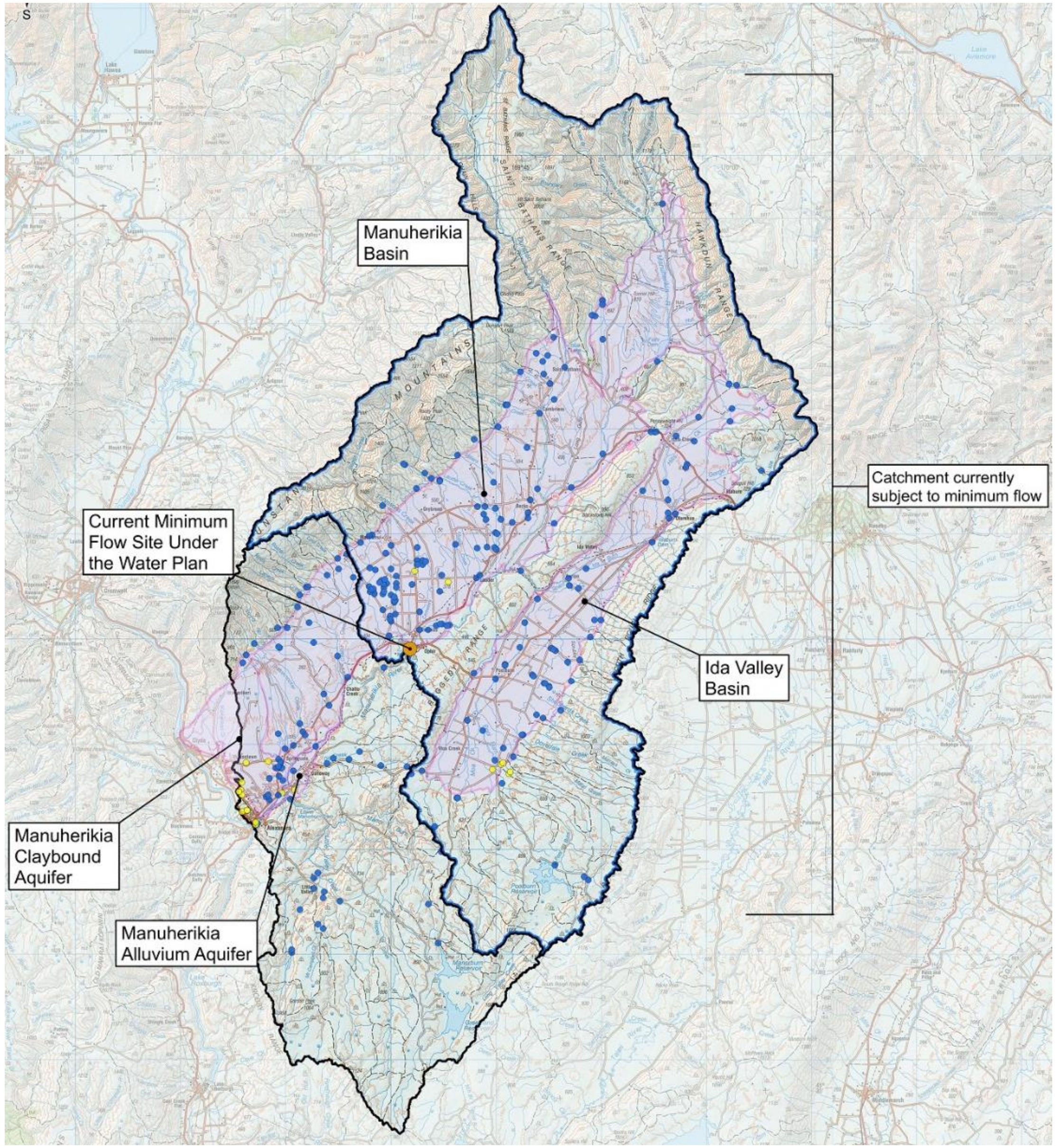
Manuherikia River

Focus Group Discussions
18 – 19 July 2018

Please Note: The science in this presentation has been updated and will differ from the presentations given at stakeholder and community meetings held in July. These updates have been made for purposes of clarity and to correct errors identified during the meetings.



Manuherikia River

Why we are doing this plan change?

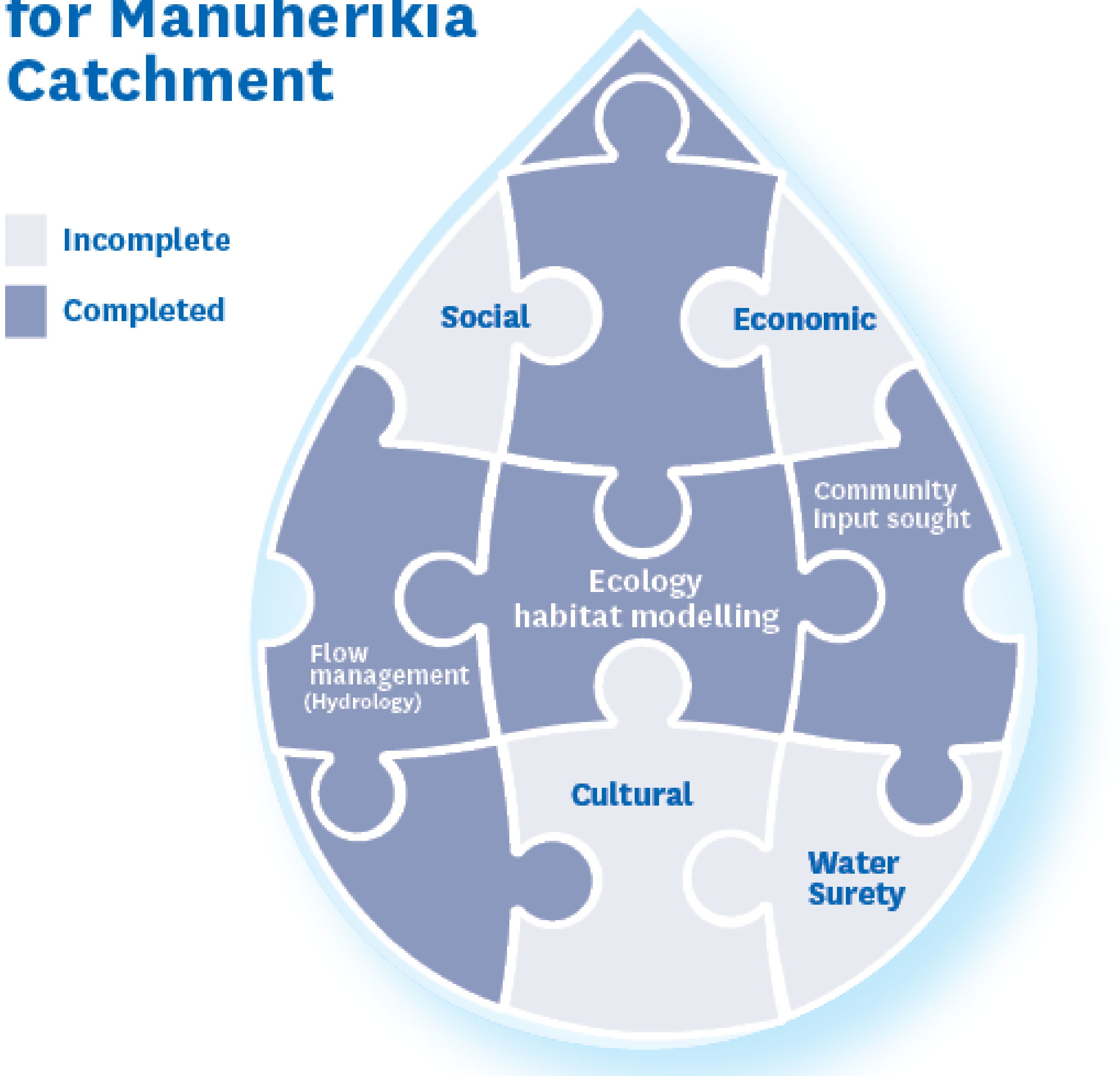
The Water Plan and the NPSFM require us to set minimum flows

- To safeguard life supporting capacity, ecosystem processes and indigenous species.
- A minimum flow will:
  - *Provide a management regime that will look after the values of a river during periods of low flow.*
  - *Low flow periods pose a "crunch time" for aquatic ecosystems as habitat and food availability for many aquatic organisms tends to decrease.*

The values that a minimum flow will support in the Manuherikia are:

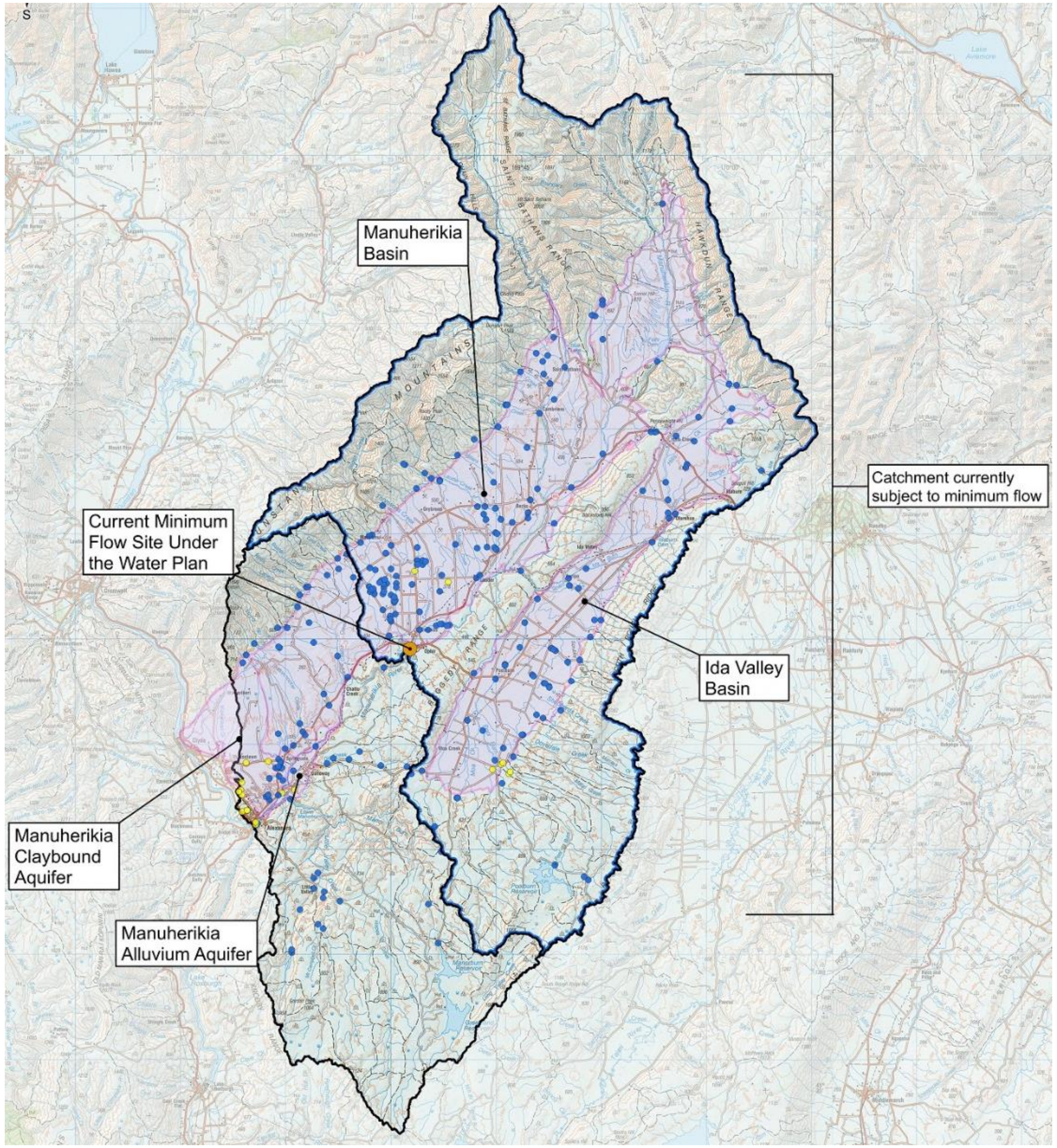
- Recreation i.e. swimming particularly in the lower reaches
- Trout habitat, Manuherikia is a regionally significant fishery
- Long fin eel, this is a specific cultural value
- Water use for irrigation
- Natural Character

