

# Rowing through the Bloom; A Survey of the Water Quality Preferences

of recreational users



*Come share the spirit*



*Dan Marsh, Lena Mkwara  
Ruth Pinkerton, Najmus Sayadat*

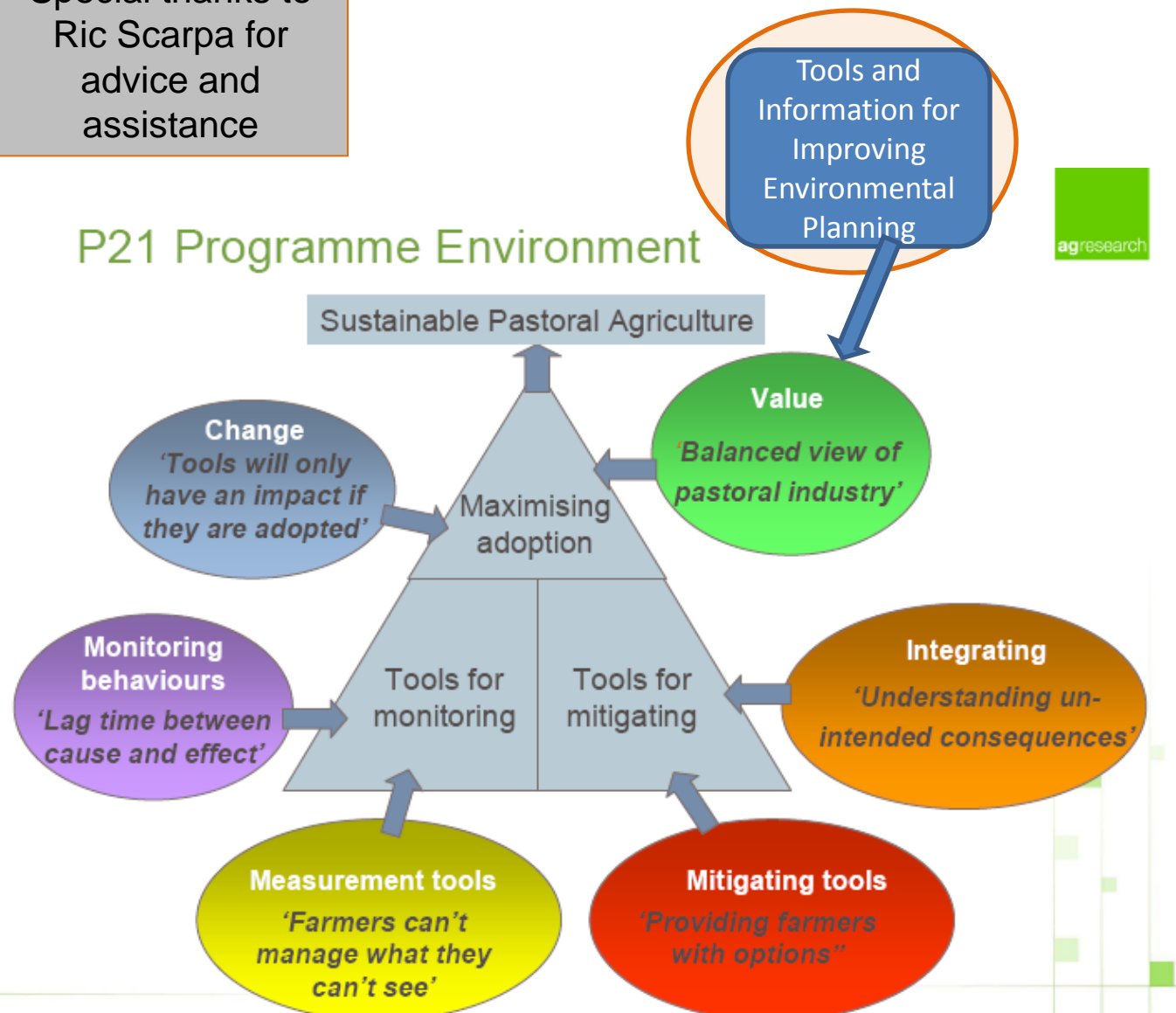


THE UNIVERSITY OF  
**WAIKATO**  
*Tē Whare Wānanga o Waikato*

# Research Funded by FRST, Dairy NZ, Meat and Wool and Fonterra

Special thanks to Ric Scarpa for advice and assistance

## P21 Programme Environment



**Funded by**  
FRST  
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# Motivation

- Develop methodology for valuation of water quality improvements in New Zealand
  - And better understand people's views about the quality of water in the Waikato River
- Allow decision makers to consider both the costs and the benefits of different levels of water quality improvements
  - Water quality improvements likely to reduce farm profits and output

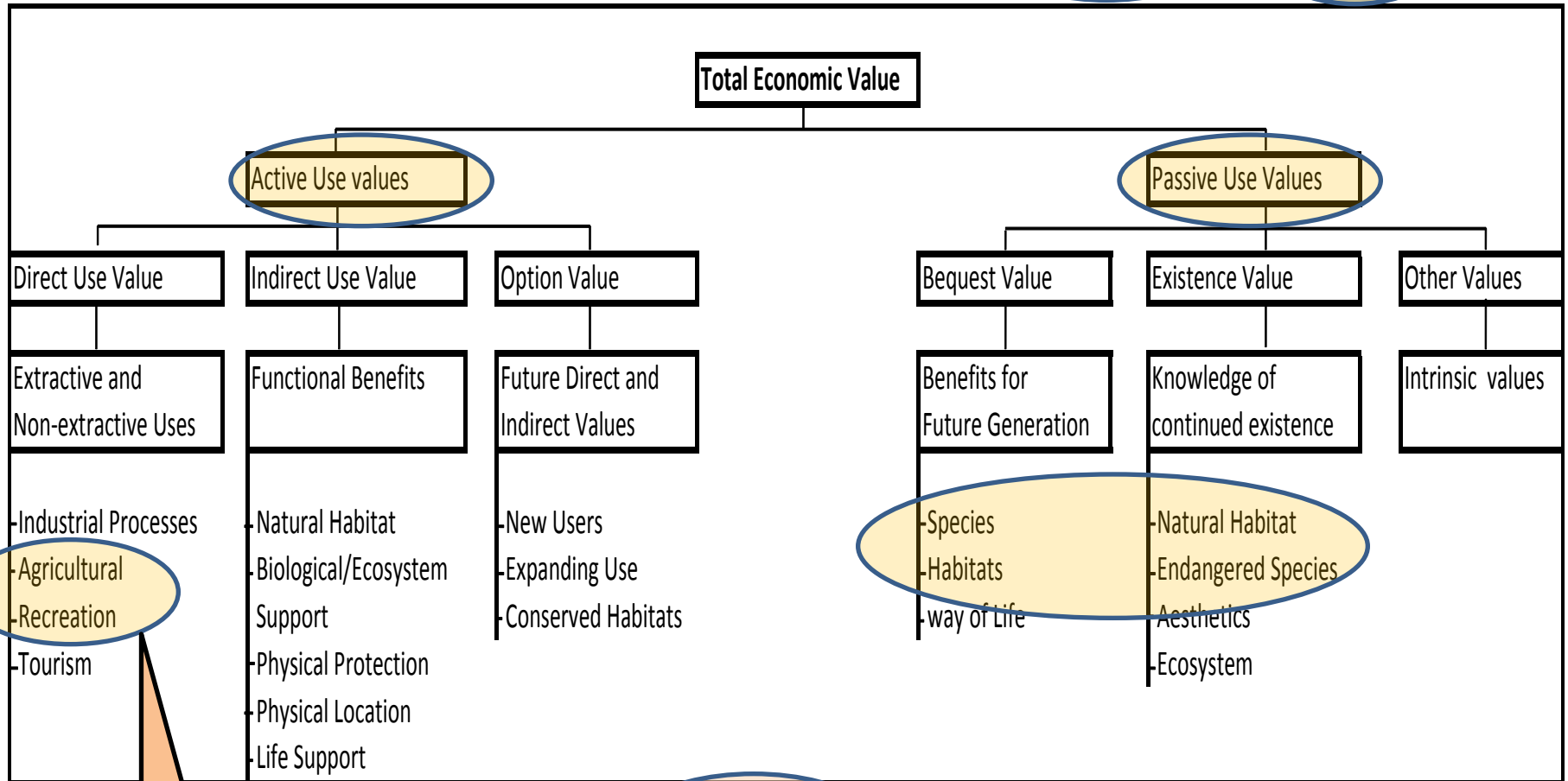
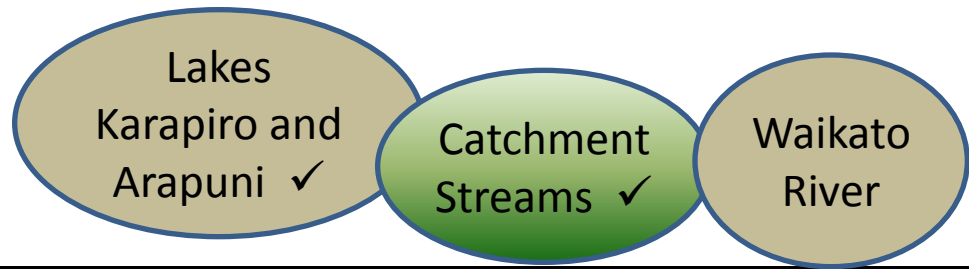


