

**ORARI-TEMUKA-OPIHI-PAREORA WATER ZONE  
MANAGEMENT COMMITTEE**

**on**

**Monday 3 July 2017**

**2.30pm**

**Sopheze on the Bay  
Timaru**

## **ORARI-OPIHI-PAREORA WATER ZONE MANAGEMENT COMMITTEE**

**Notice is hereby given that an Orari-Temuka-Opihi-Pareora Water Zone Management Committee meeting will be held on Monday 3 July 2017 at 2.30pm, at Sopheze on the Bay, Timaru.**

### **Committee Members:**

John Talbot (Chairman), David Anderson, Kylee Galbraith, John Henry, Mandy Home, Ivon Hurst, Richard Lyon, Hamish McFarlane, Anne Munro, James Pearce, Lan Pham, Ad Sintenie and Mark Webb

## ORARI-TEMUKA-OPIHI-PAREORA WATER ZONE MANAGEMENT COMMITTEE

3 JULY 2017

- |   |   |                                   |
|---|---|-----------------------------------|
| 1 |   | <b>Apologies</b>                  |
| 2 |   | <b>Register of Interest</b>       |
| 3 |   | <b>Community Forum</b>            |
| 4 | 1 | <b>Confirmation of Minutes</b>    |
| 5 |   | <b>Facilitator Update</b>         |
| 6 |   | <b>Zone Team Update</b>           |
| 7 |   | <b>Plan Change 5 presentation</b> |
| 8 | 7 | <b>LandCare Trust report</b>      |

### **Presentations**

The Zone Committee has invited a number of interested parties to present.

- |   |  |   |
|---|--|---|
| 9 |  | <ul style="list-style-type: none"><li>• Adaptive Management Group</li><li>• Opuha Water Limited</li><li>• Geraldine Water Solutions</li><li>• Fish and Game</li><li>• Forest and Bird</li></ul> |
|---|--|---|
- Papers may be available prior to the meeting.

### **Discussion and Questions**

### **Close**

**ORARI-TEMUKA-OPIHI-PAREORA WATER ZONE MANAGEMENT COMMITTEE**  
**FOR THE MEETING OF 3 JULY 2017**

**Report for Agenda Item No 4**

**Prepared by Joanne Brownie**  
**Secretary**

**Confirmation of Minutes – Committee Meeting 12 June 2017**

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Minutes of the June Committee meeting.

**Recommendation**

**That the minutes of the Committee meeting held on 12 June 2017, be confirmed as a true and correct record.**

## ORARI-TEMUKA-OPIHI-PAREORA ZONE WATER MANAGEMENT COMMITTEE

### MINUTES OF AN ORARI-TEMUKA-OPIHI-PAREORA ZONE WATER MANAGEMENT COMMITTEE MEETING HELD IN THE COUNCIL CHAMBER, TIMARU DISTRICT COUNCIL, 2 KING GEORGE PLACE, TIMARU, ON MONDAY 12 JUNE 2017 AT 1PM

**PRESENT** John Talbot (Chairperson), Kylee Galbraith, Ivon Hurst, Clr Richard Lyon, Hamish McFarlane, Clr Anne Munro, James Pearse, Clr Lan Pham, Ad Sintenie and Mark Webb

**APOLOGIES** Mandy Home and Clr David Anderson

**IN ATTENDANCE** Nic Newman (Facilitator), Dan Clark (Senior Hydrology Scientist and Technical Lead), Raymond Ford (Principal Planner), Michael Hide (Zone Implementation Team Manager), Peter Constantine (Principal Planning Officer) Lyn Carmichael (Senior Planner and Community Lead), Shirley Hayward (Senior Water Quality Scientist), Julia Forsyth (ECan Principal Planner), Barbara Nicholas (ECan), Kate Doran (ECan), Peter Ramsden (Tangata Whenua facilitator), Karl Russell (Arowhenua), Sue Eddington (Waihao), Tony McCormick, Julia Crossman, Milne Horne and Nicky Hyslop (Opuha Water Ltd), John Benn (Department of Conservation), Janet Gregory (NZ Landcare Trust), Rhys Taylor (Community Engagement Coordinator), Lloyd McMillan (Temuka Community Board), Prue Thirkettle (National Council of Women), Jan Finlayson, Peter Shutt, Tom Henderson and Frank Scarf

#### 1 REGISTER OF INTERESTS

There were no additional interests advised.

#### 2 COMMUNITY FORUM

##### **Adele Coombes - Orari River Protection Group**

Adele Coombes spoke to her letter (which had been previously circulated) and the images she presented at the meeting, in regard to continued concern at the damage to the north side of the Orari Gorge, as a result of the construction of two tracks. The issue has been previously investigated by the Committee and it is acknowledged that the damage that has occurred is greater than that predicted when consent was granted for the second track.

Mike Hide advised that subsequent discussions with the land owner and visits to the site by ECan staff, have resulted in agreement by the landowner to remove any fencing debris that falls into the river. Replanting of the sides of the track would be constrained by Health and Safety concerns, as the terrain is so steep, although there are early indications that regeneration is starting.

The Chairman noted that the Committee's ability to take action is limited but input into district and regional planning changes is necessary to guard against such incidents in the future.

### **3 CONFIRMATION OF MINUTES – COMMITTEE MEETING 1 MAY 2017**

Proposed Hamish McFarlane  
Seconded Anne Munro

“That the minutes of the Committee meeting held on 1 May 2017 be confirmed as a true and correct record.”

MOTION CARRIED

### **4 CORRESPONDENCE**

The Committee received and noted the following correspondence which had been sent -

- letter from the OTOP Committee to Environment Canterbury regarding the Healthy Catchments Project Timeline
- letter from the OTOP Committee to Central South Island Fish and Game Council regarding river flow regimes
- letter from the OTOP Committee to Royal Forest and Bird Protection Society regarding hill country development and riverbed management.

### **5 FACILITATOR UPDATE**

The new OTOP Facilitator Barb Gilchrist introduced herself to the Committee. Barb will replace Nic Newman who was temporarily seconded to the role.

### **6 ZONE TEAM UPDATE**

A brief update was provided –

- A mail out has been distributed on Good Management Practice focussed on the possibility of needing land use consent
- Promotion of good practice for winter management is about to start
- Work continues with the drinking water supply zones
- The Ashwick Flat group wants more data on trends. Initial discussion has started on hotspots for nitrates concentration.
- Compliance work continues including work around fishscreens, piggeries, stock access, Rangitata elevated groundwater levels.

### **7 PROCESS FOR THE HEALTHY CATCHMENTS ‘SOLUTIONS PHASE’**

The Committee considered a report by Raymond Ford and Lex Foster Bohm setting out the programme for the Solutions Phase of the Healthy Catchments Project and the approach for engaging with the community during this period.

7.1 Proposed Mark Webb  
Seconded Anne Munro

“That the Committee agrees with the proposed solution phase work programme as presented, with an alternative date to be found for the suggested 26 June date.”

MOTION CARRIED

7.2

Proposed Lan Pham  
Seconded Hamish McFarlane

“That the Zone Committee:

1. Agrees to the proposed approach to community engagement during the solutions seeking phase and how the information will be communicated as set out in the agenda.
2. Notes that there will be the need for additional engagement in the Opihi/Temuka catchments on flows.
3. Notes initial options for how to engage on the Draft ZIPA in October (to be decided in August).”

MOTION CARRIED

7.3

Proposed Hamish McFarlane  
Seconded Cllr Richard Lyon

“That catchment group members present feedback to the Zone Committee.”