Inputs required for Manuherikia Catchment



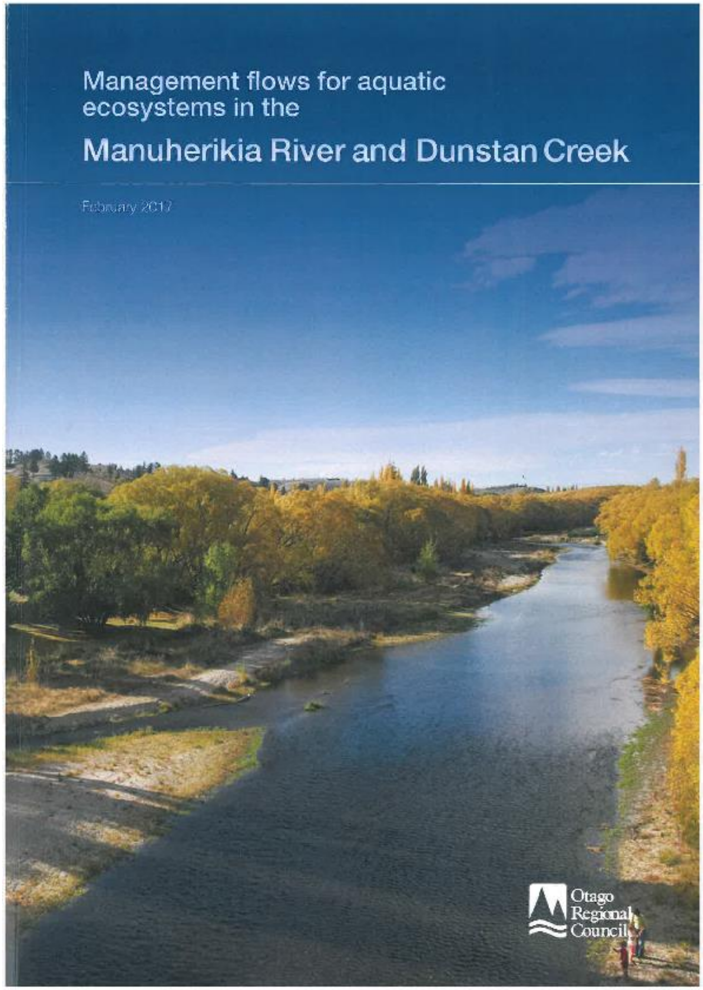
Manuherikia River

Perennial river that would flow all year round irrespective of the influence of Falls Dam



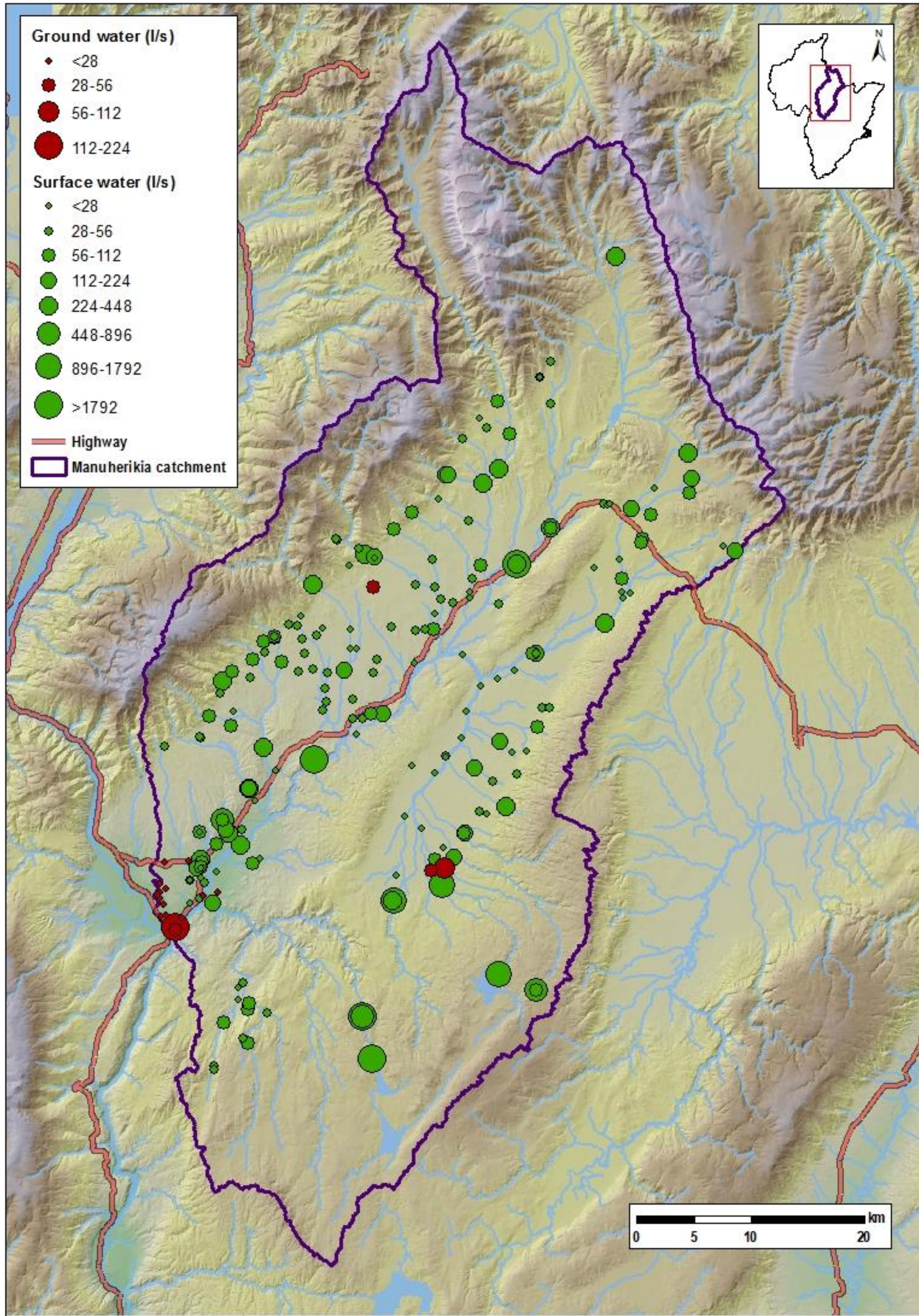
Manuherikia catchment – vital stats

- 3,033 km2
- Dominated by pasture grassland, tussock grasslands at high altitudes
- Lowest rainfall in NZ
  - Valley floor: 300-500 mm/y
- 2 flow sites – Ophir & Campground (voluntary)



Water takes

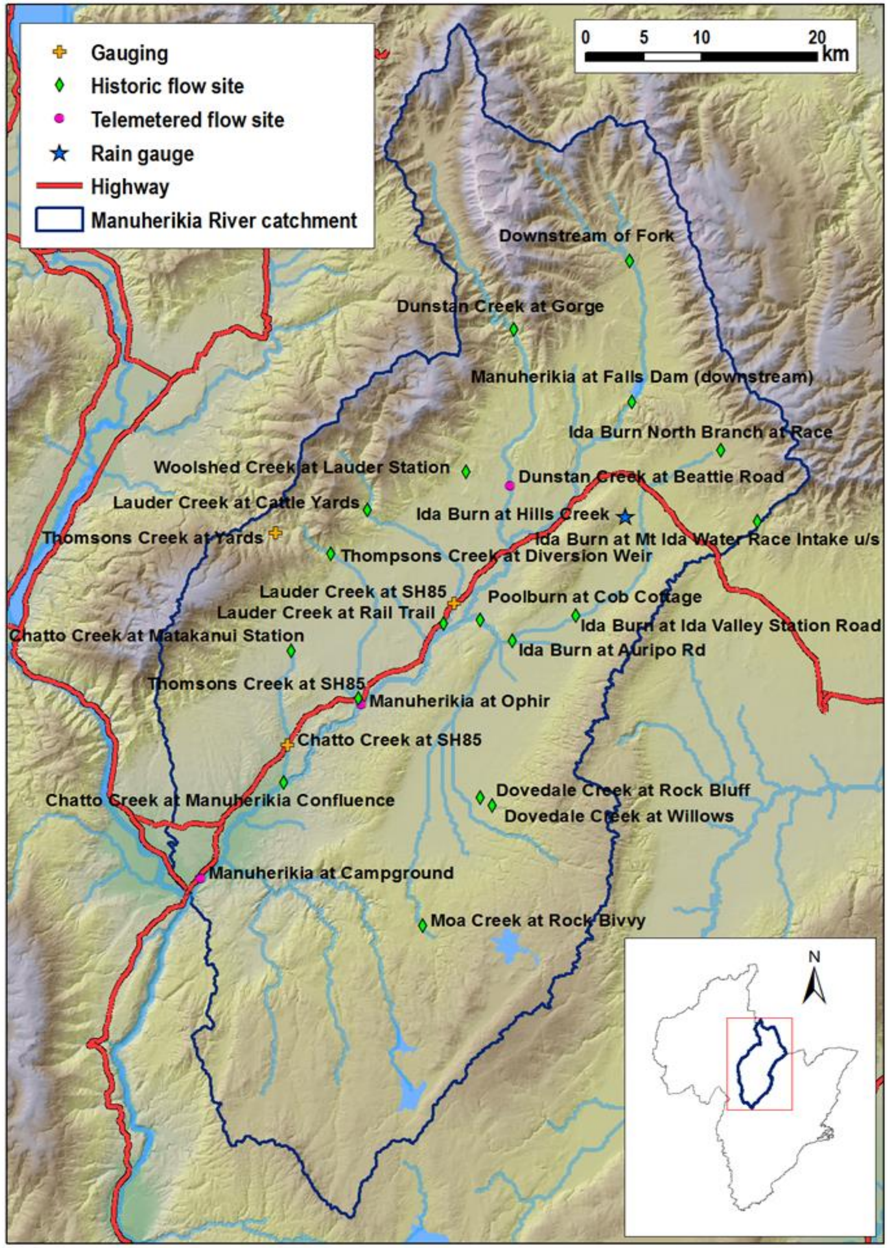
- Heavily allocated
  - >200 SW takes
  - 32 m^3/s (c.f. default ~ 2 m^3/s)
  - Actual max use ~16 m^3/s (favourable conditions)
- Storage
- Races
- Takes & re-takes



Hydrology

- Ophir
  Existing MALF ~2.197 m³/s
  Naturalised MALF ~3.2 m³/s (±0.6)