# Study Location

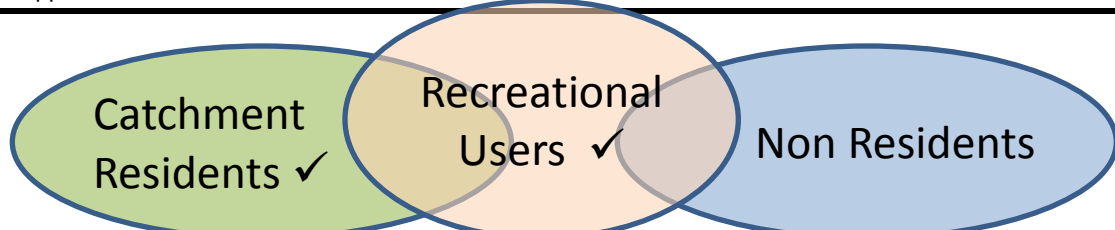
*(Lake Karapiro)*



# Components of Value



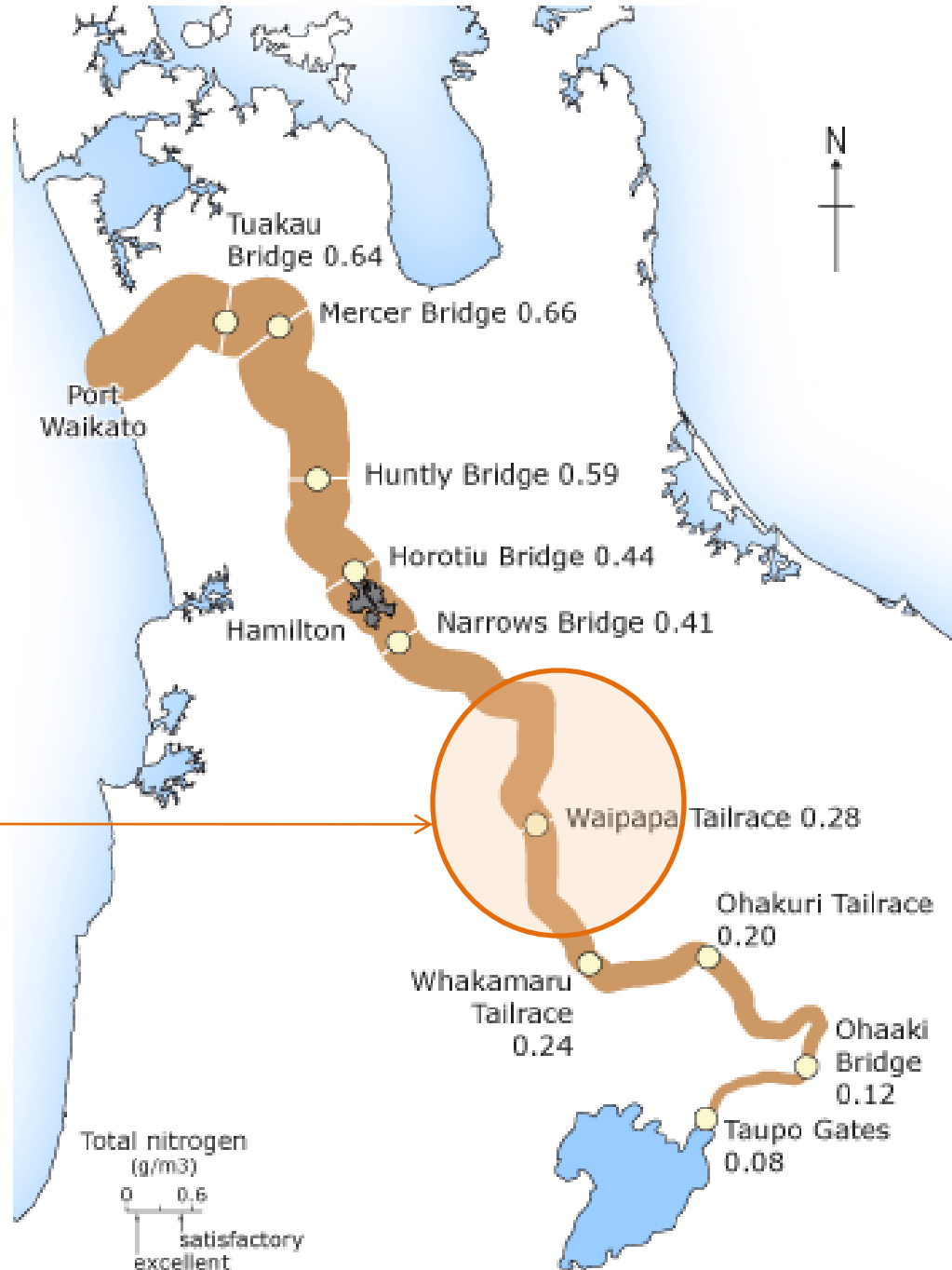
This Paper



# Nitrogen










Source: EW

Study Area



## Choice set 1

Please think about the options presented below and select your most preferred choice, followed by the 2nd and 3rd choices.