MOTION CARRIED

## **8 SALTWATER CREEK**

Rhys Taylor gave a brief update on the Saltwater Creek Working Group which has held 2 meetings that were well attended. The group has discussed water depth, silt, water quality and weed control. Two more meetings are planned and the group is on target to make recommendations to OTOP in August.

## **9 WAITARAKAO**

The Facilitator informed the Committee of progress being made with the Washdyke Lagoon work – new water level recorders are being installed, the construction of a wetland is being investigated between the industrial area and the lagoon, and broad options for the future of the Seadown drain are being looked at. There is potential for a walking and cycling track around the lagoon, which could possibly be constructed at the time of the wetland establishment. This is a long term project but action needs to start now.

The group is looking to bring recommendations to OTOP in August.

## **10 REGIONAL RECREATION AND AMENITY OPPORTUNITIES – PRIORITY RECREATION AND AMENITY RESTORATION SITES**

The Committee considered a report by Dann Olykan and Anita Fulton requesting a list of up to 5 priority recreation or amenity restoration sites of outstanding cultural or natural importance in the zone, that need protection/enhancement for the future. The Facilitator clarified that this is a Regional Committee project and separate to OTOP's work.

The Committee suggested a number of areas but noted they would not want to see this as a ‘band aid’ gesture when there are so many areas needing protection. The iwi representative explained that to Maori, the precious areas encompass from the top of a river to the bottom, and he does not support identifying a few nominal target areas. The Chairman agreed to convey this sentiment to the Regional Committee.

The Committee agreed on the following priority areas for inclusion in the Regional Committee project –

Evans Crossing (at huts)  
Orari Gorge  
Washdyke Lagoon  
Saleyards Bridge (Pleasant Point) swimming hole  
Te Moana Gorge  
Waihi Gorge and Waihi River  
Opihi Lagoon  
Te Ngawai River  
Saltwater Creek.

It was suggested that further information be obtained from the Regional Committee as to what is intended with this project, then OTOP can finalise (shorten) its list.

Proposed Lan Pham  
Seconded Ivon Hurst

“That the full list be forwarded to the Regional Committee noting it was compiled from OTOP’s initial consideration of the request but seeking further direction in order that OTOP can reprioritise and refine its list.”

MOTION CARRIED

#### **11 PROTECTING TUHITUHI NEHERA ROCK ART SITES ACROSS SOUTH CANTERBURY**

The Committee considered a report by Mandy Home and Sue Eddington on the need to factor in the protection of rock art sites in South Canterbury when OTOP develops its Solutions Package. Further to the report, Amanda Symon, Maori Rock Art Curator, gave a presentation on the rock art sites in South Canterbury, explaining the historical significance of the rock art and the damage that can be caused to the art by hydrological and land use changes. The direct (irrigation) and indirect (new drainage, groundwater abstraction) impacts on the rock art were outlined.

The limestone on which the rock art is located is porous and vulnerable to seepage causing fractures, salt blooms and flaking off the surface for example. It is vital that there is an adequate framework for the management of rock art to ensure it is retained and further degradation does not occur.

Proposed Mark Webb  
Seconded Lan Pham

“That during the development of the Zone Implementation Plan and the sub-chapter for inclusion in the Regional Land and Water Plan, provisions be added to the plans to identify and manage potential effects on tuhituhi neherā sites from the taking, use, damming or diversion of water; the discharge of contaminants; or land uses which affect water quality; and measures be incorporated in the relevant District Plans as well as making any non-statutory provisions that are necessary.”

MOTION CARRIED

#### **12 IMMEDIATE STEPS BIODIVERSITY DECISIONS 2017/18**

The Committee considered projects applying for biodiversity funding from the Immediate Steps programme.



Proposed Hamish McFarlane  
Seconded Kylee Galbraith

“That the Zone Committee formally approves the following Immediate Steps Projects that were agreed upon at the 22 May workshop, as follows:

Project	Description	IMS funding
Awarua Wetland Year 4	Further planting and weed control	\$5,000
Station Stream Weed Control	Weed control to protect indigenous forest	\$11,600
Black Birch QEII Covenant Protection	Stock proofing 60ha QEII covenant for indigenous forest	\$22,400
Pig Hunting Creek Wetland Restoration	Improve hydrology to restore regionally significant wetland.	\$18,900
Upper Rangitata Predator Control	Ongoing landscape scale predator control to increase populations of Wrybill and Black fronted terns	\$13,333 each year until end of 2020/2021 financial year
Upper Rangitata Cotoneaster Control	Control two populations of cotoneaster at Bush Stream and Harper Lodge	\$8,690
Taniwha Gully Restoration	Wetland restoration planting	\$10,000
Opihi Limestone Gullies	Weed control and limestone gully restoration	\$10,000
	<b>Total</b>	<b>\$99,923</b>

MOTION CARRIED

### 13 COMMUNITY ENGAGEMENT

The Committee was informed of a meeting held in Pleasant Point involving farmers, OTOP representatives and guest speakers, to investigate the effects on different farming types of going beyond Good Management Practice. The next meeting will be held on 11 July which will review the outcomes of different modelling.

### 14 THANKS TO FACILITATOR

The Chairman thanked Nic Newman for stepping in as facilitator for the past few months, taking over the work of the Committee unexpectedly during a busy phase in the work of the Committee. The Committee has enjoyed working with him during this time.

The meeting concluded at 3.10pm with a karakia from Karl Russell.

\_\_\_\_\_  
Chairperson

**ORARI-TEMUKA-OPIHI-PAREORA ZONE WATER MANAGEMENT COMMITTEE**  
**FOR THE MEETING OF 3 JULY 2017**

**Report for Agenda Item No 8**

**Prepared by Barbara Gilchrist**  
**Facilitator**

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**Purpose**

The purpose of this paper is to present the final report on the OTOP catchment group project.

**Background**

Janet Gregory, Canterbury Regional Coordinator for NZ Landcare Trust will present a final report on the work of the OTOP catchment group project. Below are her observations to the committee regarding next steps, and the link to download the flyers produced by the catchment groups.

“The 8 catchment groups formed as part of the project managed by the NZ Landcare Trust are keen to continue with support from their facilitators and ECan. The support from the facilitators has been crucial and I thank them and their organisations for supporting them in this work. Their knowledge and understanding of farming systems, rural communities and local networks, is instrumental in the success of the catchment groups. My thanks to Julia Crossman (Opuha Water), Nicki Pridham (Rabobank), Martin O'Connor (Ravensdown), Angela Darke (Balance AgriNutrients), Caleb Strowger (Dairy NZ), and Rhys Taylor (ECan).

Catchment Group members also understand that the next 6 months is a critical time for input into and development of the Healthy Catchments Project and welcome the opportunity to provide information to the Zone Committee. Through the range of activities members now have a better understanding of the range of issues and different perspectives reflecting the wider community that needs to be considered in the development of the plan to improve water quality and water quantity in the future and remain economically sustainable.

The catchment groups and facilitators are also keen to continue working with the sector groups on combined field days and resources to share information and examples of Good Management Practice as this reduces duplication and provides shared learnings and discussion.”

Link to flyers:

<http://www.landcare.org.nz/News-Features/News/Catchment-Group-Perspectives>

A final report will be tabled at the meeting.

**Recommendation**

**That the Zone Committee receives a final report from NZ Landcare Trust regarding the OTOP catchment group project.**

# UPPER OPIHI CATCHMENT GROUP

March 2017

Welcome to the Upper Opihi Catchment Group. Below we have outlined our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.