- Campground
  Existing MALF ~0.915 m³/s
  Naturalised MALF ~3.9 m³/s (±0.8)

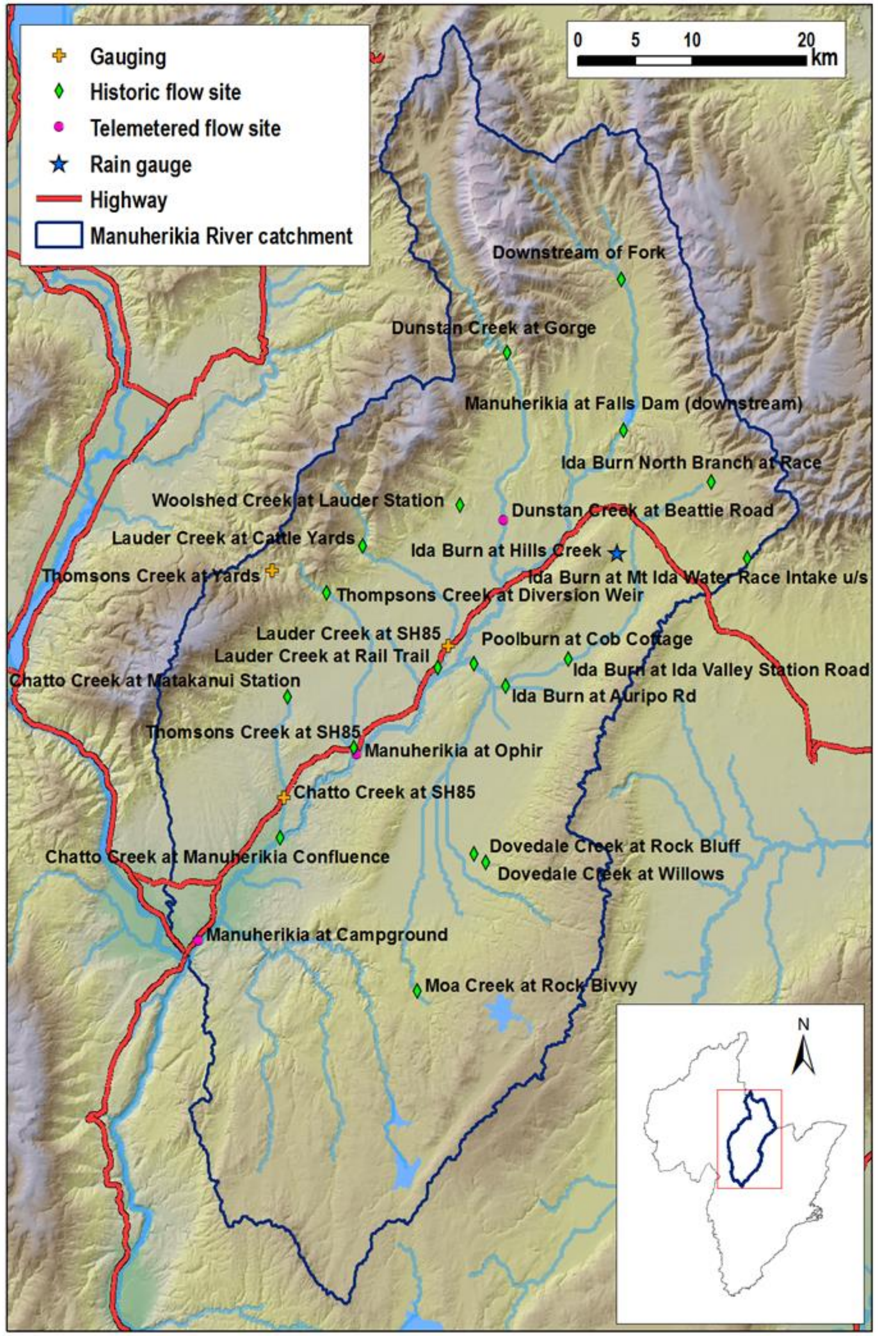


Existing MALF at Ophir corrected

Tributaries

- Flow at bottom + upstream take
  - Limited take records
  - Some takes missing
- Provides under estimate

