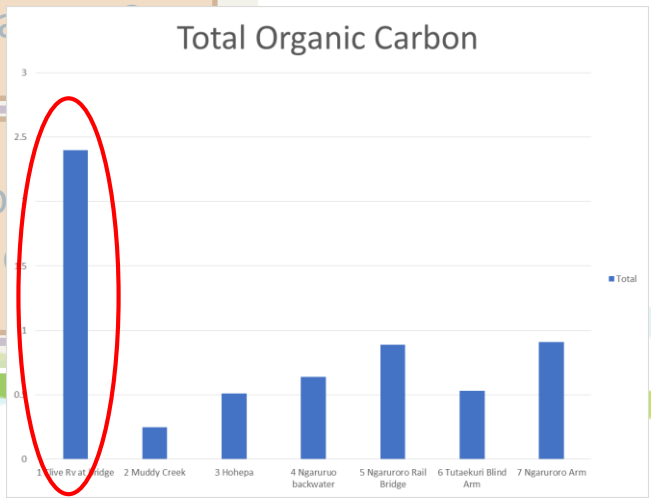
# Sediments and contaminants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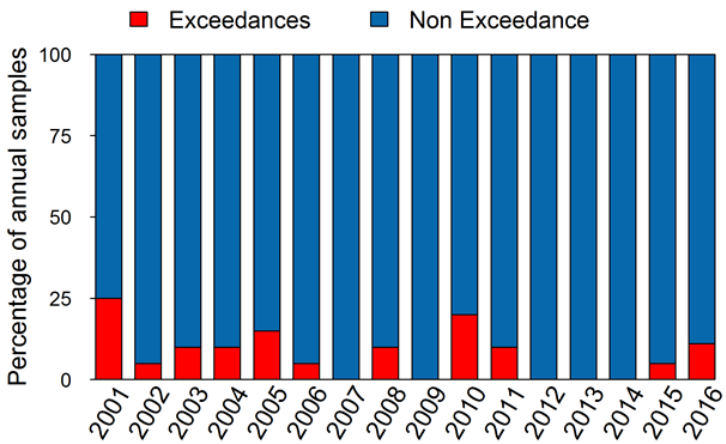
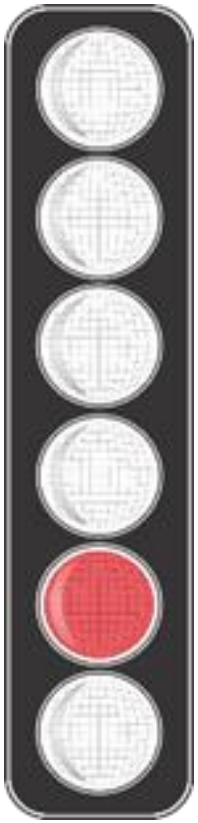
# Sediment fate

Nearshore → gradually moves → Offshore

# Recreational usage



## Faecal source tracking:

- Bird and vegetation
- Some ruminant

## Result unclear!

# Very poor

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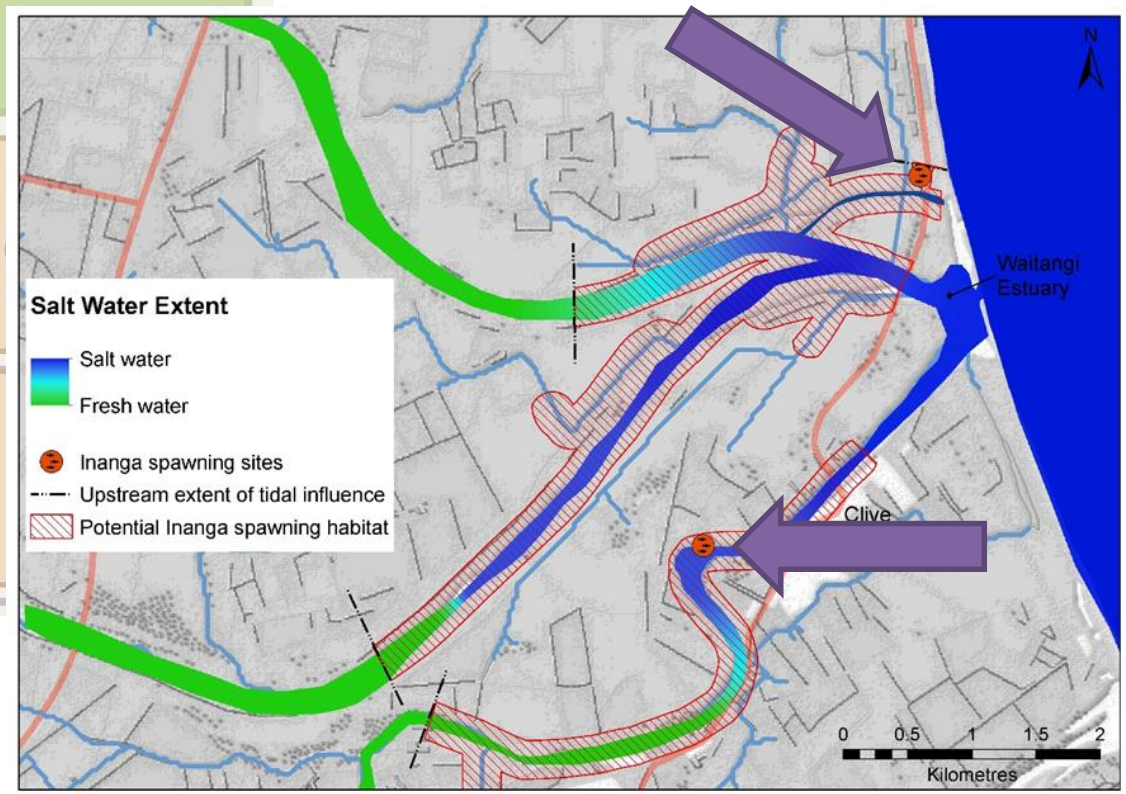
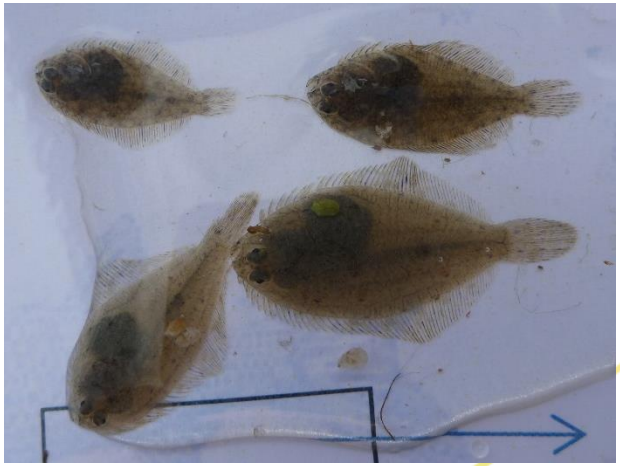
# Food gathering