At a joint meeting of the Opuha and Upper Opihi Catchment Group in February, the groups decided there were efficiencies to be gained from merging into one group. As part of the merge the groups would like to extend an invitation to the wider Fairlie community, farmers, Fairlie residents, recreational users, or others with an interest in water management in these catchments, to get involved with the group.

Please contact the facilitator if you are interested.

## WHAT DO WE KNOW?

Water quality in the Allendale and Greenfield streams are not up to standard in terms of water quality.

There are many variations from year to year in the water quality in the upper Opihi.

There are times of the year where not all rivers are swimmable.

## Biodiversity – Key Values

- Enhance and protect wetlands where possible.
- Protect and enhance native vegetation remnants.
- Gain funding to support landowners protecting biodiversity.
- Identify areas of bat populations and support landowners to protect them.
- Identify and enhance habitat for threatened species.
- Manage weeds and pests.
- Map significant areas of biodiversity.

## Upper Opihi Catchment Group Vision

Learn and understand the current situation of water quality and nutrient management and develop a plan of how as a group we can improve water quality and local biodiversity through

- Discussing allocation of nutrients
- Undertaking water quality monitoring to identify issues
- Working together to identify solutions to issues
- Improving understanding of catchment planning process
- Involving a diverse range of community interests

## WATER QUALITY

- Stream health – generally healthy populations of invertebrates (graded 'good' to 'excellent') except 2016 (consecutive low flows = poorer invertebrate communities)
- Swimmability – E. coli concentrations indicate that the upper Opihi River meets the national criteria for boating/wading activities, but may not be suitable at times for swimming. There are increasing incidences of potentially toxic cyanobacteria.



## GOOD MANAGEMENT PRACTICES, ON FARM

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is regularly assessed using buried sensors, tapes or hand held probes for water scheduling.
- Return period and/or application depth adjusted according to evapotranspiration, soil moisture, crop requirements and rainfall.

### Winter Grazing

- Choose a winter crop paddock with a low risk of pugging and compaction.
- For intensive winter grazing leave a vegetative strip not grazed from edge of drain, stream or river to capture P and sediment runoff.
- Graze low lying areas and areas closest to a waterway last. Avoid leaving stock on during wet periods, long periods, or concentrated on small sections of crop.
- Adjust cultivation practices and duration of bare soil between crops to minimise N loss.

### Waterway Management

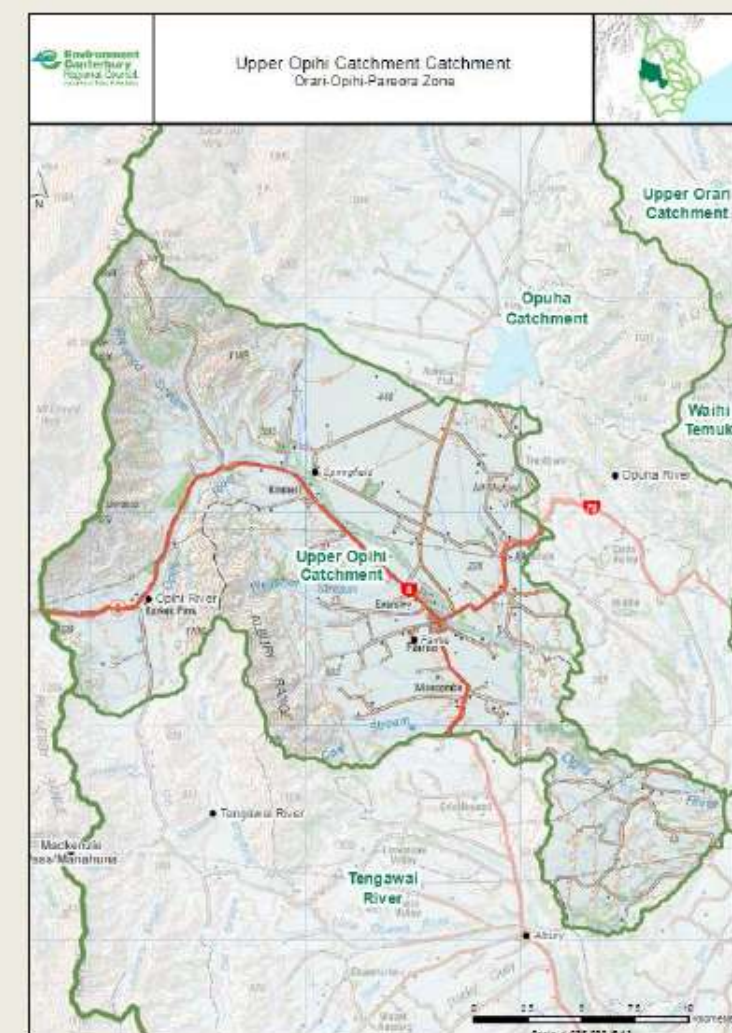
- Exclude stock from waterways, drains, and wetlands.
- Prevent erosion and movement of sediment and runoff into waterways.

### Riparian Management

- Identify areas on your farm where runoff or erosion occur most frequently and have the greatest effect on water quality.
- Ensure riparian margins are sufficiently wide to adequately filter sediment from any run-off.
- ECan Land Management Advisor Helen Risk can help develop a free riparian plan that is tailored to your farm. Call 0800 324 636.

### Nutrient Management

- Use nutrient budgets and Farm Environment Plans to identify key areas of nutrient loss.
- Split applications of fertiliser may reduce the risk of leaching and ensure greater utilisation of nutrients by plants.
- Maintain optimum Olsen P levels of 20-35 by soil testing annually and monitoring phosphate trends.



- Equipment used for N and P applications is suitably calibrated and well maintained.

### Effluent Management

- Ensure dairy effluent storage meets consent requirements for when soils are saturated.
- Effluent should be spread evenly across the area to ensure it does not exceed 200 kg/ha/yr. Nutrient levels in effluent on paddocks must be tested and the results recorded.
- Regularly test the effluent system to ensure that effluent is being applied uniformly at a measured depth (bucket test) and that there is no ponding or runoff.
- Silage stacks are located at least 50m from surface water and any leachate is directed to pasture or the farm's effluent system.

- Any offal or rubbish pits are sited to minimise risk of leachates entering ground or surface water.

### Cropping Management

- Cultivate across instead of down the slope where possible.
- Use no or low tillage to retain soil moisture.
- Use crop rotations to take-up residual N in soil.
- Use paddock history, plant and deep N tests and soil test results to assist fertiliser planning.

For a poster or further project information see: <http://bit.ly/2lYJjZs>

### please get in touch:

Julia Crossman  
julia@opuha.co.nz  
021 535 174



# TENGAWAI CATCHMENT GROUP (TE ANA A WAI)

March 2017

Welcome to the Te Ana a Wai Catchment Group. Here we have outlined some of the actions we want to focus on to improve water quality and biodiversity in our area and good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to protect and improve special areas in our catchment. We welcome your involvement at meetings and field days, so do contact us.

Many farmers are pastoral farmers, growing beef, lamb and venison without irrigation. Some are also arable farming and a few are dairying, for which irrigation is required. The area is water short in summer, has some steep slopes and currently has reasonable surface water quality.

## Tengawai Catchment Group Vision (Te Ana a Wai)

A collaborative group of residents which learns about and promotes good farming practice and cares about local waterways and biodiversity, in the Te Ana A Wai (Tengawai) catchment, from South West of Fairlie to Pleasant Point.