Added context: Unless water is taken twice

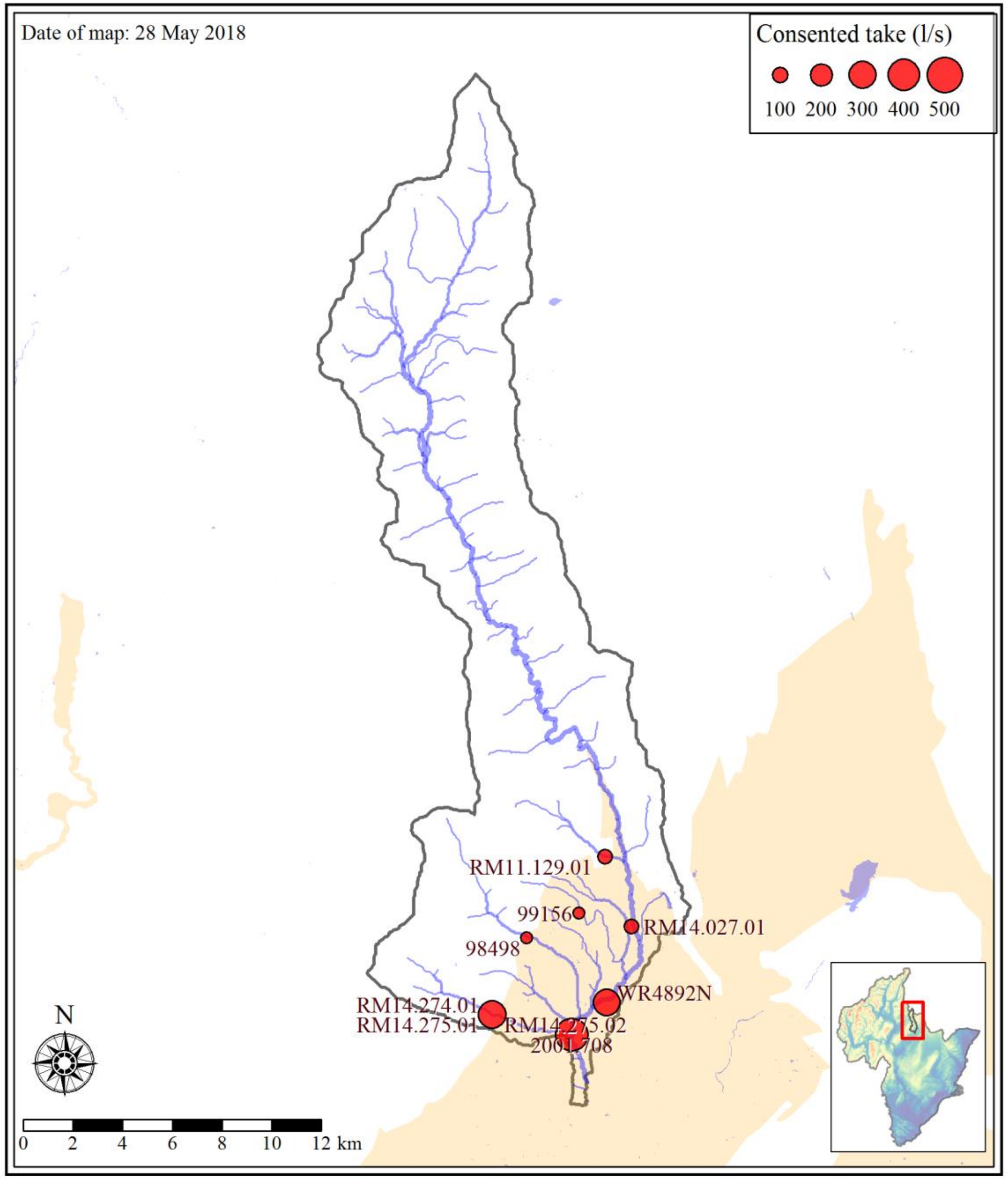


What are we seeking to avoid

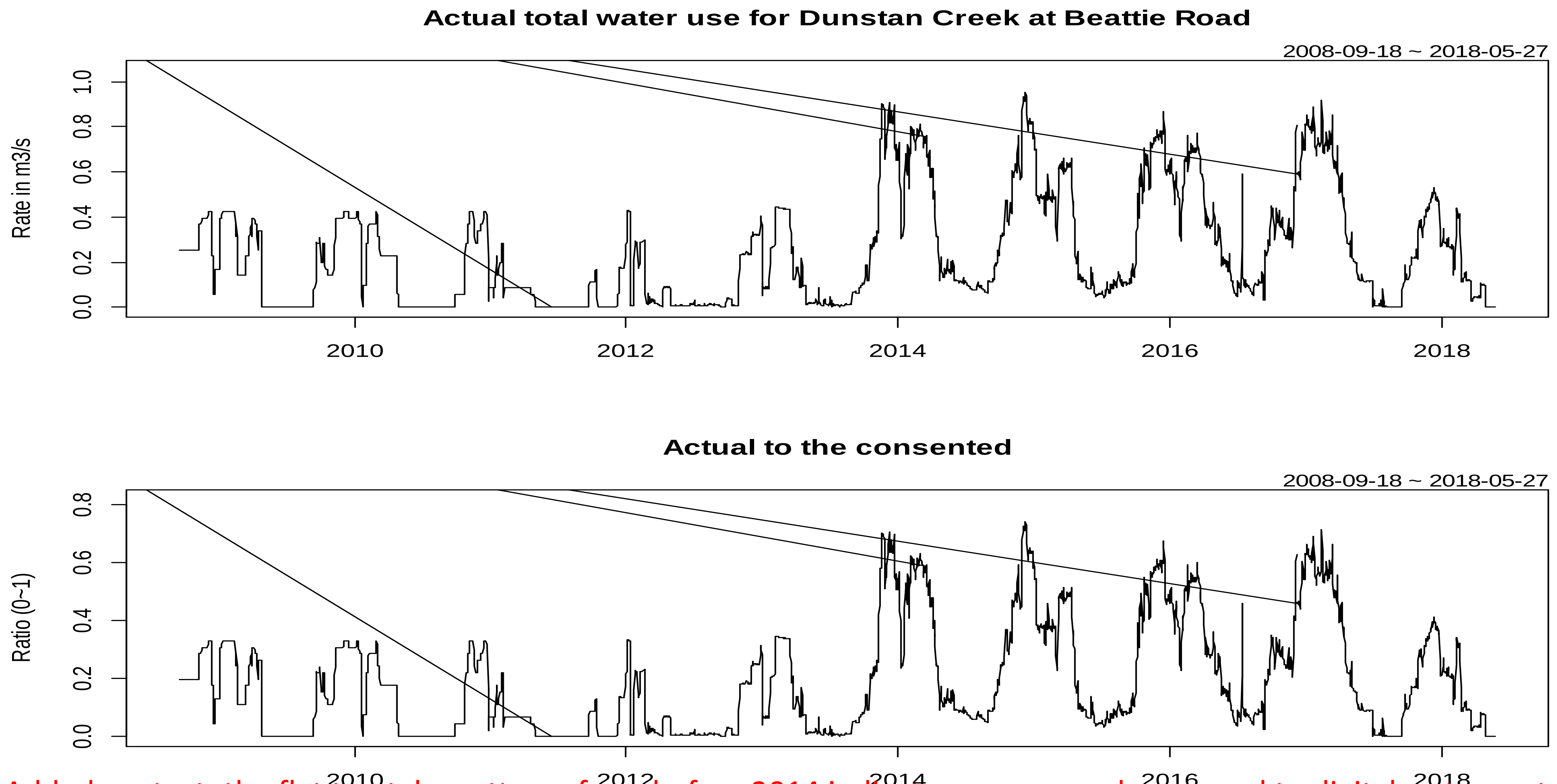
Dunstan Creek

- Nine water takes
- Average monthly water use 2013 – 2017 is 570l/s

Dunstan Creek at Beattie Road (catchment)
Allocation of 1287.03 l/s



Pattern of water use

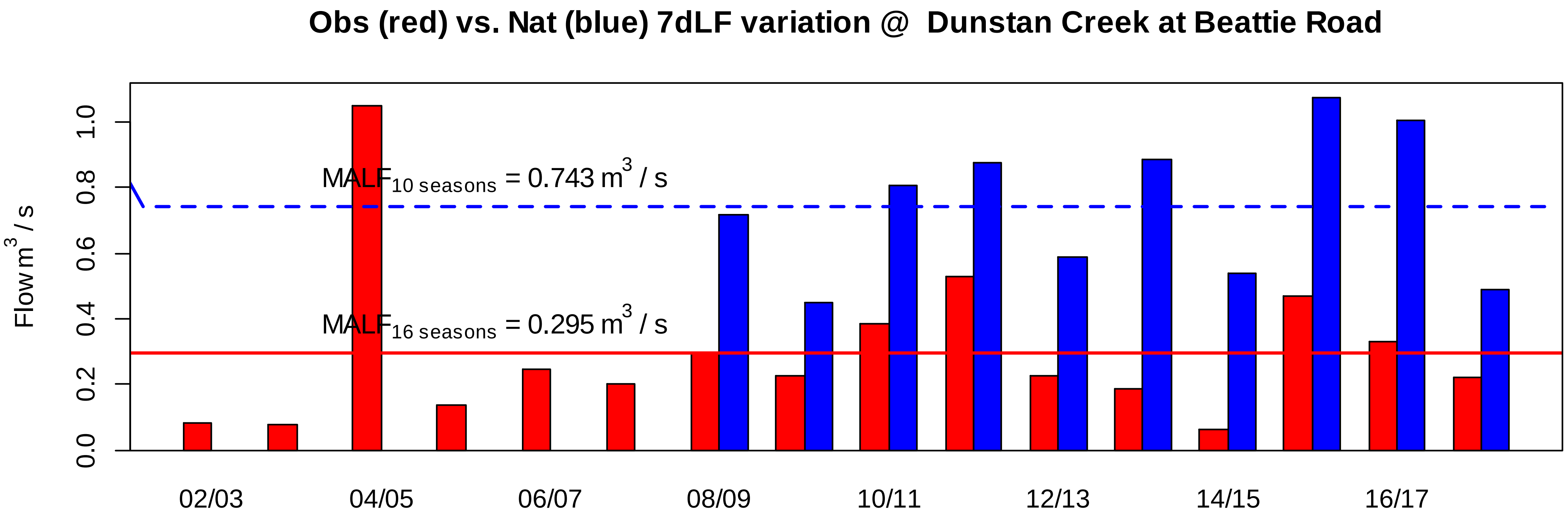


Added context: the flat top take patterns from before 2014 indicate paper records opposed to digital water metering. Not a doubling in take.

Dunstan Creek flow statistics

(Naturalised flows - at Beattie Road)

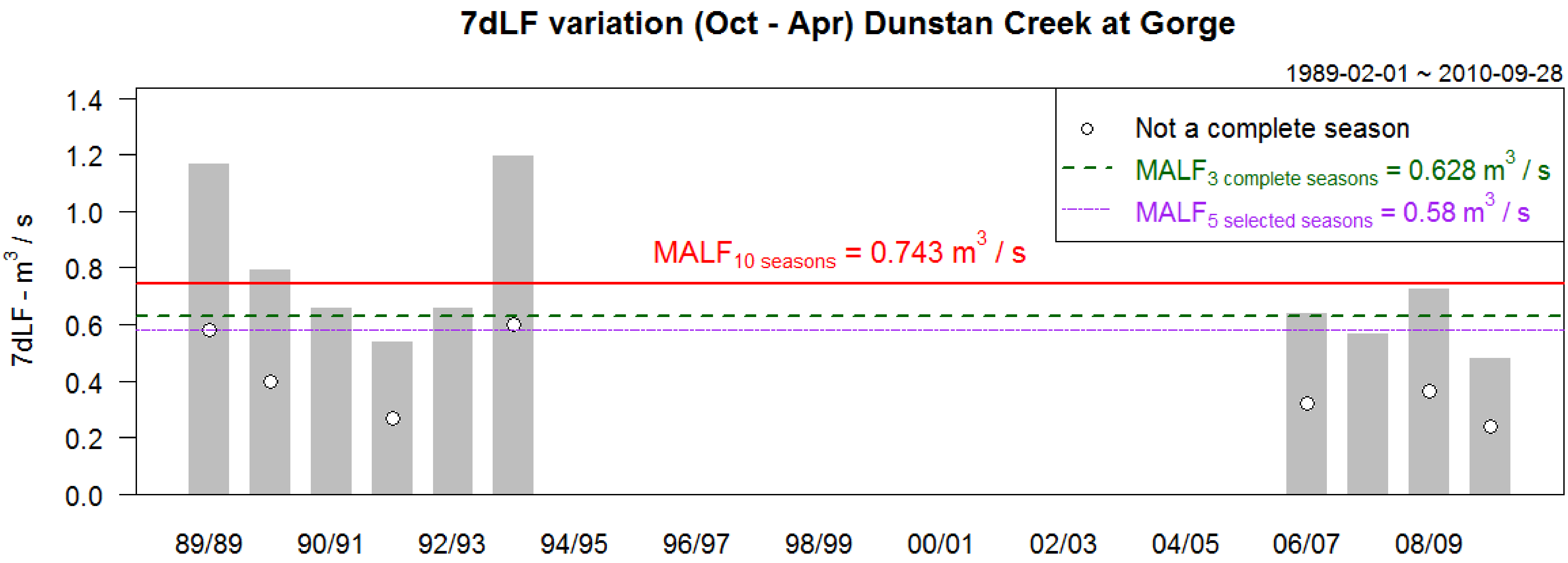
Added context: Water is double accounted in these figures, this will be addressed in the CHES model



Dunstan Creek flow statistics

(Natural flows – Gorge site)

Added context: Water is double accounted in these figures, this will be addressed in the CHES model



Dunstan Creek flow statistics

Data availability	Type	Minimum (m^3/s)	Mean (m^3/s)	Median (m^3/s)	Maximum (m^3/s)	7dMALF (m^3/s)
2002-11-14 ~ 2018-05-16	Observed	0.038	2.314	1.399	42.813	0.295
2008-09-18 ~ 2018-05-16	Naturalised	0.407	2.716	1.959	42.813	0.743

Added context: Water is double accounted in these figures, this will be addressed in the CHES model

Minimum flow options

- **Minimum flow range 0.400 m^3/s – 0.600 m^3/s**

Values

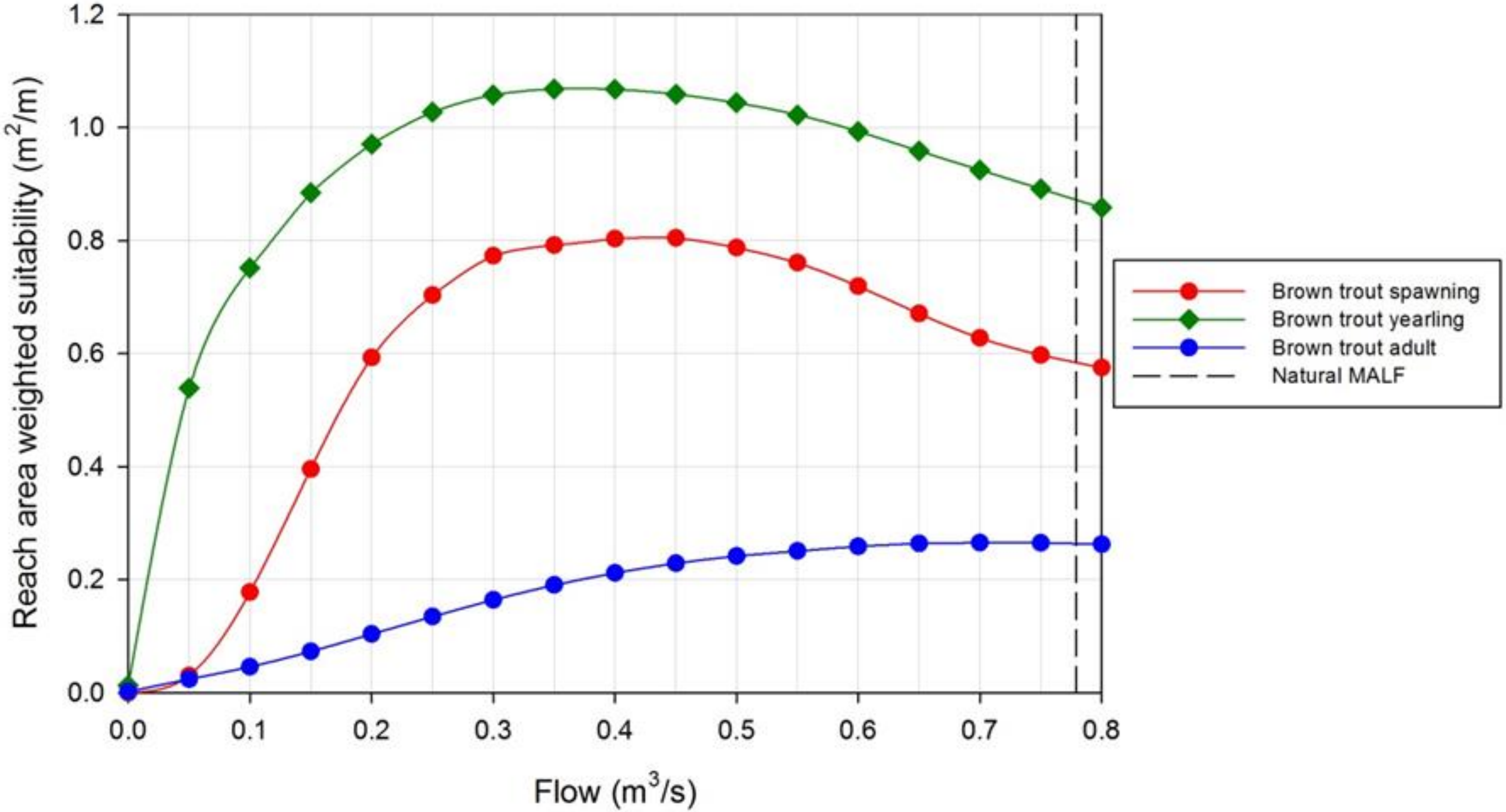
Central Otago roundhead galaxias

Brown trout

Rainbow trout

“Dunstan Creek is categorised as a back country fishery containing both brown and rainbow trout”