	<b>Future Situation (within 10 years) 'Do Nothing'</b>	<b>Alternative Option 1</b>	<b>Alternative Option 2</b>
Suitability for Swimming and Recreation	50% chance of health warnings (1 in 2 years)	20% chance of health warnings (1 in 5 years)	50% chance of health warnings (1 in 2 years)
Water Clarity	up to 1 metre	4 metres	1.5 metres
Ecological Health % Excellent	less than 40% are excellent	50% are excellent	less than 40% are excellent
Number of jobs in dairying and related industries	Stay about the same	Reduce by 140 (20%)	Reduce by 70 (10%)
Cost to you (\$ per year for the next 10 years)	0	150	150
	  	  	  

Results:

MNL

RPL

Models

All

Respondents

	MNL	RPL
ASC	0.7181***	0.873***
SWIM20	0.3293**	0.468***
SWIM10	0.5386***	0.775***
SWIM2	0.7773***	1.256***
CLAR15	0.0860	0.219
CLAR2	0.2797**	0.462***
CLAR4	0.5214***	0.982***
ECO50	0.4983***	0.657***
ECO60	0.5270***	0.769***
ECO80	0.8919***	1.480***
JOB5	-0.0620	-0.030
JOB10	-0.0445	-0.131
JOB20	-0.4937***	-0.490**
COST	-0.0038***	-0.0077***
<i>Model Statistics</i>		
N (Observation)	1380	1380
Log L	-1032	-973
AIC (finite sample)	1.51611	1.4375
BIC	1.56917	1.5096
R <sup>2</sup> (McFadden)		0.358

# Annual WTP (individual)

*Simulated marginal WTP estimates using SM package in R*

Attribute		1st Quartile	Median	Mean	3rd Quartile	
<b>Suitability for Swimming</b>	SWIM20***	15	78	108	153	To reduce probability of algal bloom from 1 in 2 years to 1 in 50 years
<i>(Probability of algal bloom)</i>	SWIM10***	100	129	180	183	
	SWIM2***	107	192	269	313	
<b>Water Clarity</b>	CLAR1.5					
<i>You can usually see for ..m</i>	CLAR2***	63	83	116	120	
<i>Underwater</i>	CLAR4***	79	140	196	227	
<b>Ecological Health</b>	ECO50***	52	108	150	181	
<i>Percentage of excellent</i>	ECO60***	96	128	178	186	
<i>readings</i>	ECO80***	133	222	309	350	
<b>Job Losses in dairying</b>	JOB5					
<i>% reduction</i>	JOB10					
	JOB20**	-4	-83	-116	-179	

# Annual WTP (rowers vs. all rec' users)

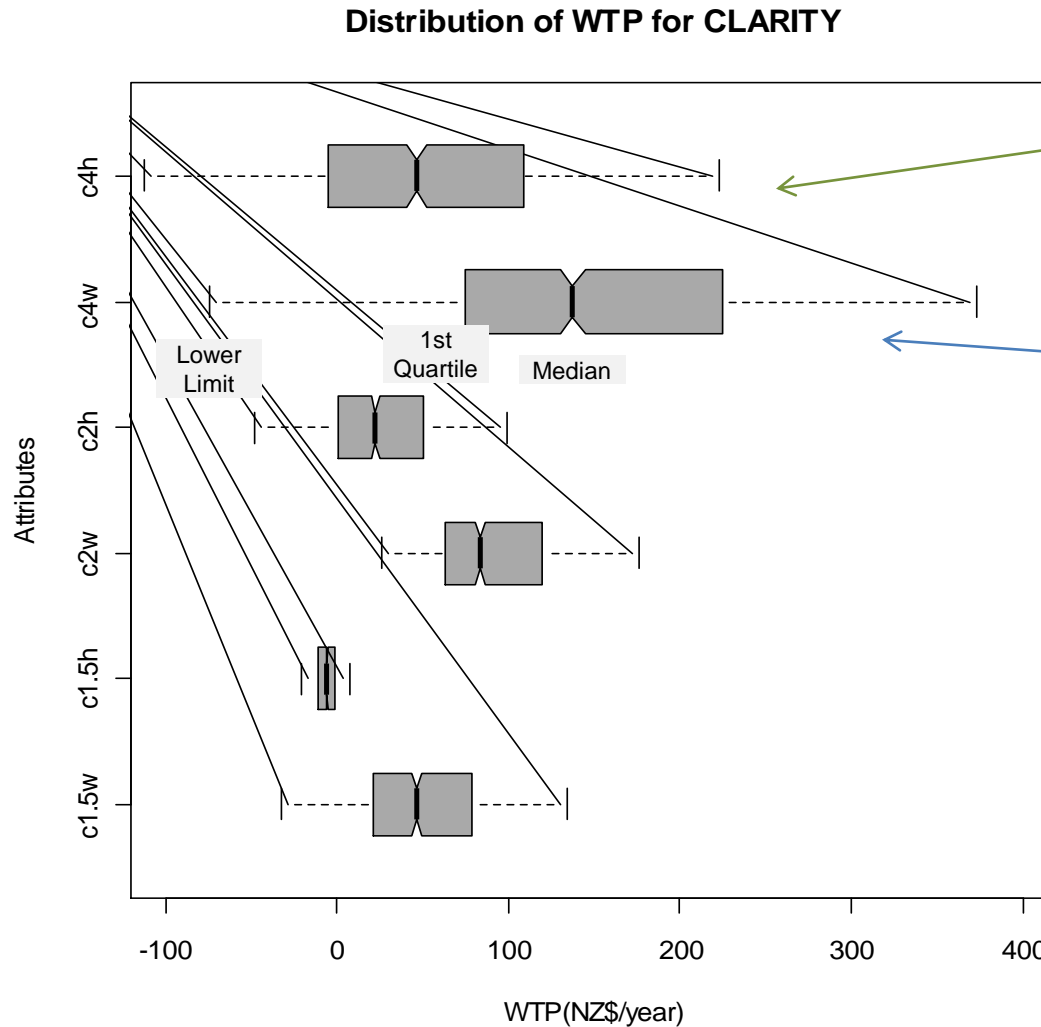
*Simulated marginal WTP estimates using SM package in R (EC Model)*

Attribute		All Median	Rowers Median
<b>Suitability for Swimming</b> <i>(Probability of algal bloom)</i>	SWIM20***	78	118
	SWIM10***	129	129
	SWIM2***	192	170
<b>Water Clarity</b> <i>You can usually see for ..m Underwater</i>	CLAR1.5		
	CLAR2***	83	76
	CLAR4***	140	160
<b>Ecological Health</b> <i>Percentage of excellent readings</i>	ECO50***	108	141
	ECO60***	128	114
	ECO80***	222	225
<b>Job Losses in dairying</b> <i>% reduction</i>	JOB5		
	JOB10		
	JOB20**	-83	-99