Angus France, beef farmer at Albury, beside riparian planting organised by his father John, and Environment Canterbury grant-aided, on a spring-fed tributary of the Opawa River. Photo RT



Above! A catchment group event on the Tengawai run in cooperation with Fish & Game Council. Photo RT

Below! Landscape of a sheep and beef farm well above the rivers. Photo: RT

## BIODIVERSITY - Key Values

- Bats feed and roost here.
- Distinctive limestone habitat.
- Wetlands.

## Goals

- Understand the values of the native vegetation before trying to change them.
- Seek funding to be able to help farmers with bat populations and develop plans to protect and enhance bat feeding and roosting places.
- Map and protect significant areas of biodiversity.

## Cultural values

- Maori Rock Art sites.
- Food gathering (mahinga kai).

## WATER QUALITY

- Stream health – generally healthy populations of invertebrates (graded 'good' to 'excellent') except in 2016 when consecutive low flows resulted in poorer invertebrate communities.
- Swimmability – the E. coli (faecal indicator bacteria) concentrations are low BUT increasing incidences of potentially toxic Phormidium cyanobacteria warnings.
- Nutrients – low to moderate levels of nitrogen and phosphorous.

## GOOD MANAGEMENT PRACTICES

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is being regularly assessed using buried sensors, tapes or hand held probes.
- Return period and/or application depth adjusted according to evapo-transpiration, soil moisture, crop requirements and rainfall.





### Winter Grazing

- Winter crop paddock selection for lower risk of pugging and compaction.
- For intensive winter grazing leave a vegetative strip not grazed above drain, stream or river, to capture phosphorous and bacteria in any sediment run off.
- Graze lower lying areas and areas closest to a waterway last. Avoid leaving stock on during heavy rain, or for long periods, or concentrated on small sections of crop.
- Cultivation practices and timing adjusted to minimise N loss.
- Minimise periods of exposed soil between crops to reduce the risk of erosion, overland flow and leaching into subsoil.

### Waterway Management

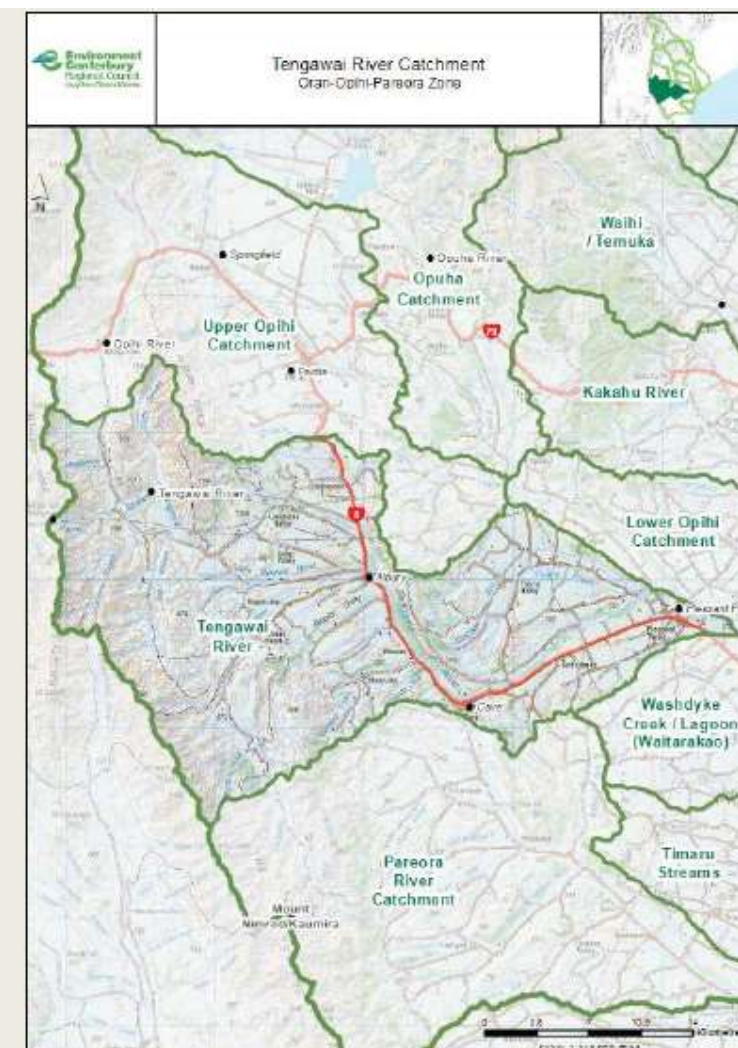
- Exclude stock from waterways, drains, and wetlands to prevent livestock damaging banks and defecating in water. Otherwise sediment, nutrients, and bacteria may enter the waterway, reducing water quality.
- Prevent erosion and movement of sediment and runoff into waterways by use of conservation tillage, filter strips, sediment retention ponds, cut-out drains and planting critical source areas. Use the method that best suits your situation.

### Riparian Management

- Identify areas on your farm where runoff or trample erosion occur most frequently and have the greatest effect on water quality. This includes seeps, springs, swales, gullies, eroding banks, boggy areas, and wet soils. These should be prioritized for fencing and planting.
- Ensure riparian margins are sufficiently wide to adequately filter sediment from any run-off. Observe if winter over-land flows are trapped or still cross it?
- Environment Canterbury Land Management Advisor Helen Risk can help develop a riparian plan that is tailored to your farm. It is free: call 0800 32 4636.

### Nutrient Management

- Nutrient budgets and Farm Environment Plans are helpful as a tool to identify ways to reduce nutrient loss.



- Practices such as use of side dressings and split-volume applications may be helpful to reduce the risk of leaching and ensure greater utilisation of nutrients by plants, with less leaching.
- Nitrogen and phosphorus fertiliser is applied strategically from well calibrated machinery to meet agronomic requirements, and to avoid adverse environmental impacts.
- Maintain optimum Olsen P levels of 20-35 by soil testing annually and monitoring phosphate trends, to avoid over-applying.
- Effluent should be spread evenly across the area to ensure it does not exceed 200 kg/ha/yr. Nutrient levels in effluent on paddocks must be tested and the results recorded.
- Regularly test the effluent system to ensure that effluent is being applied uniformly at a measured depth (bucket test works well) and that there is no ponding or runoff.
- Silage stacks and offtal pits to be located at least 50m from surface water and any leachate is directed to pasture or the farm's effluent system.

### Effluent Management

- Ensure dairy effluent storage volume meets consent requirements, for when soils are saturated and effluent cannot be applied.

#### Facilitator contact details:

Rhys Taylor – contractor to  
Environment Canterbury  
ph 03 693 8726 text 021 462 260  
rhys.taylor@ecan.govt.nz



# LOWER ORARI/OHAPI CATCHMENT GROUP

March 2017

Welcome to the Orari Catchment Group. Below we have outlined our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement, so feel free to contact us.

## Lower Orari/Ohapi Catchment Group Vision

An informal group of farmers and residents, many of whom contributed to an Integrated Management Strategy for the Orari in 2004 and/or a more recent Water Allocation Plan, who share interest in protecting, using and enjoying the river catchment. We seek to maintain or improve water quality, learn about human impacts and to farm in ways that do not deplete the river and groundwater yet remain economically sustainable.



Orari River mouth, popular for whitebait netting. Photo: RT



Ohapi Creek, a spring fed three-branch tributary of the Lower Orari, has water quality monitored monthly by Environment Canterbury. Photo: RT

## WHAT DO WE KNOW?

Many farmers are fencing off streams from stock and undertaking riparian planting, particularly along the smaller streams. This is resulting in improved stream habitat and less sediments in the stream. Some of the larger rivers have a high amount of weed growth which is resulting in less movement of the gravels within the river fairways. The group is keen to work with ECan and others to improve this for the wider community.