Habitat modelling for brown trout



Habitat modelling for brown trout

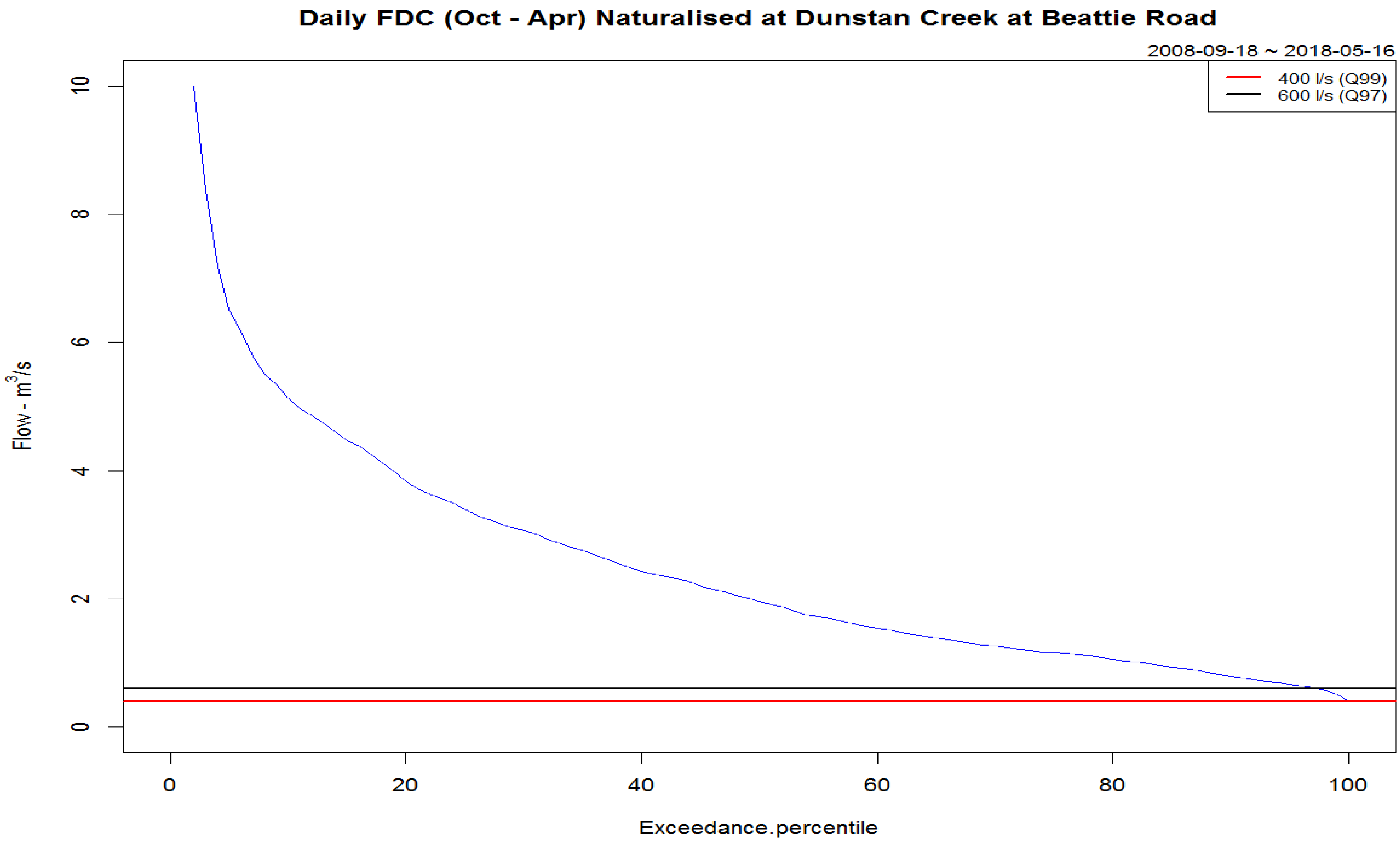
Species	Optimum flow (m^3/s)	Flow below which habitat rapidly declines (m^3/s)	Flow at which % habitat retention occurs (m^3/s)		
			70%	80%	90%
Compared to naturalised flows					
Brown trout adult	>700	0.25	0.339	0.398	0.483
Brown trout yearling	0.30–0.45	0.2	0.067	0.087	0.113
Brown trout spawning	0.35–0.50	0.25	0.153	0.168	0.183

Added context: Optimum flow for brown trout corrected due to typographical error in report.

Summary

Value	Season	Significance	Suggested level of habitat retention	Flow to maintain suggested level of habitat retention		Flow below which habitat rapidly declines (m^3/s)
Dunstan Creek						
CO roundhead galaxias	All year	Nationally endangered	90%	0.034	-	0.500
Brown trout	All year	Regionally significant†	80%	0.398	-	0.250
Rainbow trout	All year	Regionally significant†	80%	0.753	-	-
Food producing	All year	Life-supporting capacity	80%	0.528	-	-
Deleatidium mayfly	All year	Life-supporting capacity	80%	0.404		0.050
Long filamentous algae	Summer	Nuisance	<150%	0.453	-	-

Flow duration curve

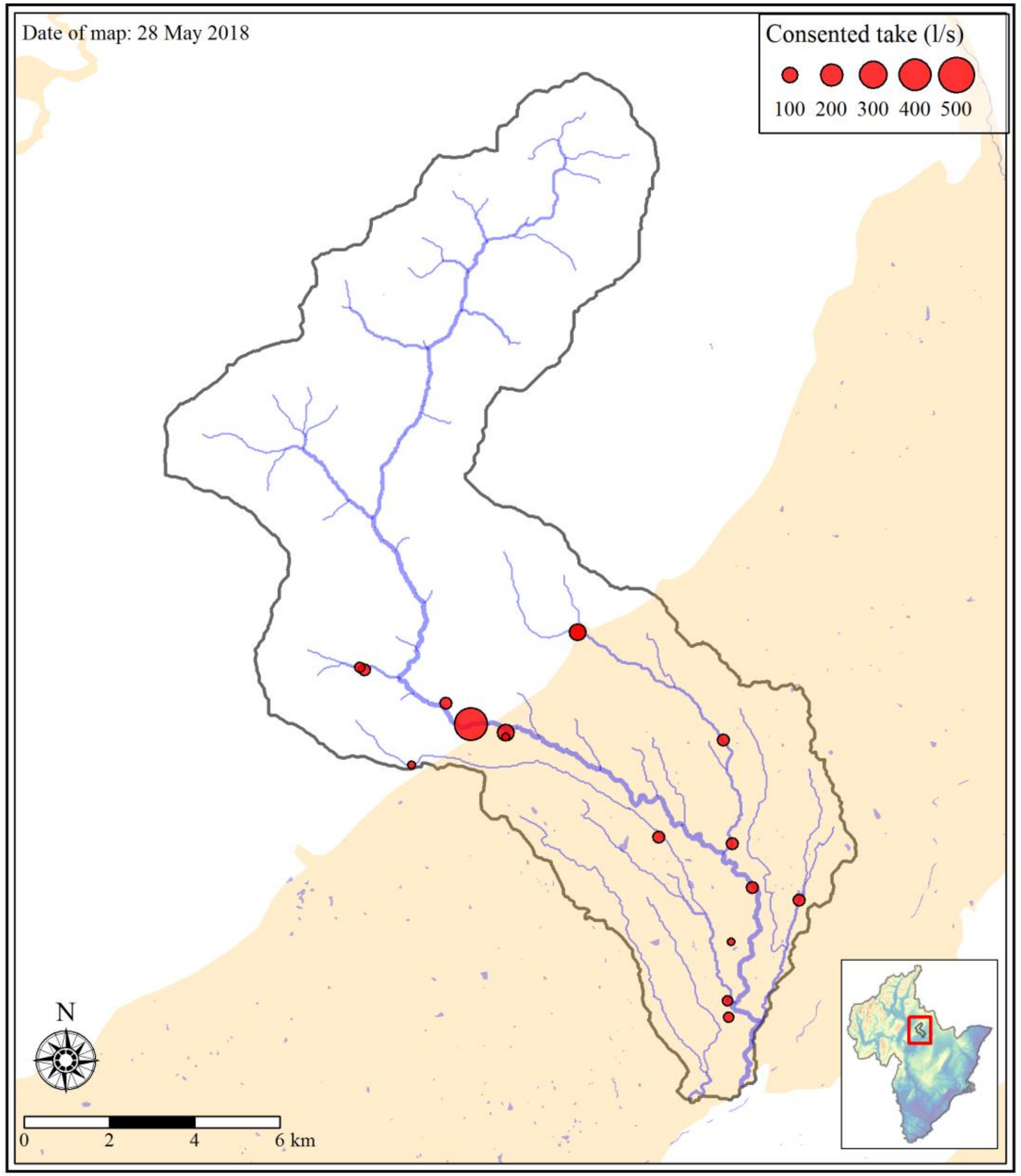


Added context: Water is double accounted in these figures, this will be addressed in the CHES model

Lauder Creek

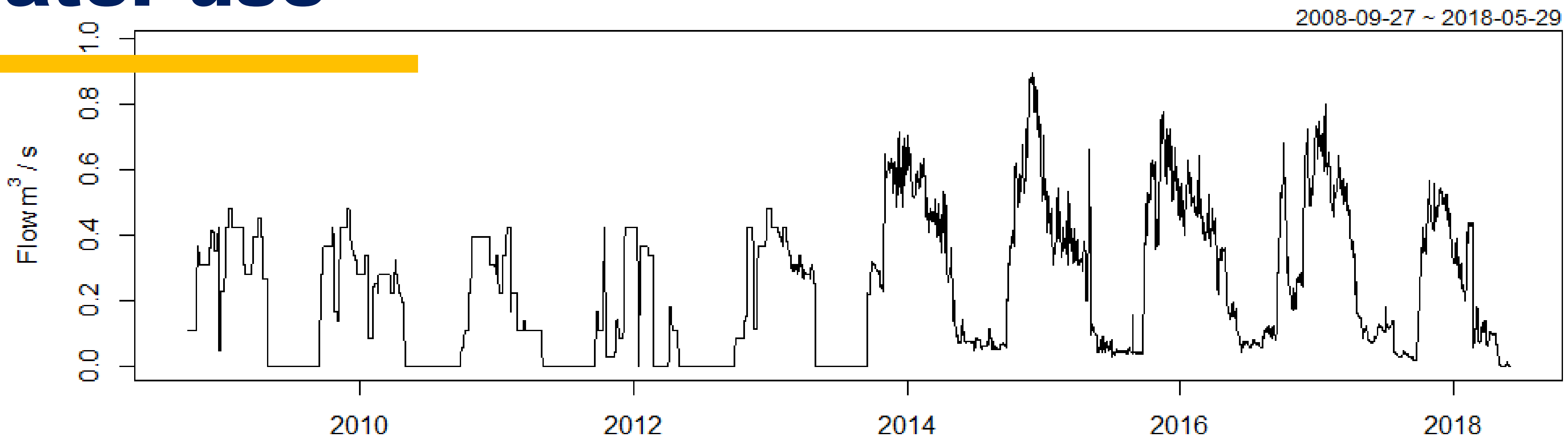
- 16 water takes
- Average monthly water use 2013 – 2017 was 487l/s