# Median WTP for Clarity

## *Recreational Users vs Resident HHs*

Recreational users WTP more



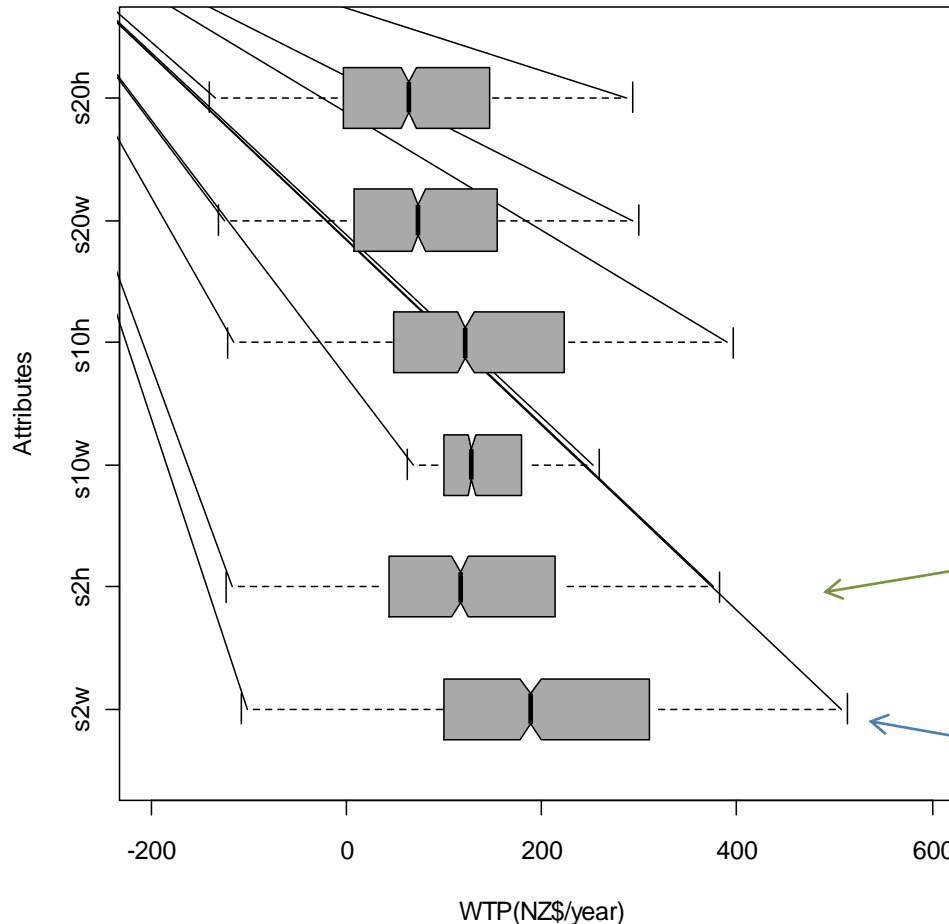
Catchment Residents median WTP for 4 metres clarity

Recreational Users median WTP for 4 metres clarity

# Median WTP for Reduction in Blooms

## *Recreational Users vs Resident HHs*

Distribution of WTP for SWIMMING



Recreational users WTP more

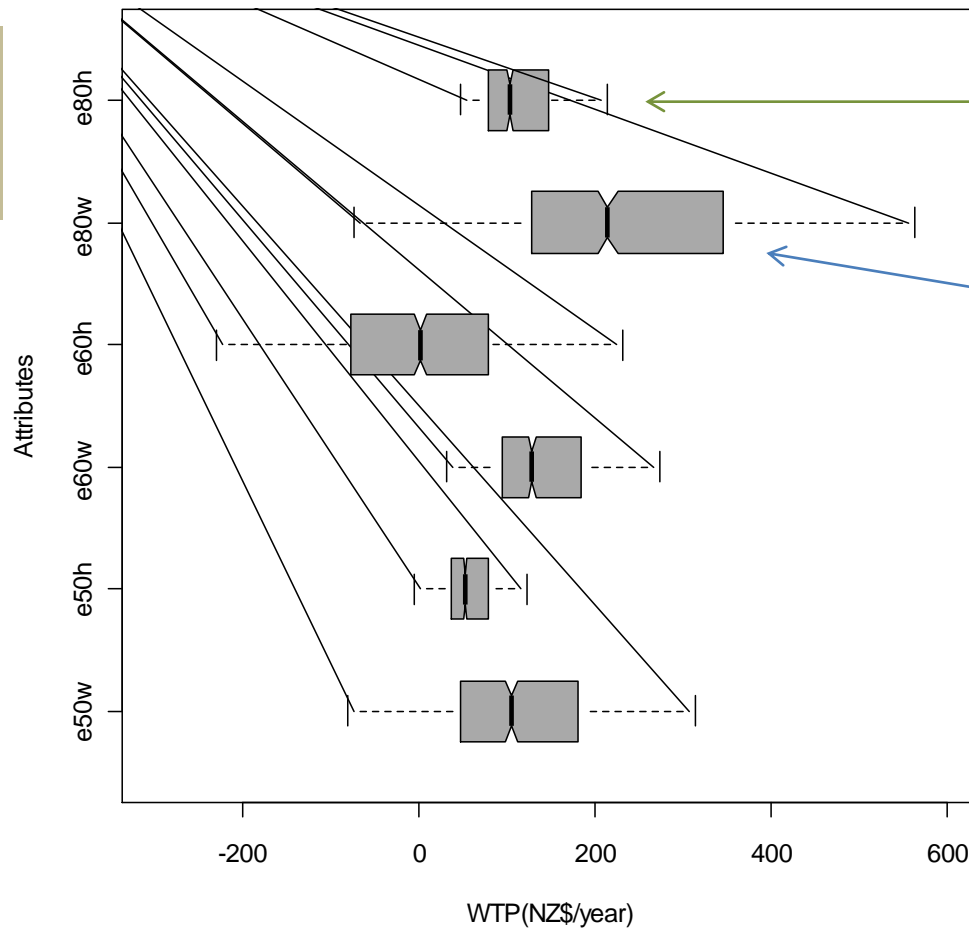
Catchment Residents median WTP for 2% chance of blooms