## BIODIVERSITY - Key Values

Spring fed water ways have distinctive wildlife but are vulnerable in a lowering water-table (often not fence-protected, as they are shallow and narrow). There is a general reduction in tree habitat as pivot irrigation has spread throughout the Lower Orari catchment, and there are intensification challenges to retaining tussock grassland and scrub habitat in the Upper Orari catchment, above the Gorge.

Left: Riparian planting on Ohapi Creek, near Muff Road. Farmer attitudes to riparian planting are being explored in a 2017 interview survey. Photo: RT

## WATER QUALITY

- Stream health – variable state of invertebrate populations (grades range from 'good' to 'poor').
- Salmon and trout spawning sites are found on some river tributaries.
- Swimmability – The Orari Gorge is graded 'Fair' for contract recreation (low to moderate E. coli concentration). Higher E. coli concentrations occur further downstream and in the lowland tributaries.

Nutrients – nitrate concentrations in tributaries emerging from the Orari Plains are above the national 'bottom line'. Elevated phosphorus concentrations found in some Ohapi Creek branches, which feed the Orari near to its mouth.

Below: Volunteers from Orari River Protection Group have begun sampling invertebrate life quarterly at several points, to monitor river health. They also survey the nesting birds each November. Photo: RT



147 LANDCARE TRUST

Ministry for Primary Industries  
Marine & Aquaculture



Sustainable Farming Fund

Deer Industry  
New Zealand

Rabobank

Environment Canterbury  
Regional Council  
Rangiora to the Mountains



## GOOD MANAGEMENT PRACTICES, ON FARM

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is regularly assessed using buried sensors, tapes or hand held probes for water scheduling.
- Return period and/or application depth adjusted according to evapotranspiration, soil moisture, crop requirements and rainfall.

### Winter Grazing

- Choose a winter crop paddock with a low risk of pugging and compaction.
- For intensive winter grazing leave a vegetative strip not grazed from edge of drain, stream or river to capture P and sediment runoff.
- Graze low lying areas and areas closest to a waterway last. Avoid leaving stock on during wet periods, long periods, or concentrated on small sections of crop.
- Adjust cultivation practices and duration of bare soil between crops to minimise N loss.

### Waterway Management

- Exclude stock from waterways, drains, and wetlands.
- Prevent erosion and movement of sediment and runoff into waterways.

### Riparian Management

- Identify areas on your farm where runoff or erosion occur most frequently and have the greatest effect on water quality.
- Ensure riparian margins are sufficiently wide to adequately filter sediment from any run-off.
- ECan Land Management Advisor Helen Risk can help develop a free riparian plan that is tailored to your farm. Call 0800 324 636.

### Nutrient Management

- Use nutrient budgets and Farm Environment Plans to identify key areas of nutrient loss.
- Split applications of fertiliser may reduce the risk of leaching and ensure greater utilisation of nutrients by plants.
- Maintain optimum Olsen P levels of 20-35 by soil testing annually and monitoring phosphate trends.



- Equipment used for N and P applications is suitably calibrated and well maintained.

### Effluent Management

- Ensure dairy effluent storage meets consent requirements for when soils are saturated.
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- Silage stacks are located at least 50m from surface water and any leachate is directed to pasture or the farm's effluent system.

- Any offal or rubbish pits are sited to minimise risk of leachates entering ground or surface water.

### Cropping Management

- Cultivate across instead of down the slope where possible.
- Use no or low tillage to retain soil moisture.
- Use crop rotations to take-up residual N in soil.
- Use paddock history, plant and deep N tests and soil test results to assist fertiliser planning.

For a poster or further project information see: <http://bit.ly/2lYJjZs>

### Facilitator contact details:

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# LOWER OPIHI CATCHMENT GROUP

March 2017

Welcome to the Lower Opihi Catchment Group. Below we have outlined our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.

## Lower Opihi Catchment Group Vision

Learn and understand the current situation of water quality and nutrient management and develop a plan of how as a group we can improve water quality and local biodiversity through

- Involve diverse interests in the community
- Significant areas for Iwi.
- Significant areas of Maori rock art
- Undertake testing to identify existing issues
- Share information on planning process and issues to help understanding
- Talk about fair allocation of nutrients
- Identify cause of water quality problems



Irrigation is important in the catchment and farmers are working to improve efficiencies.

## WHAT DO WE KNOW?

There are a number of groups assisting landowners to protect and enhance native areas.

We have a number of significant waterways, coastal lagoons and areas of remnant vegetation.

Our catchment is reliant on irrigation to maintain production and we need to use water efficiently.

- Assist landowners and community groups to gain funding to help protect and enhance areas in our catchment.
- Share information and gain funding to help landowners protect areas of bat habitat.
- Map significant areas of biodiversity

## BIODIVERSITY - Key Values

- Significant coastal lagoons and waterways
- Wetlands
- Mudfish
- Significant areas of native vegetation remnants
- Wide range of bird species
- River fairways important for birdlife
- Important areas for Mahinga Kai

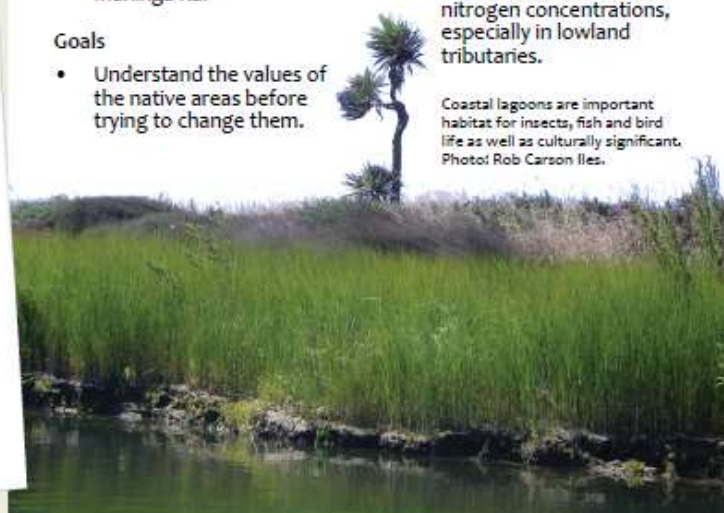
## Goals

- Understand the values of the native areas before trying to change them.

## WATER QUALITY

- Stream health – moderately healthy populations of invertebrates (graded 'good' to 'fair') except last year (consecutive low flows = poorer invertebrate communities).
- Swimmability – E. coli (faecal indicator bacteria) concentrations generally are low (except after rainfall) BUT frequent occurrence of potentially toxic cyanobacteria prompting warnings to avoid swimming.
- Nutrients – generally low to moderate phosphorus concentrations but high nitrogen concentrations, especially in lowland tributaries.

Coastal lagoons are important habitat for insects, fish and bird life as well as culturally significant. Photo: Rob Carson Iles.





## GOOD MANAGEMENT PRACTICES, ON FARM

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is regularly assessed using buried sensors, tapes or hand held probes for water scheduling.
- Return period and/or application depth adjusted according to evapotranspiration, soil moisture, crop requirements and rainfall.

### Winter Grazing

- Choose a winter crop paddock with a low risk of pugging and compaction.
- For intensive winter grazing leave a vegetative strip not grazed from edge of drain, stream or river to capture P and sediment runoff.
- Graze low lying areas and areas closest to a waterway last. Avoid leaving stock on during wet periods, long periods, or concentrated on small sections of crop.
- Adjust cultivation practices and duration of bare soil between crops to minimise N loss.