Lauder Creek at Rail Trail (catchment)
Allocation of 1350.59 l/s

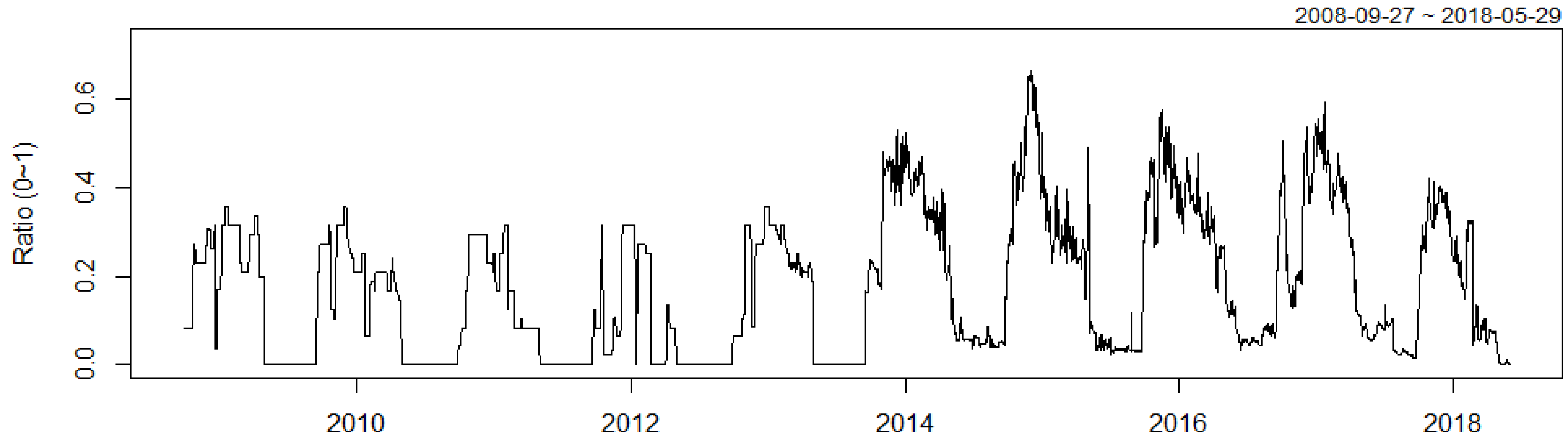


Pattern of water use

Actual total water use for Lauder Creek at Rail Trail



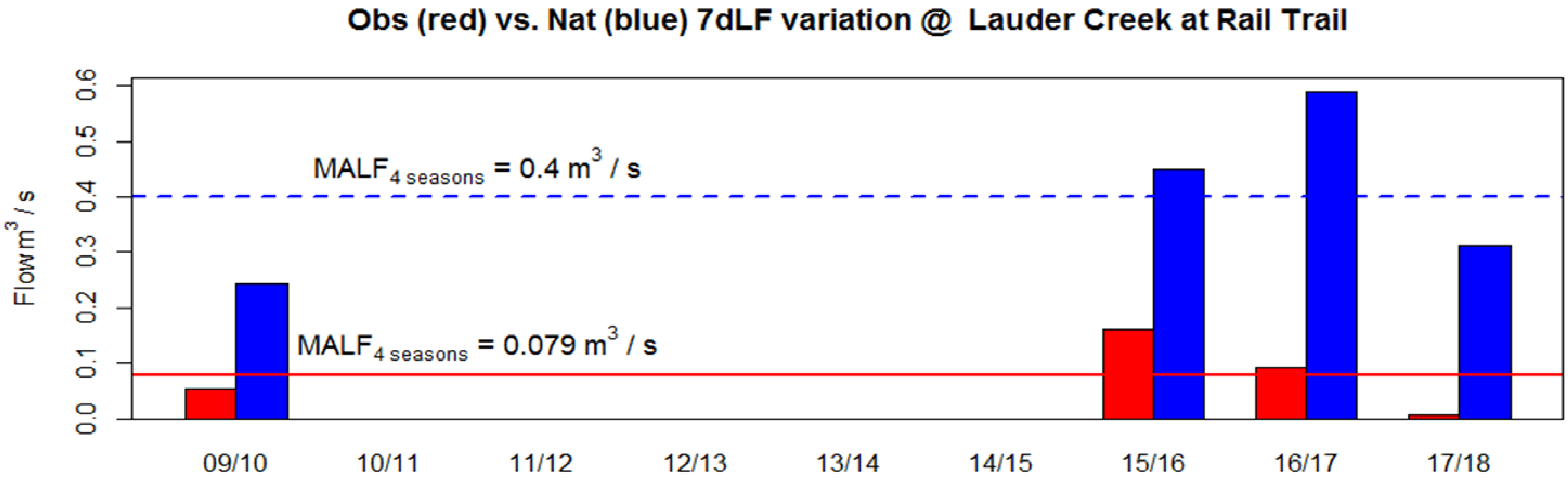
Actual to the consented



Added context: the flat top take patterns from before 2014 indicate paper records opposed to digital water metering. Not a doubling in take.

Lauder Creek flow statistics

(Naturalised flows at the Rail Trail)



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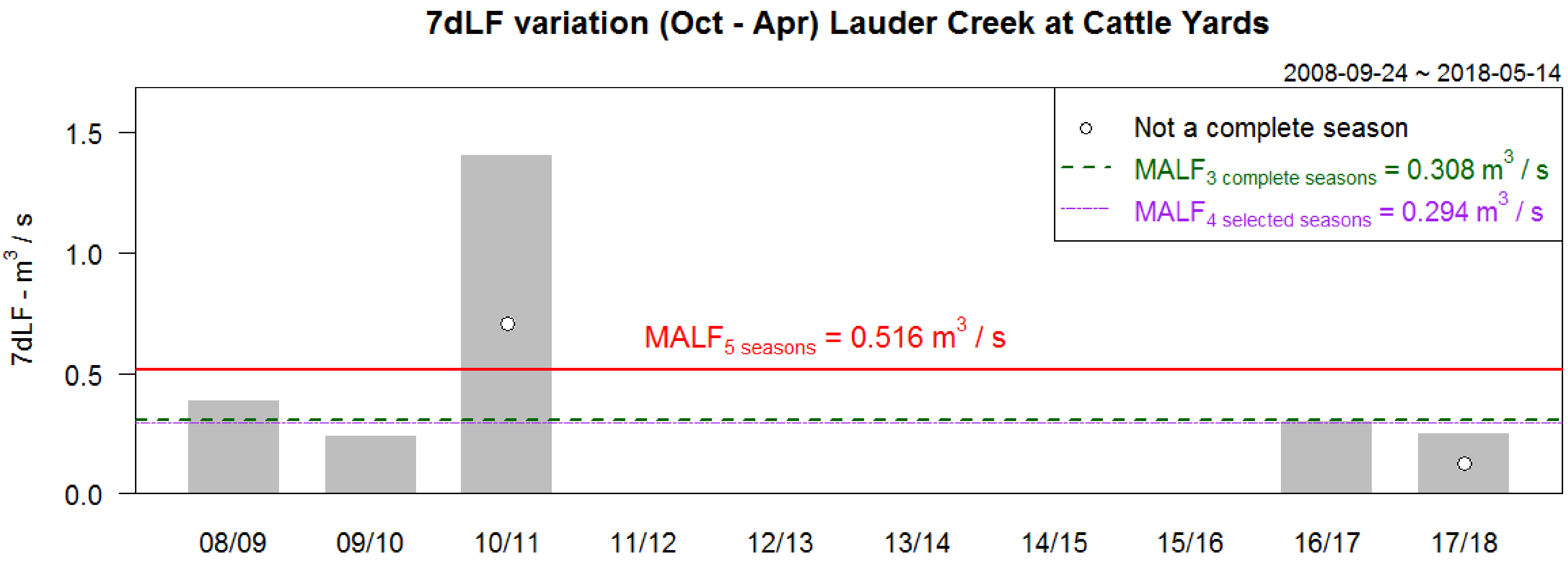
Lauder Creek flow statistics

Data availability	Type	Minimum (m^3/s)	Mean (m^3/s)	Median (m^3/s)	Maximum (m^3/s)	7dMALF (m^3/s)
2009-08-28 ~ 2018-05-14	Observed	0.001	0.600	0.242	7.045	0.079
2009-08-28 ~ 2018-05-14	Naturalised	0.182	0.954	0.735	7.203	0.4

Added context: Water is double accounted in these figures, this will be addressed in the CHES model

Lauder Creek flow statistics
(Natural flows – Cattle Yards)



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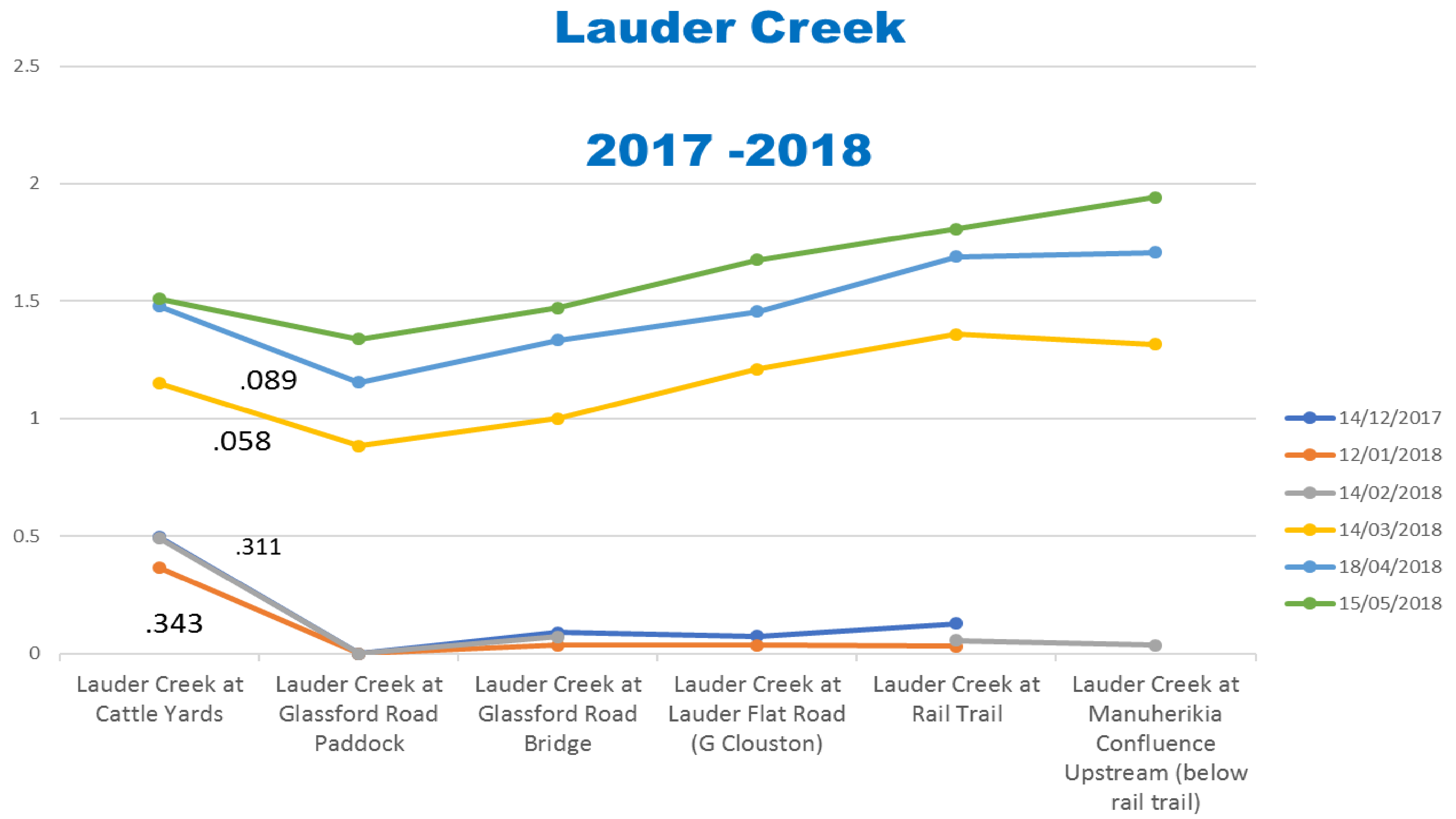
Lauder Creek concurrent gauging's