Recreational Users median WTP for 2% chance of Blooms

# Median WTP for Ecological Health

## *Recreational Users vs Residents*

Distribution of WTP for ECOLOGY



Catchment Residents median WTP for excellent ecological health

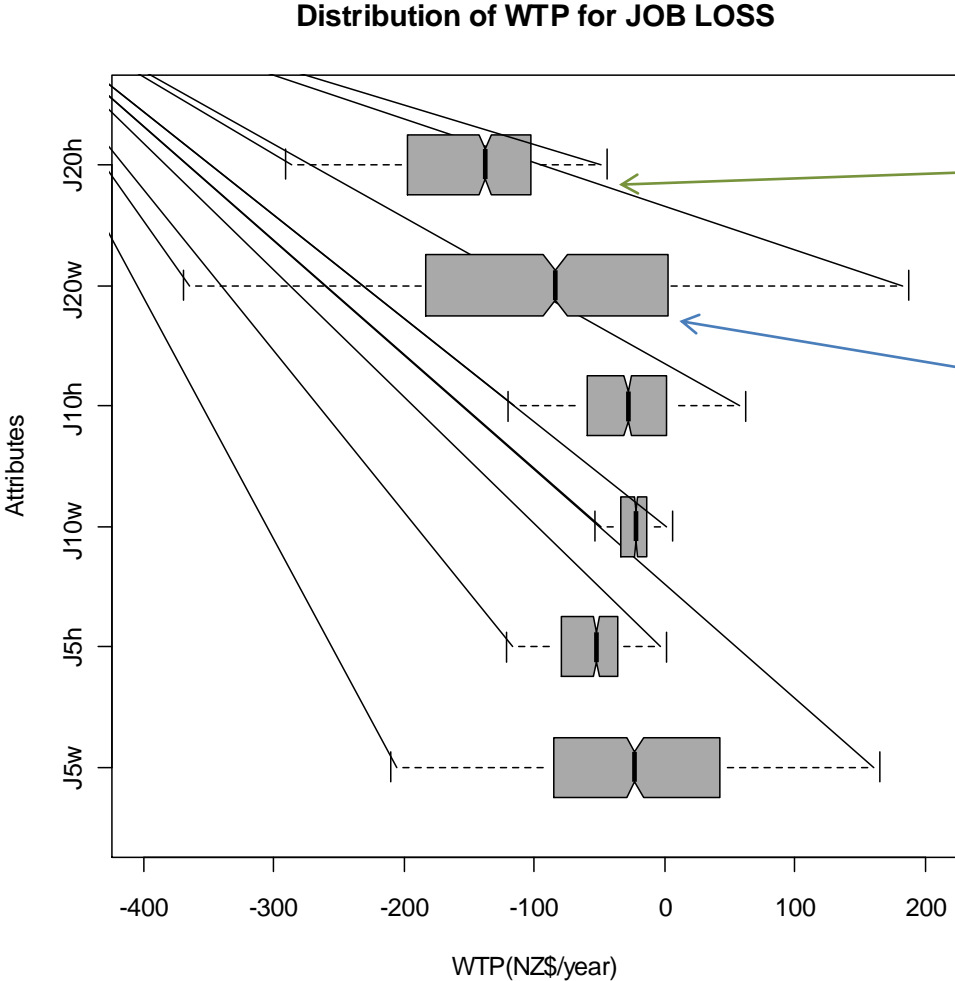
Recreational Users median WTP for excellent ecological health

Recreational users WTP more

# Median WTA for Job Losses

## *Recreational Users vs Residents*

Catchment residents are less WTA job losses

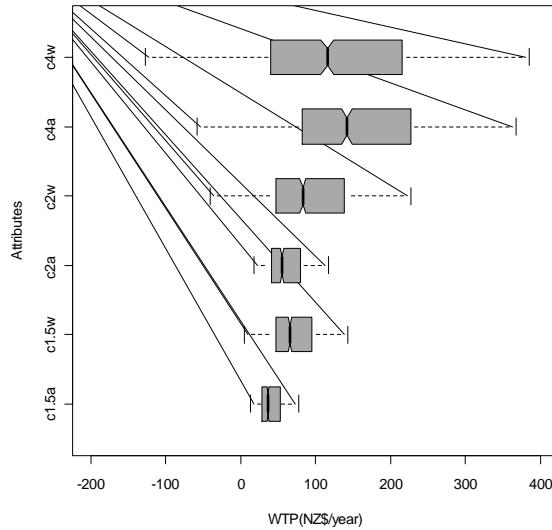


Catchment Residents median WTA 20% job losses

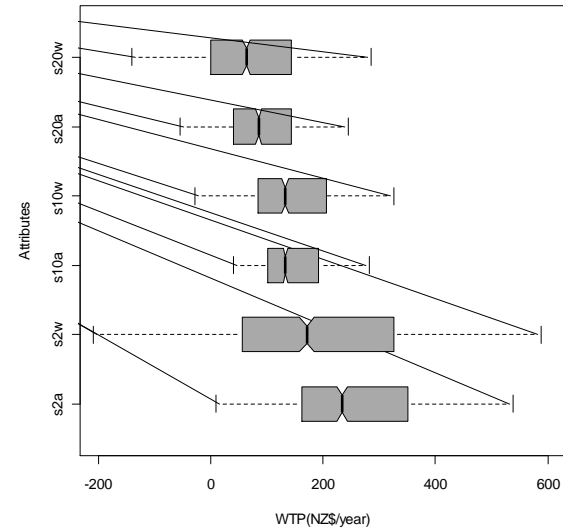
Recreational Users median WTA 20% Job Losses

# Auckland vs. Waikato/BOP

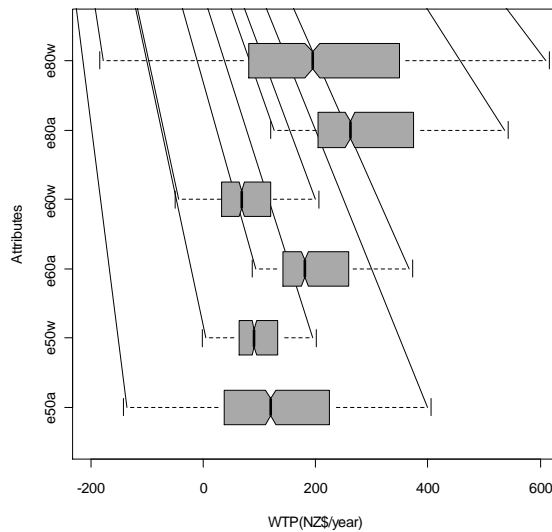
Distribution of WTP for CLARITY



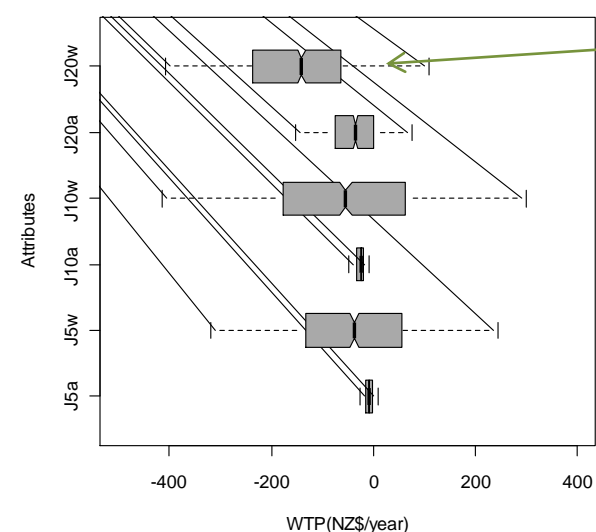
Distribution of WTP for SWIMMING



Distribution of WTP for ECOLOGY



Distribution of WTP for JOB LOSS



Waikato /BOP respondents more concerned about job losses

Auckland respondents WTP more for clarity, swim & ecology

# Preliminary Findings (1)

- Recreational users WTP for clarity, swim & ecology higher than catchment residents
- Recreational users and Aucklanders less concerned about job losses in dairying
- Rowers WTP more for clarity
- Non rowers WTP more for fewer algal blooms
- Auckland respondents WTP more than Waikato respondents

# Preliminary Findings (2)

- Rowers care about and are WTP for 'SWIM', clarity, and ecological health.
  - 80% think there is too much algae/water weed
- 9000 recreational users have median WTP for reduced chance of algal blooms of \$120-170/yr
  - Rec users WTP *approx* \$1 million/year
  - + residents WTP \$0.2-0.7 million per year (other work)
  - + 21,000 spectators median WTP ?