### Waterway Management

- Exclude stock from waterways, drains, and wetlands.
- Prevent erosion and movement of sediment and runoff into waterways.

### Riparian Management

- Identify areas on your farm where runoff or erosion occur most frequently and have the greatest effect on water quality.
- Ensure riparian margins are sufficiently wide to adequately filter sediment from any run-off.
- ECan Land Management Advisor Helen Risk can help develop a free riparian plan that is tailored to your farm. Call 0800 324 636.

### Nutrient Management

- Use nutrient budgets and Farm Environment Plans to identify key areas of nutrient loss.
- Split applications of fertiliser may reduce the risk of leaching and ensure greater utilisation of nutrients by plants.
- Maintain optimum Olsen P levels of 20-35 by soil testing annually and monitoring phosphate trends.



- Equipment used for N and P applications is suitably calibrated and well maintained.

### Effluent Management

- Ensure dairy effluent storage meets consent requirements for when soils are saturated.
- Effluent should be spread evenly across the area to ensure it does not exceed 200 kg/ha/yr. Nutrient levels in effluent on paddocks must be tested and the results recorded.
- Regularly test the effluent system to ensure that effluent is being applied uniformly at a measured depth (bucket test) and that there is no ponding or runoff.
- Silage stacks are located at least 50m from surface water and any leachate is directed to pasture or the farm's effluent system.

- Any offal or rubbish pits are sited to minimise risk of leachates entering ground or surface water.

### Cropping Management

- Cultivate across instead of down the slope where possible.
- Use no or low tillage to retain soil moisture.
- Use crop rotations to take-up residual N in soil.
- Use paddock history, plant and deep N tests and soil test results to assist fertiliser planning.

For a poster or further project information see: <http://bit.ly/2YJjZs>

### Facilitator contact details:

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# WAIHI & TE MOANA CATCHMENT GROUP

March 2017

Welcome to the Waihi & Te Moana Catchment Group. Here we outline our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.

We have learned in the past few years about water quality, stream life, flood management and local biodiversity. We have visited varied types of farm (sheep & beef, deer and dairying) to discuss Farm Environment Plans and riparian plantings, looked at protection of clean ground-water sources and scope for community-based water monitoring.

## Waihi & Te Moana Catchment Group Vision

The Group seeks to avoid decline in water quality, make improvements where it has declined; identify opportunities to protect and enhance biodiversity and support local solutions and ownership of catchment issues.



Water in summer at the footbridge to Kennedy Park, where users often wade. Photo: RT

Barkers Creek deer farmer Kelly Bennett was an early adopter of a farm environment plan and is fencing and planting stream margins as he can afford, so that less silt is washed away. Photo: RT

## BIODIVERSITY - Key Values

- Bats and birds
- Native vegetation remnants and regrowth of forest
- Spring-fed waterways
- Understand the values of the native areas before trying to change them.
- Seek funding to be able to help farmers with habitat for bat populations.
- Timaru District Council has mapped significant natural areas of biodiversity.

## WATER QUALITY

- Stream health – invertebrate communities generally graded 'good' to 'excellent' in upper Waihi and Hae Hae Te Moana, but only graded 'fair' to 'poor' further down the catchment.

- Swimmability – Historical high E. coli (faecal indicator bacteria) concentrations at Waihi Gorge DOC campground, but improvements in stock management are expected to result in lower E. coli concentrations.
- Hae Hae Te Moana Gorge and Temuka River have lower E. coli concentrations except after rainfall. BUT the Waihi and Temuka Rivers frequently experience growth of potentially toxic cyanobacteria which mean warnings to avoid swimming are often in place over summer.
- Nutrients – nutrient concentrations are generally low at the gorges, but increase to moderate or high levels downstream. Nitrogen concentrations over time have been increasing in the lower reaches of the Waihi River and the Temuka River and gradually in groundwater.

The group discussing a spring-fed 'wet spot' on a local dairy farm visit. Photo: RT



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## GOOD MANAGEMENT PRACTICES, ON FARM

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is regularly assessed using buried sensors, tapes or hand held probes for water scheduling.
- Return period and/or application depth adjusted according to evapotranspiration, soil moisture, crop requirements and rainfall.

### Winter Grazing

- Choose a winter crop paddock with a low risk of pugging and compaction.
- For intensive winter grazing leave a vegetative strip not grazed from edge of drain, stream or river to capture P and sediment runoff.
- Graze low lying areas and areas closest to a waterway last. Avoid leaving stock on during wet periods, long periods, or concentrated on small sections of crop.
- Adjust cultivation practices and reduce duration of bare soil between crops to minimise N loss.

### Waterway Management

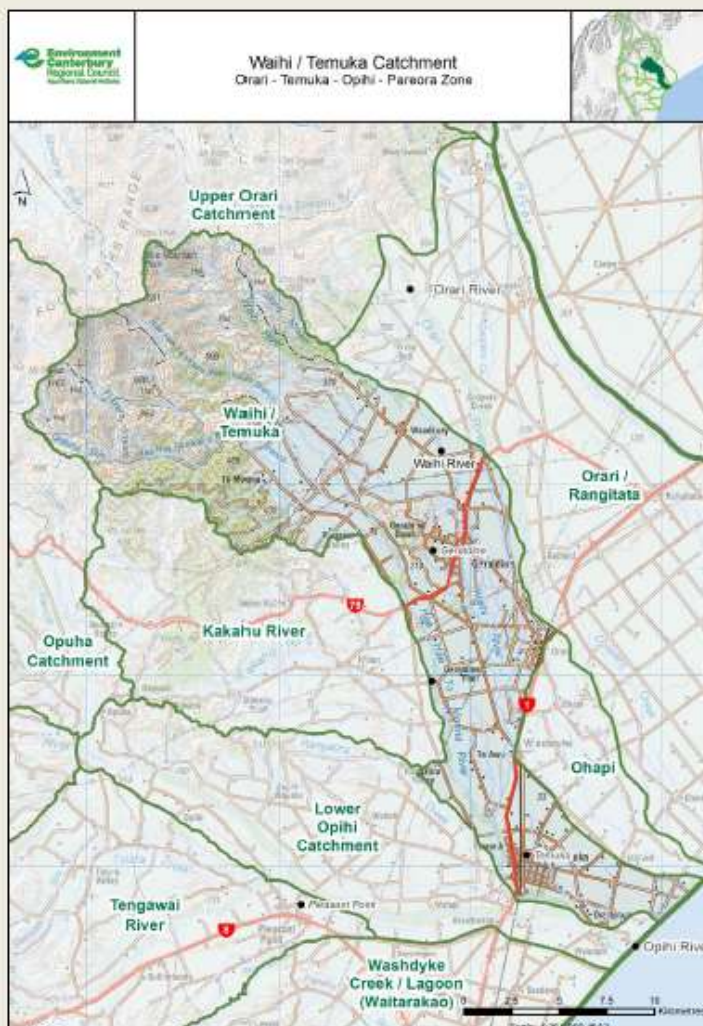
- Exclude stock from waterways, drains, and wetlands.
- Prevent erosion and movement of sediment and runoff into waterways.

### Riparian Management

- Identify areas on your farm where runoff or erosion occur most frequently and have the greatest effect on water quality.
- Ensure riparian margins are sufficiently wide to adequately filter sediment from any run-off.
- ECan Land Management Advisor Helen Risk can help develop a free riparian plan that is tailored to your farm. Call 0800 324 636.