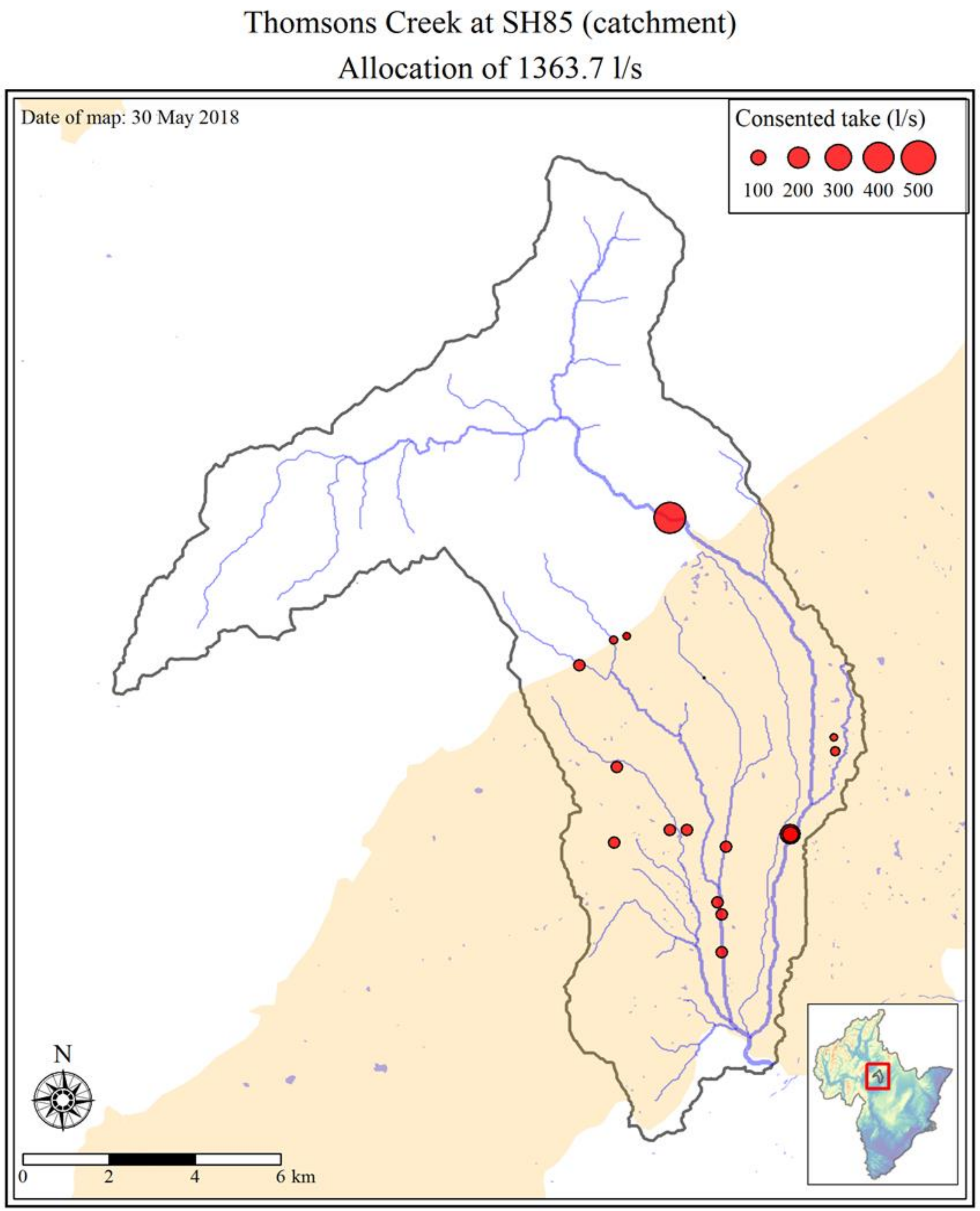
Results of the gauging's (To date)

Date	Cattle Yard flow recorder (m^3/s)	Omakau water take (m^3/s)	Glassford Paddock (m^3/s)	Other water takes monthly Av .080 m^3/s	Water deficit (m^3/s)
12/1/2018	.366	.343	0		
14/2/2018	.491	.311	0		
14/3/2018	1.15	.058	.884		.208
18/4/2018	1.479	.089	1.155		.235
15/5/2018	1.51	0	1.338		.113

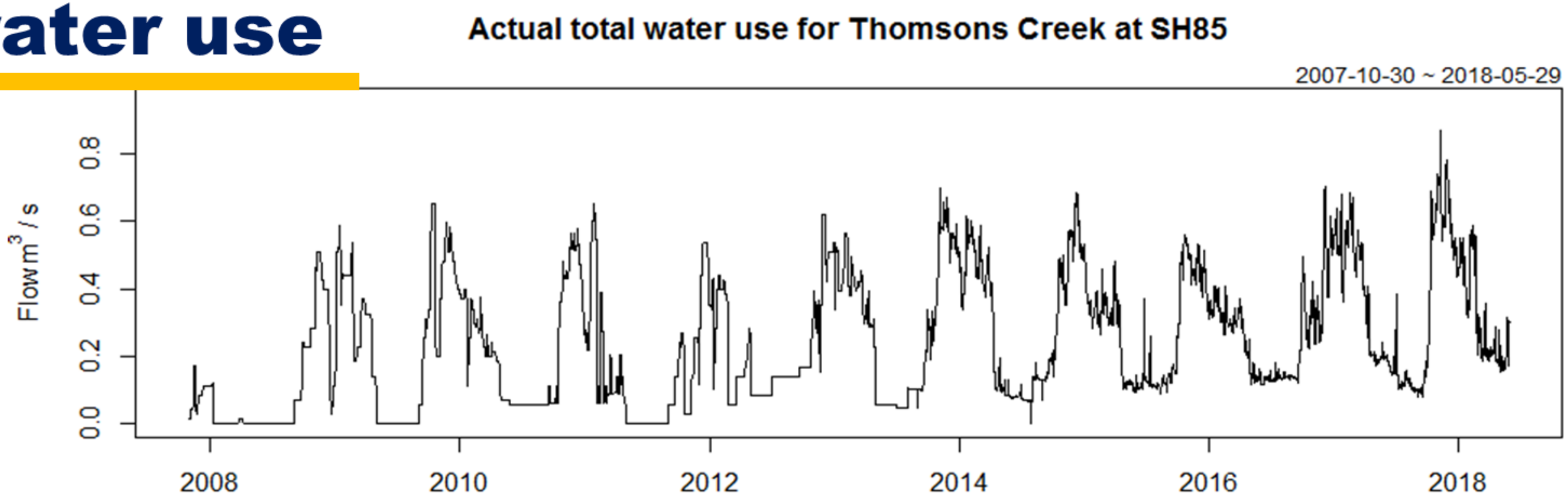
Thomsons Creek

- 18 water takes

- Average monthly water take 2013 – 2017 was 407l/s



Pattern of water use



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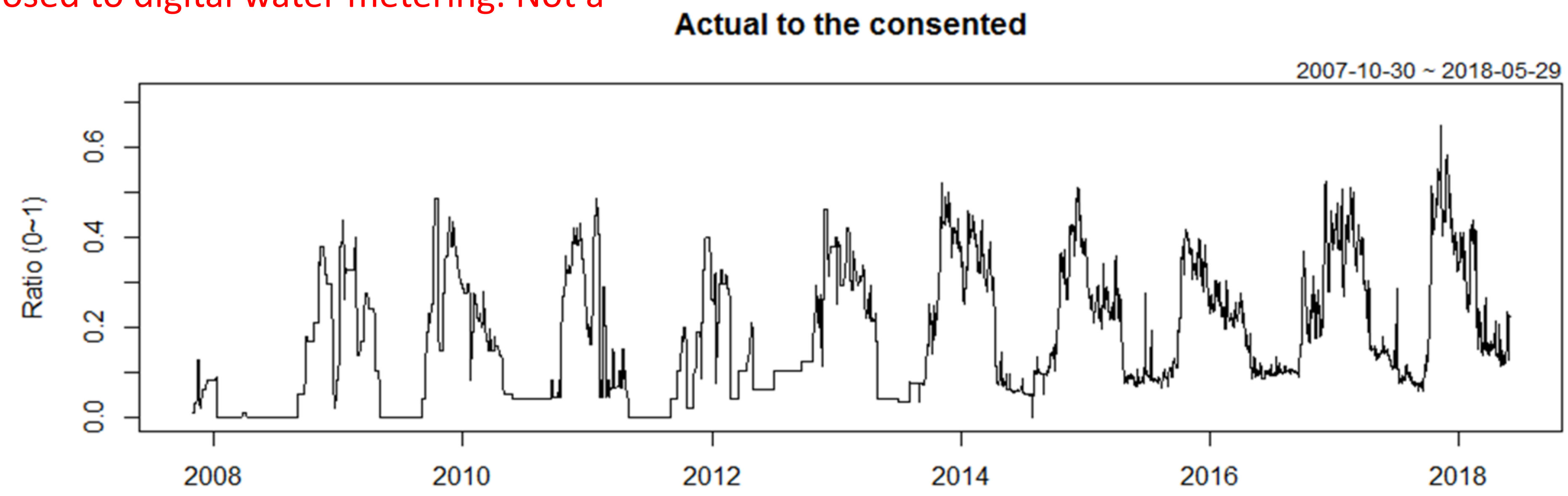
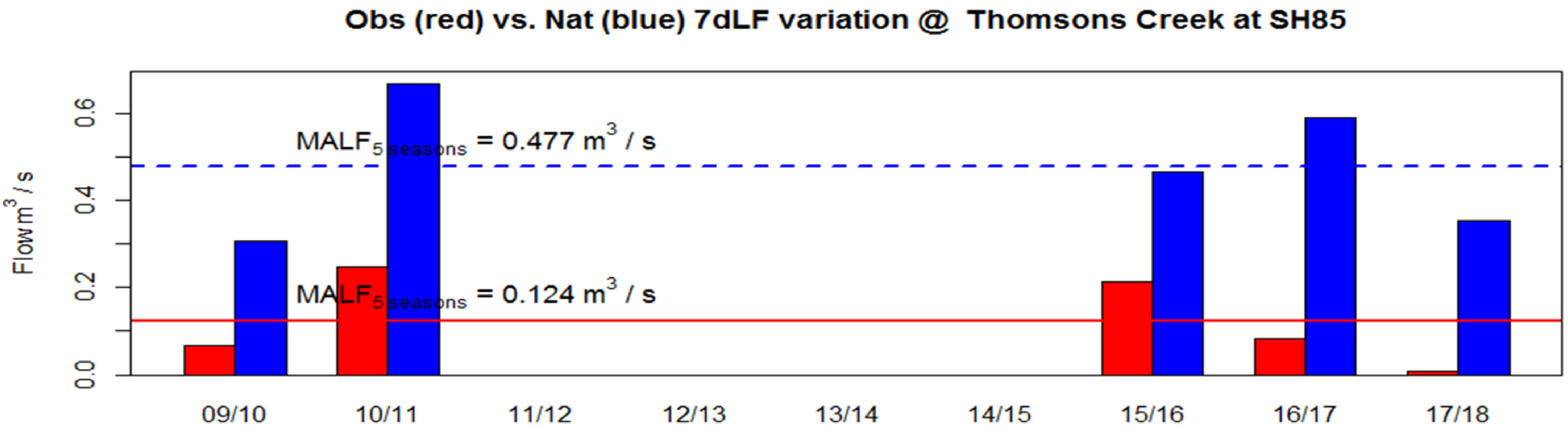