Thank you

Dan Marsh

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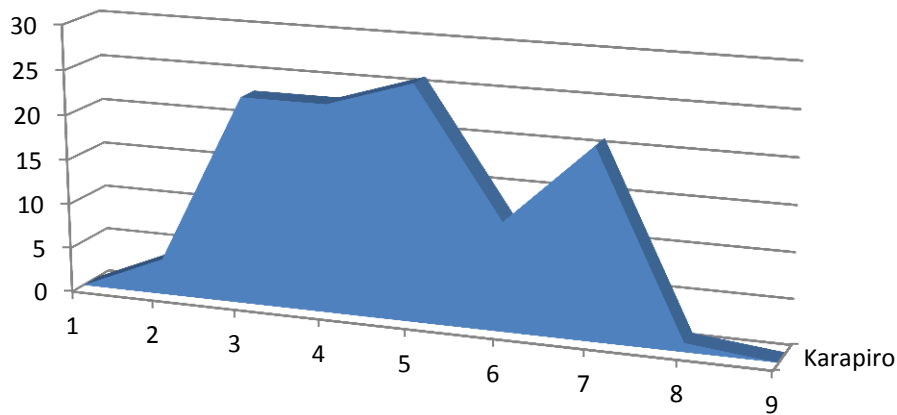
# Additional Materials

# Experience of Lake Karapiro in last 12 months

Too much algae or water weed	80%
Water Looking or Smelling Unpleasant	31%
Infected cuts or grazes after contact ..	9%
Becoming sick after contact with water	3%



## Assessed Water Quality (1 Very Bad, 9 Excellent)

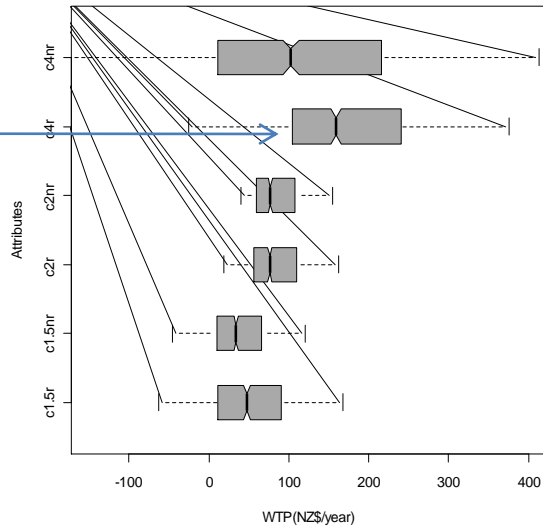


Median  
score 5

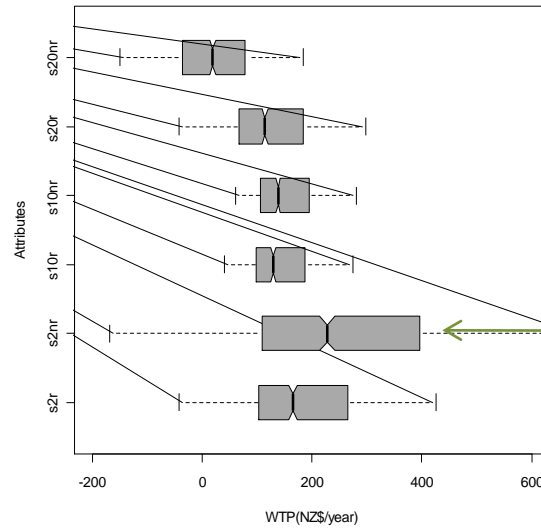
# Rowers vs. Non Rowers

Rowers WTP more for clarity

Distribution of WTP for CLARITY



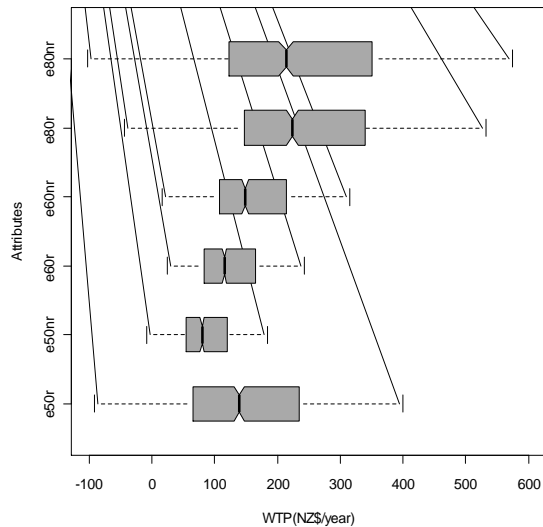
Distribution of WTP for SWIMMING



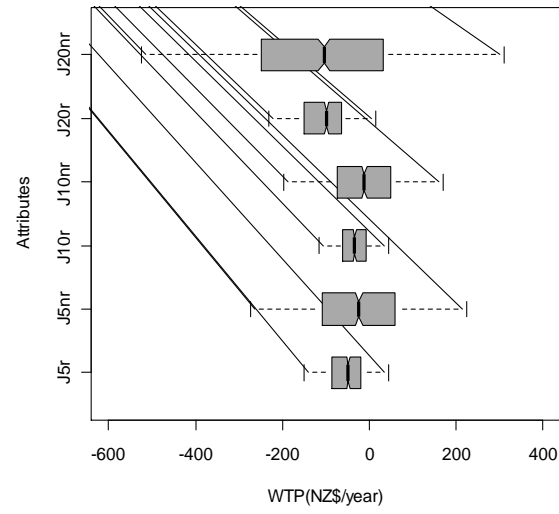
Non Rowers WTP more for fewer algal blooms

Preferences for Ecology and Job Losses are similar

Distribution of WTP for ECOLOGY



Distribution of WTP for JOB LOSS



# Current Water Quality

As reported by Environment Waikato

- Reduction in point source pollution; but
- N & P has increased
- Even with good management practices, intensification of farming and dairy conversions are expected to lead to falling water quality
  - River and lakes will support more algae
  - Clarity will fall and become slightly greener
  - Increased risk that blooms of potentially toxic blue green algae will occur
  - Levels of E.coli may also increase (*advice from other sources*)

# Web Survey Details

- Contact details for 3940 participants in Rowing NZ Karapiro events, 2640 email addresses
- Emails sent out in Feb/March 2010, one reminder

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	# email addressees	# Completed surveys	Response rate
Cambridge	46	19	41%
Hamilton	143	34	24%
Waikato/BOP	202	20	10%
Auckland	439	40	9%
Other	?	2	
<b>Total</b>	<b>830</b>	<b>115</b>	<b>14%</b>

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# Research into Recreational and Commercial Use of Lakes Karapiro

- Review of secondary sources 2008/9
- Telephone interviews with user clubs/associations
- Discussions with Rowing NZ (Karapiro) and Karapiro Domain
- Focus group discussion (Recreational users)
- Boat Ramp interviews
- Web Survey – rowers (Feb – March 2010)

# Attribute Levels

Attribute	Future Situation 'Do Nothing'	Option 1	Option 2	Option 3
Suitability for Swimming and Recreation	Every summer there is a 50% chance of health warnings for 1-2 weeks.	20% chance	10% chance	2% chance
Water Clarity	You can usually see up to:- 1 metre underwater	1.5 metres	2 metres	4 metres
Ecological Health	Less than 40% of readings are excellent	50% are excellent	60% are excellent	More than 80% are excellent
Jobs in Dairying	Stay about the same	Reduce by 5%	Reduce by 10%	Reduce by 20%
Cost to you(\$ per year for the next 10 years)	Stay about the same	\$50, \$100, \$200		