### Nutrient Management

- Use nutrient budgets and Farm Environment Plans to identify key areas of nutrient loss.
- Split applications of fertiliser may reduce the risk of leaching and ensure greater utilisation of nutrients by plants.
- Maintain optimum Olsen P levels of 20-35 by soil testing annually and monitoring phosphate trends.



- Equipment used for N and P applications is suitably calibrated and well maintained.

### Effluent Management

- Ensure dairy effluent storage meets consent requirements for when soils are saturated.
- Effluent should be spread evenly across the area to ensure it does not exceed 200 kg/ha/yr. Nutrient levels in effluent on paddocks must be tested and the results recorded.
- Regularly test the effluent system to ensure that effluent is being applied uniformly at a measured depth (bucket test) and that there is no ponding or runoff.
- Silage stacks are located at least 50m from surface water and any leachate is directed to pasture or the farm's effluent system.

- Any offal or rubbish pits are sited to minimise risk of leachates entering ground or surface water.

### Cropping Management

- Cultivate across instead of down the slope where possible.
- Use no or low tillage to retain soil moisture.
- Use crop rotations to take-up residual N in soil.
- Use paddock history, plant and deep N tests and soil test results to assist fertiliser planning.

For a poster or further project information see: <http://bit.ly/2lYJZs>

### Facilitator contact details:

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# PAREORA CATCHMENT GROUP

March 2017

Welcome to the Pareora Catchment Group. Below we have outlined our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.

## Pareora Catchment Group Vision

Have an engaged catchment community collaborating to

- maintain a healthy river and river flows while allowing for existing water allocations
- understand cultural value of river
- promote farm environment plans and implement good farm practices
- equitable allocation of nutrients
- enhance riparian and recreational areas
- share knowledge, understand science and gain funding for research and development of innovative farming techniques



Irrigation Efficiency Field Day. Photo: Channele O'Sullivan

## WHAT DO WE KNOW?

Relatively short, steep catchment comprising 539km<sup>2</sup>, 1/3 steepland, 2/3 rolling hill country, becoming less steep towards the coast.

Upper reaches of Pareora River retain it's natural character with largely native vegetation.

Farming is the predominant land use with a mix of pastoral, dairying and arable.

Water allocation considered highly allocated with consented water takes including the larger Timaru District Council's water supply for households and industry, Silver Fern Farms meat processing facility near the coast and large agricultural and horticultural operations on the plains.

River has moderately regular flood events interspersed by long periods of lower flow.

Rain is typically associated with easterly and south-easterly airflow with a trend of higher rainfall in summer months.

Taiko Gentians, Limestone Outcrops. Photo: Rob Carson-Iles



## BIODIVERSITY - Key Values

- Protect and enhance habitat for mudfish and other freshwater values.
- Protect and enhance native vegetation remnants.
- Identify habitat for threatened species.
- Support landowners to protect limestone faces and vegetation.

## WATER QUALITY

- Stream health – moderately healthy populations of invertebrates (graded 'excellent' to 'fair') in tributary streams.
- Swimmability – E. coli (faecal indicator bacteria) concentrations generally are low (except after rainfall) BUT frequent occurrence of potentially toxic cyanobacteria prompting warnings to avoid swimming.
- Nutrients – phosphorus concentrations increase downstream along the Pareora River, and nitrogen concentrations are generally moderate to high.



## GOOD MANAGEMENT PRACTICES, ON FARM

### Irrigation

- Design, calibrate and operate irrigation systems to minimise the amount of water needed to meet production objectives.
- Soil moisture is regularly assessed using buried sensors, tapes or hand held probes for water scheduling.
- Return period and/or application depth adjusted according to evapotranspiration, soil moisture, crop requirements and rainfall.

### Winter Grazing

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- Adjust cultivation practices and duration of bare soil between crops to minimise N loss.

### Waterway Management

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- Use paddock history, plant and deep N tests and soil test results to assist fertiliser planning.

For a poster or further project information see: <http://bit.ly/2lYJZs>

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# OPUHA CATCHMENT GROUP

March 2017

*Welcome to the Opuha Catchment Group. Below we have outlined our vision for the catchment, some of the aims we have for water quality, water quantity and biodiversity in our area and the key tasks we are currently working on or wish to undertake. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.*

At a joint meeting of the Opuha and Upper Opihi Catchment Group in February, the groups decided there were efficiencies to be gained from merging into one group.

As part of the merge the groups would like to extend an invitation to the wider Fairlie Community, farmers, Fairlie residents, recreational users, or others with an interest in water management in these catchments, to get involved with the group.

Please contact the facilitator if you are interested.



Snow tussock on hills provides good vegetation cover in climatic extremes. Photo: Janet Gregory



North Opuha. Photo: Craig Moore

## WATER QUALITY

What we want to see for water quality in the Opuha River Catchment:

- Minimise the opportunity for didymo to develop
- Improve water quality in the Opuha without detrimentally affecting downstream users
- Protect opportunities for food gathering, fishing, contact recreation, cultural values
- Co-funding regime to improve dam infrastructure
- Achieve swimmable water quality

## STREAM HEALTH

- Moderately healthy population of invertebrates (graded 'excellent' to 'fair') in tributary streams.

The Opuha River at Skiptons Bridge has generally poor populations of invertebrates.

- Swimmability – Lake Opuha is generally suitable for swimming with E. coli gradings of 'fair' to 'excellent'.
- Nutrients – generally low to moderate phosphorus concentrations but nitrogen concentrations have increased in some streams flowing into Lake Opuha.

Key tasks for the catchment

- ☐ Understand and discuss causes of water quality issues through discussions with ECan scientists understand indicators and influences of water quality
- ☐ Advocate for improved water quality testing

## Opuha Catchment Group Vision

- To improve the water quality in the river and lake to a swimmable state, while maintaining profitability, farming and recreation.
- To develop a catchment plan for water quality and water quantity, at a catchment and farm level.

Fieldtrip, December 2014. Photo: Phil Keene



147  
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## WATER QUANTITY

What we want to see for water quantity and flows in the Opuha River Catchment:

- The self-management of river users through water users group
- The protection of trout spawning and trout runs and the native fishery
- The protection or improvement of reliability for current irrigation abstractors, while maintaining the use of the river by other users (downstream water users, recreational users, those that take for drinking and stock water)
- Fairness between above and below dam users – reflected in the minimum flows and reliability
- Maintain an open (Opihi) river mouth as often as possible

Key tasks for the catchment

- ☐ Understand the science
- ☐ Understand the current flow regime
- ☐ Contribute local knowledge about river flows and river health to the OTOPI sub-regional process