# Summary

- A muddy estuary is not natural
- Turbid water and high suspended sediment concentrations are not natural
- Sediment loads are causing issues
- Sediments are intrinsically linked to nutrients; toxicants and pathogens.
- Need to consider the estuary when thinking about management of the freshwater environment

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# Translating Mana Whenua Values to Attributes for the Ngaruroro Awa

# Verbal updates from Working Groups

- Engagement
  - Pastoral hill country farmer meetings
- Economic Assessments
  - RfP
- Stormwater
- Wetlands/Lakes
- Mana whenua

# Agenda for Meeting 24

- Groundwater values and attribute states
- Reviewing attribute states in light of mana whenua values to attributes work
- Risks and opportunities
- ~~Initial mapping of management areas for Water Quality~~
- Develop scenarios for testing and working on management options

# Revised work programme

- Updated to
  - reflect science programme
  - economic assessment project outputs
  - Include further detail about meeting content

| | | |
|---|---|---|
| **Meeting 23** | **Estuary state and trends – and impact on values**<br>**Understanding sediment inputs and management options**<br>**Presenting findings - tangata whenua values and attribute state project** | **20 September 2016** |
| **Meeting 24** | Groundwater values and attribute states<br>Report back on tangata whenua project findings<br>Risk and opportunities report back from EAWG<br>Develop scenarios for testing and work on management options – quality and quantity<br>~~Ahuriri~~ | 2 November 2016 |
| **Meeting 25** | Karamū Management<br>Report on Heretaunga Source Model<br>Continuing Waitangi Estuary state/trends information – nutrient load limits<br>Confirm Karamu values/attributes/attributes states<br>Scenarios for modelling – further from work on 2nd November | 13 December 2016 |
| **Meeting 26** | Preliminary report from Stormwater group<br>Part 1 and 2 economic assessment report back and development of second round of mitigation options.<br>Possible establishment of Water Augmentation Group | 9 February 2017 |

| | | |
|---|---|---|
| **Meeting 27** | **Ahuriri reporting**<br>**Report on nutrient loads to estuaries**<br>**TANK quality and quantity modelling – report on Source model** | **22 March 2017** |
| **Meeting 28** | Part 1 and 2 economic assessment reporting – round 2<br>Final report from stormwater group<br>Final report from Wetland Group | 3 May 2017 |
| **Meeting 29** | Quality and quantity alignment<br>Review all decisions for Tūtaekuri and Ngaruroro and Karamu<br>Costs/benefits and implications assessments<br>Part 4 of economic assessment<br>Monitoring plan – report on current and identify gaps, propose solutions<br>How does the BBN look? | 14 June 2017 |
| **Meeting 30 and 31** | Economic assessment outputs parts 3 and 4<br>Review all decisions for Ahuriri<br>Allocation options, Other methods, Implementation plan –commence preparation alongside draft plan change | 26 July 2017<br>5 September 2017 |
| **Meeting 32** | Plan drafting | 18 October 2017 |
| **Meeting 33** | | 22 Nov |

# Closing Karakia

Nau mai rā

Te mutu ngā o tatou hui

Kei te tumanako

I runga te rangimarie

I a tatou katoa

Kia pai to koutou haere

Mauriora kia tatou katoa

Āmine