# Aspects of Water Quality Monitored by Environment Waikato

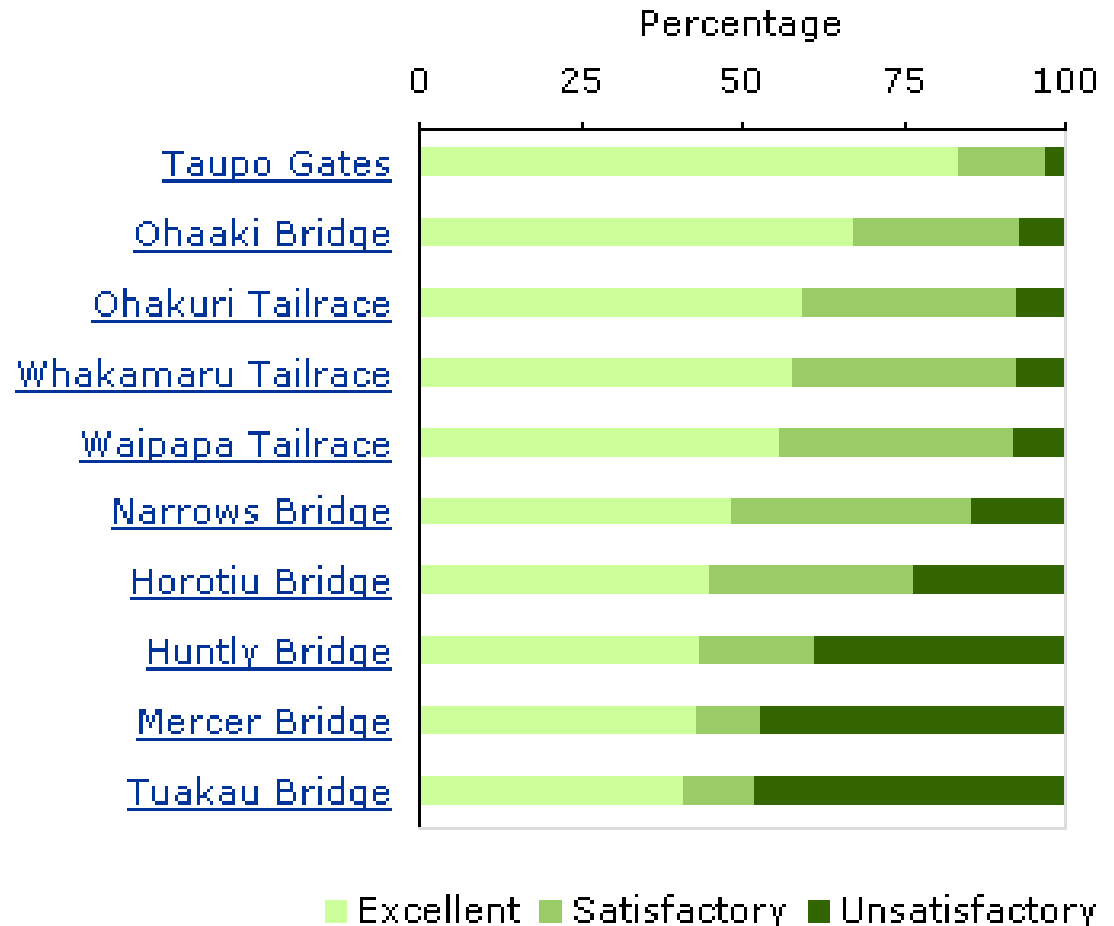
Water quality variable (units)	Relevance	Categories		
		Excellent	Satisfactory	Unsatisfactory
<a href="#">Dissolved oxygen</a> (% of saturation)	Oxygen for aquatic animals to breathe	>90	80-90	<80
<a href="#">pH</a> (acidity)	Can affect plants and fish	7-8	6.5-7 or 8-9	<6.5 or >9
<a href="#">Turbidity</a> (NTU)	Can restrict plant growth	<2	2-5	>5
<a href="#">Total ammonia</a> (g N/m <sup>3</sup> )	Toxic to fish	<0.1	0.1-0.88	>0.88
<a href="#">Temperature</a> (°C)	Fish spawning May-Sep	<10	10-12	>12
	Fish health Oct-Apr	<16	16-20	>20
<a href="#">Total phosphorus</a> (g/m <sup>3</sup> )	Causes nuisance plant growth	<0.01	0.01-0.04	>0.04
<a href="#">Total nitrogen</a> (g/m <sup>3</sup> )	Causes nuisance plant growth	<0.1	0.1-0.5	>0.5
<b>Human uses - recreation</b>				
<a href="#">Baseflow water clarity</a> (m)	Visibility	>4	1.6 - 4	<1.6
<a href="#">Escherichia coli</a> , single sample (no./100 mL)	Human health	<55	55 - 550	>550

Check out Environment Waikato's indicators of [river water quality](#) for ecological health and for [contact recreation](#).

<http://www.ew.govt.nz/enviroinfo/water/healthyivers/measuringstreams.htm>

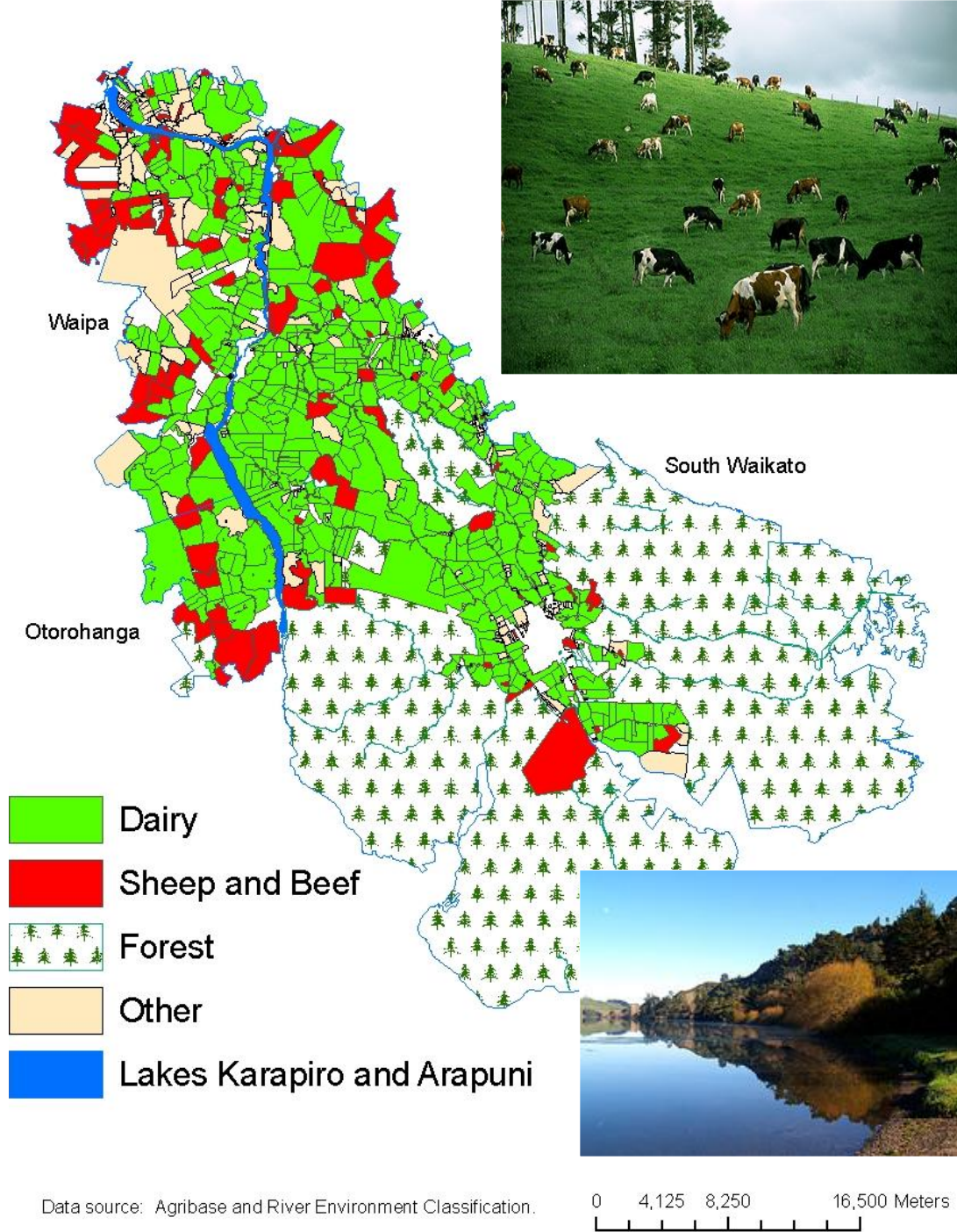
Dan Marsh, University of Waikato,  
dmarsh@waikato.ac.nz