## BIODIVERSITY

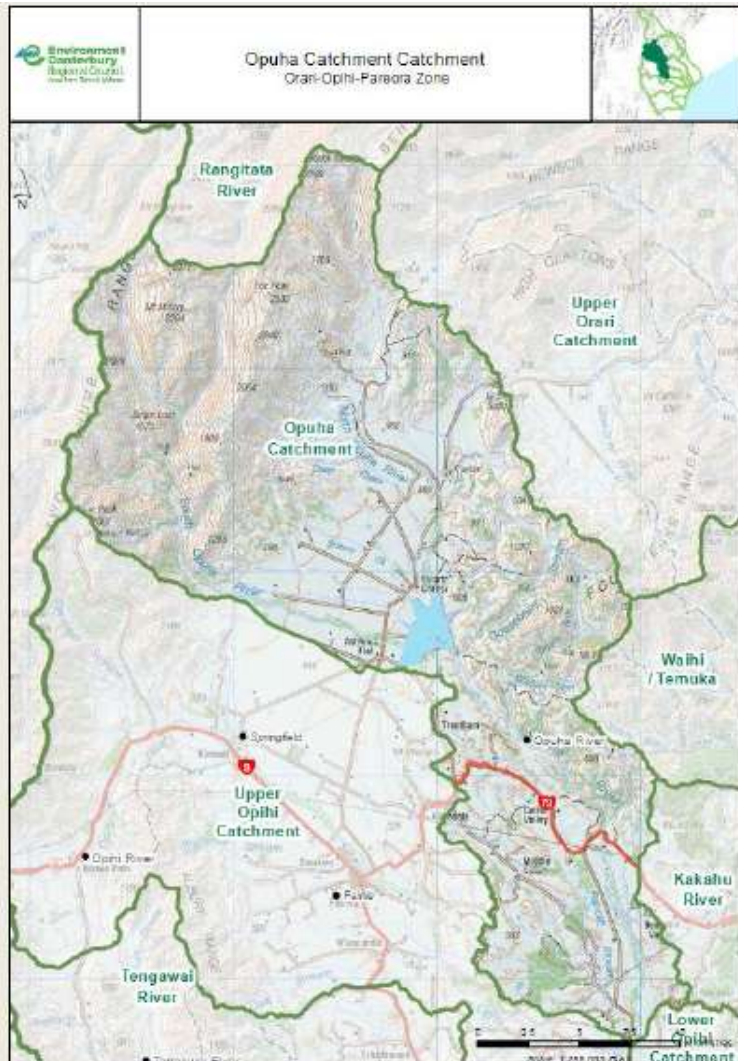
What we want to see for biodiversity in the Opuha River Catchment

- Enhance conditions suitable for a healthy river system and its inhabitants (insects, trout, salmon, natives etc)
- Protect the recreational fishery in the upper reaches

Key tasks for the catchment

- ☐ Understand flow requirements to maintain a healthy river system and instream biodiversity
- ☐ Identify and map areas of biodiversity value in the catchment
- ☐ Meet with ECan biodiversity officer to discuss possible biodiversity projects and funding

Recreational activity. Photo: Julia Crossman



## GOOD MANAGEMENT PRACTICES

What we want to see for nutrient management in the Opuha River Catchment:

- Sustainable, diverse land use in the catchment (economic, environmental, social, cultural)
- Common agreement (across rural/urban and between industries) on what we want to achieve

Key tasks for the catchment

- ☐ Understand current land use and nutrient loss in the catchment
- ☐ Promote the use of Farm Environment Plans and nutrient budgets

- ☐ Encourage and support greater uptake of GMP through field days
- ☐ Identify mitigations that can be used at farm and catchment scale and cost effectiveness of different measures to reduce nutrient loss, and host a field day

For a poster on GMP in the Ophihi region see Ophihi Water Project webpage: <http://bit.ly/2LYJZs>

Please get in touch:  
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021 535 174



# KAKAHU CATCHMENT GROUP

March 2017

Welcome to the Kakahu Catchment Group. Below we have outlined our vision for the catchment, some of the actions we want to focus on to improve water quality and biodiversity in our area and the good management practices we will work together to promote. We are also keen to work with farmers, landowners and community members to improve special areas in our community. We welcome your involvement so feel free to contact us.

## WHAT DO WE KNOW?

- Visual pollution is generally considered bad by most people i.e. Algae, Didymo etc.
- 4-5 families within the catchment get their drinking water from the Kakahu
- Bank slumping creates sediment discolouration which needs to be addressed.

At this stage, we still have the opportunity to improve water quality through action on the ground and fencing of water ways where possible.

## Kakahu Catchment Group Vision

'The Kakahu Catchment will provide for safe drinking water, recreation, enhanced cultural and wildlife values, and support sustainable, economic activities for the immediate and long term future.'



The Kakahu River has recently been surveyed to identify areas of Kakahi-freshwater mussels.



Carex Bog at Kelly Bennett's. Photo: Rhys Taylor

## Findings from our River visit to the top of the Kakahu Catchment in August 2016

- Looked at logging site in the Geraldine Forest, owned by Blakely Pacific (head of the Kakahu River) and how they manage logging to minimise erosion with little disturbance to the stream
- Logging has been changed in the Kakahu to predominantly Douglas Fir near the river that will be a 50-year harvest rotation.
- Looked at the confluence of Stony Creek & Kakahu River – We found major bank erosion which is similar to other sites on the Kakahu.

Following discussions with Kennedy Lang from ECan about his work on the Wainono Lagoon Restoration Project, the group are keen to investigate possible mitigation strategy's.

These will potentially include a mix of "Farm Scale" actions such as Farm Environment Plans and fencing off water ways combined with "Catchment Scale" actions such as bank battering and sediment traps.

The group is keen to engage ECan and the landowners in the catchment to conduct a survey in order to prioritise the order and scale of work required. We are keen to work with all stakeholders in the catchment and attempt to improve the current state.

- Looked at the KIL discharge site into the Kakahu River. Looks good, although it wasn't flowing when we visited. We had a discussion on requirements for excluding stock from waterways and what these are & some cost-effective ways to do this. E.g. Electric tape around edge of river, drive a few posts in key spots, replace tape as needed/washed out by flood etc
- Looked at Kelly Bennett's raised peat bog with Carex secta (Pedicelled sedge) plants. This has received some funding from ECan's First Steps programme to protect and enhance the bog with planting and weed control.

Visit to Blakely Pacific Forestry. Photo: Jemma Mulvihill



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Kakahu in flood. Photo: Jemma Mulvihill

## KEY TASKS FOR THE CATCHMENT

### Biodiversity

- Understand the values of the native areas before trying to change them.
- Gain funding to be able to help farmers with bat and bird populations.
- Approach farmers with bat and bird populations and develop plans to protect and enhance their habitat.
- Promote habitat requirements for bat and bird populations.
- Map significant areas of biodiversity
- Identify areas of Kakahu-freshwater mussels, and management options to protect them

### Water quality

- Identify causes of poor water quality through a river tour.
- Monitor quality indicators to identify trends over time.
- Promote benefits of riparian fencing e.g. Provides a riparian buffer to filter run-off.
- Exclude stock from significant waterways, drains and wetlands to prevent damaging banks and defecating in water.

The key issues for the Kakahu include increasing nitrogen concentrations, and elevated concentrations of phosphorus and E. coli.

### Water quantity

- Map the catchments irrigation.
- Promote irrigation efficiency.
- Retaining vegetation cover in gully systems where steep

### Good Management Practices:

- Winter crop management and follow up crops to reduce nutrient losses.
- Winter crop paddock selections and grazing management.



- Cultivation practices and timing adjusted to minimise N loss. Manage periods of exposed soil between crops to reduce the risk of erosion, overland flow and leaching.
- Farm Environment plan and nutrient budgets.
- Keep Olsen P at agronomic optimum, usually 20-30, using soil testing.
- Nitrogen application rates and timing set to match growth cycle of crop and soil moisture conditions, taking into account all sources of nutrients are applied.
- Ensure effluent storage meets requirements for when soils are saturated and meet regulatory requirements.
- Silage stacks are located at least 50m from surface water and any leachate is directed to pasture or the farms effluent system.
- Any offfal or rubbish pits are sited to minimise risk of leachates entering ground or surface water.
- Ophi Water Project webpage: <http://bit.ly/2lYJjZs>

### Contact details:

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