# Ecological Health



# Land Use in the Study Area

	No of Properties	% of Area
Forestry	6	48
Dairy	370	34
Sheep/ Beef & Drystock	199	13
Lifestyle, bush, deer etc		5



# Event Users (2008/9)

109 days

7000

competitors

21,000

Spectators

Event	Number of days	competitors /day	Spectator / day	Total person/day	Total Event number	Remarks
World GrandPrix Hydroplane Champs	3	108	1225	1333	4000	Estimate
Camb/Waik PowerBoat - The Kilo Run	1	<i>unknown</i>				
Club champs series race monthly - Kayak	1x12	30	30	60	720	Estimate
Legion of Rowers Masters Regatta	2	150	350	500	1000	
Te Awamutu Rowing Club	1	700	2100	2800	2800	Estimate
WRA/KRI Spring Rowing Regatta	2	450	2050	2500	5000	
ARA 125th Anniversary Rowing Regatta	2	450	2050	2500	5000	
National U20 Trials Rowing	2					
KRI#2 - Cambridge Town Cup Rowing	2	500	2000	2500	5000	
KRI N.I. Club Champs Rowing Regatta	2	375	1625	2000	4000	
KRI #3 Junior Rowing Regatta	2	375	1125	1500	3000	
KRI N.I. Sec Schools Rowing Champs	2	750	750	1500	3000	
NZ Sec Schools Champs - Maadi Cup	8	313	1250	1563	12500	
National Junior Trials Rowing		<i>unknown</i>				
Winter Series Racing Rowing	3	25	75	100	300	Estimate
Winter Series Racing Rowing	3	17	50	67	200	Estimate
Winter Series Racing - Rowing	3	17	50	67	200	Estimate
National U21 Youth Cup Trial Rowing	3	<i>unknown</i>				
WRA - Horohora to Karapiro Domain Rowing	1x5	<i>unknown</i>				
National Elite Trial Rowing	7	<i>unknown</i>				
Summer Regatta - Sailing	1	20	20	40	40	Estimate
Jump & Slalom Tournament	2	40	80	120	240	Estimate
Pick & Choose	2	40	80	120	240	Estimate
Regional Barefoot Tournament	2	40	80	120	240	Estimate
Tournament Regionals	2	40	80	120	240	Estimate
Pairere Club Champs	1	40	80	120	120	Estimate
Ramco Poker Run	1	500	0	500	500	
NZ Water Ski Racing Association	2	50	50	100	200	Estimate
Race Karapiro Open Water Swim	1	67	133	200	200	Estimate
Race Karapiro Open Water Swim	1	67	133	200	200	Estimate
NZ Sch MultiSports/Race Karapiro Multisport	1	100	200	300	300	Estimate
NZ College Games Triathlon/Multisport	1	333	667	1000	1000	Estimate
Triathlon	2	33	67	100	200	Estimate
Waikato BOP Teams Triathlon	1	167	333	500	500	Estimate
Waikato BOP Teams Triathlon	1	167	333	500	500	Estimate
NZ Schools Triathlon Championships	1	667	1333	2000	2000	Estimate
Te Puku O Te Ika Wakaama	3	167	667	833	2500	
National Waka Ama Championships	5	240	720	960	4800	Estimate
Waka Ama Secondary School Nationals	7	171	1257	1429	10000	
<b>Total</b>	<b>109</b>	<b>7209</b>	<b>21042</b>	<b>28251</b>	<b>70740</b>	

Club  
Users  
(2008)  
  
1,700  
users  
  
130,000  
user  
days

User	Number of Members	Days/year	Total
<b>Cambridge Yact club members</b>	25	10	250
<b>Karapiro Kayak Racing Club</b>			
Serious paddlers	5	200	1000
Medium paddlers	20	52	1040
The rest	75	12	900
<b>NZGP Hydroplanes club</b>			
Majority	35	1	35
The rest	10	10	100
<b>Cambridge/Waikato Powerboat club</b>			
Majority	19	1	19
The rest	3	10	30
<b>Karapiro Waterski club</b>			
Daily users	7	360	2520
Majority	218	10	2180
The rest	25	6	150
<b>Pairere Water Ski club</b>			
Serious users	320	10	3200
The rest	180	6	1080
<b>Te Awamutu Rowing Club</b>			
Majority	25	6	150
The rest	5	1	5
<b>Rowing NZ atheletes</b>	40	334	13360
<b>Cambridge rowing club</b>			
Regular rowers	30	356	10680
Peak of the rowers	170	210	35700
<b>Waikato Rowing club</b>			
Regular rowers	30	356	10680
Peak of the rowers	220	210	46200
<b>Te Toki Voyaging Trust</b>			
Active members	200	10	2000
Cambridge members	25	10	250
<b>Waikato Waka Ama and Dragon boating Association</b>	20	7	140
<b>Total</b>	<b>1707</b>	<b>2,188</b>	<b>131,669</b>

# Valuation of Water Quality Improvements in the Karapiro Catchment

## Information for Potential Participants

### Purpose

This research project aims to collect information on people's views about the quality of water in the rivers, streams and lakes in the Waikato catchment above Karapiro dam ('the Karapiro Catchment').

Waikato region residents said that water pollution was their most important environmental concern in each of four surveys conducted by Environment Waikato (EW). EW has identified the Karapiro catchment as 'highest priority' for nutrient management, the catchment is also a key recreational area – for example Lake Karapiro. We hope that data from this survey will assist with the development of better government policies for the catchment.

The Waikato Management School Ethics Committee has approved this study.

### Prizes for participants!

There will be regular prize draws for \$100 worth of shopping vouchers for people who complete the survey

*Thanks to  
Yvonne Phillips  
for Web Design*

[Start the survey](#)