Thomsons Creek flow statistics
(Naturalised flows at SH85)



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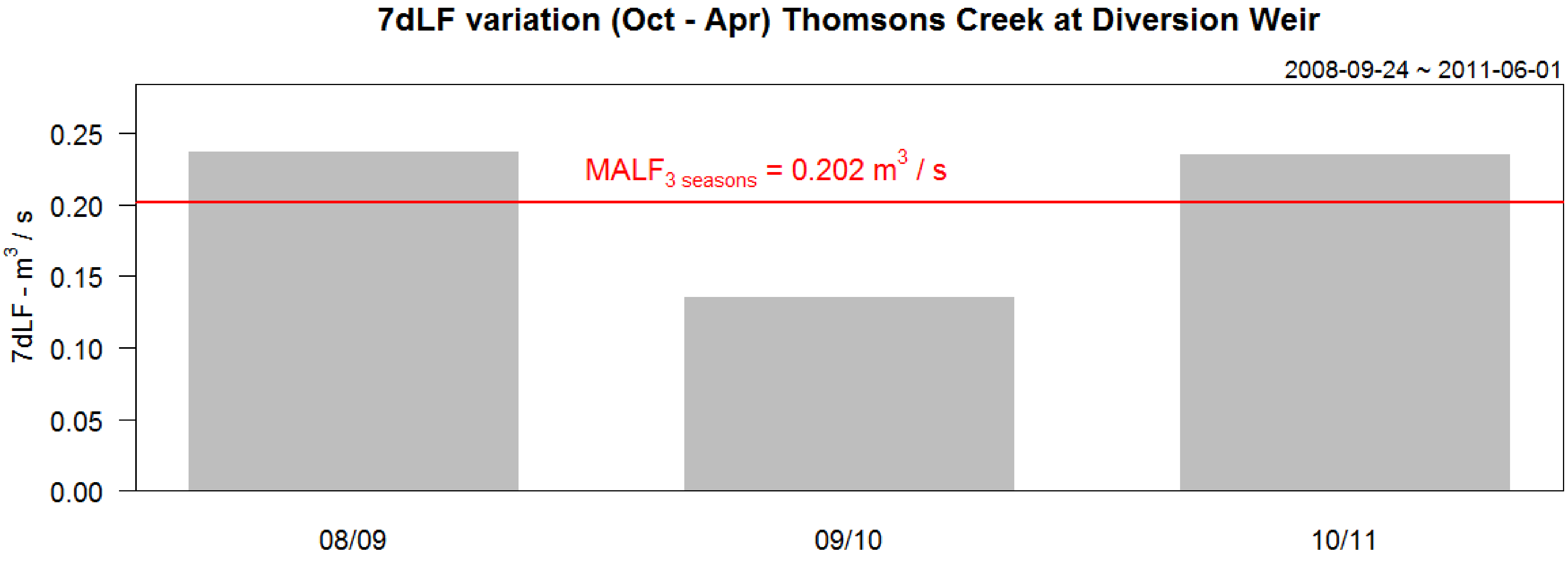
Thomsons Creek flow statistics

Added context: Water is double accounted in these figures, this will be addressed in the CHES model

Data availability	Type	Minimum (m^3/s)	Mean (m^3/s)	Median (m^3/s)	Maximum (m^3/s)	7dMALF (m^3/s)
2009-10-15 ~ 2018-05-13	Observed	0.002	2.046	0.402	525.629	0.124
2009-10-15 ~ 2018-05-13	Naturalised	0.281	2.419	0.877	526.183	0.477

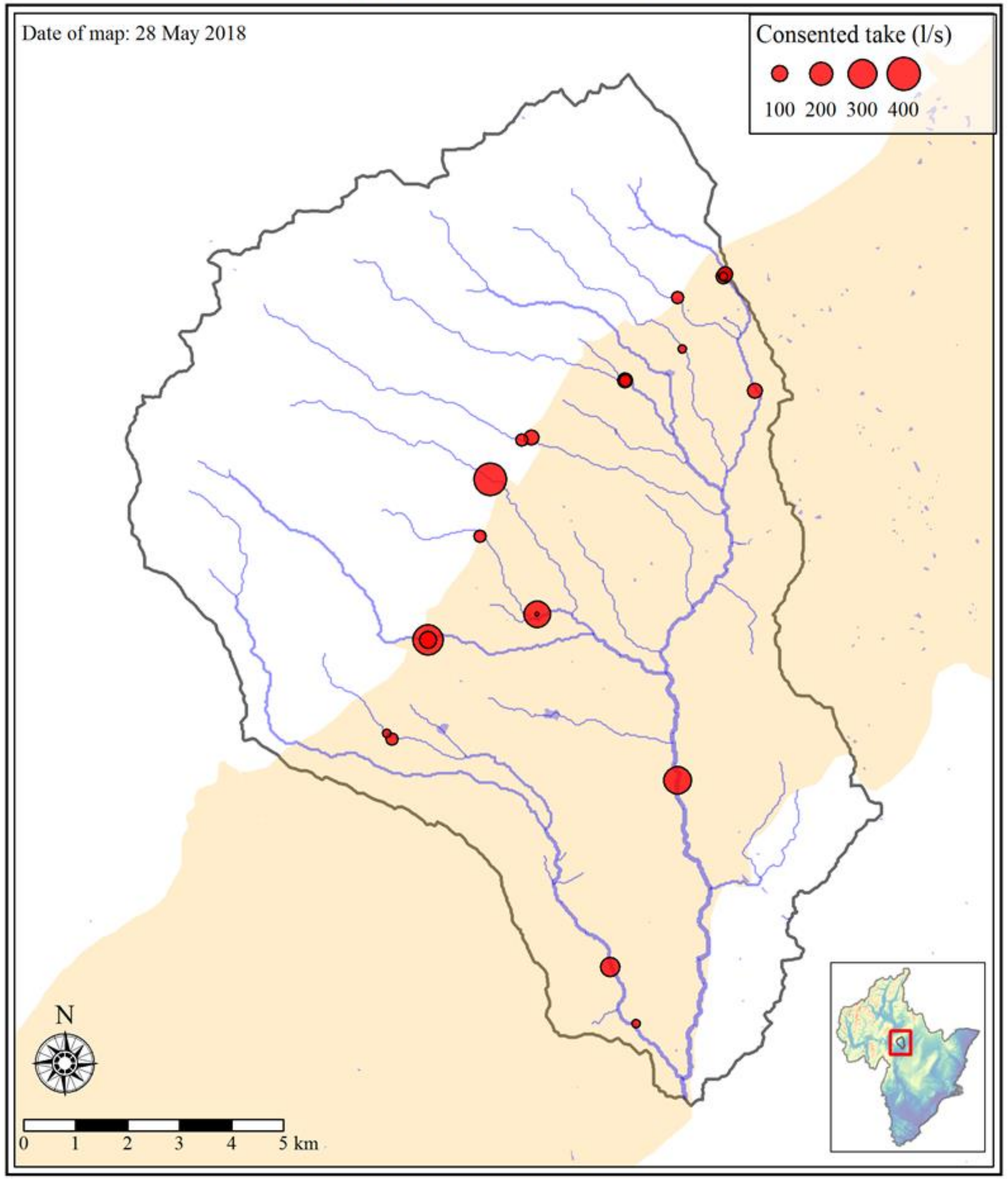
Thomsons Creek flow statistics
(Natural flows at the diversion weir)



Chatto Creek

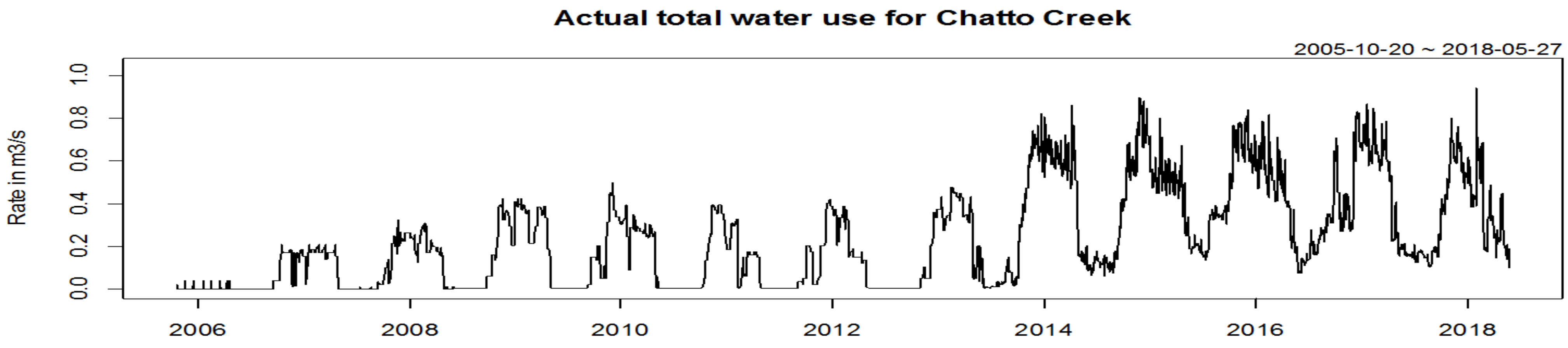
- 7 water takes
- Average monthly water use 2013 – 2017 was 361 l/s

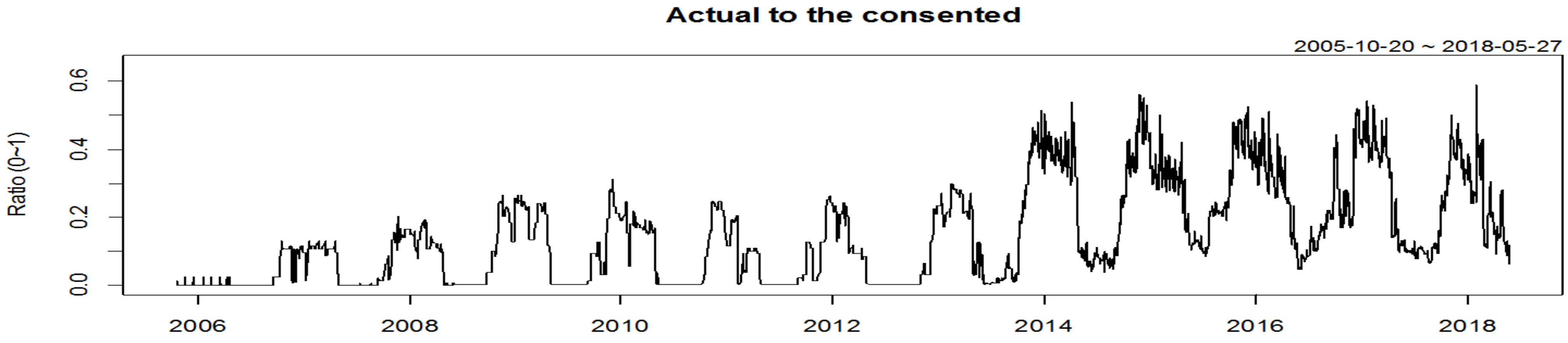
Chatto Creek (catchment)
Allocation of 2342.181 l/s



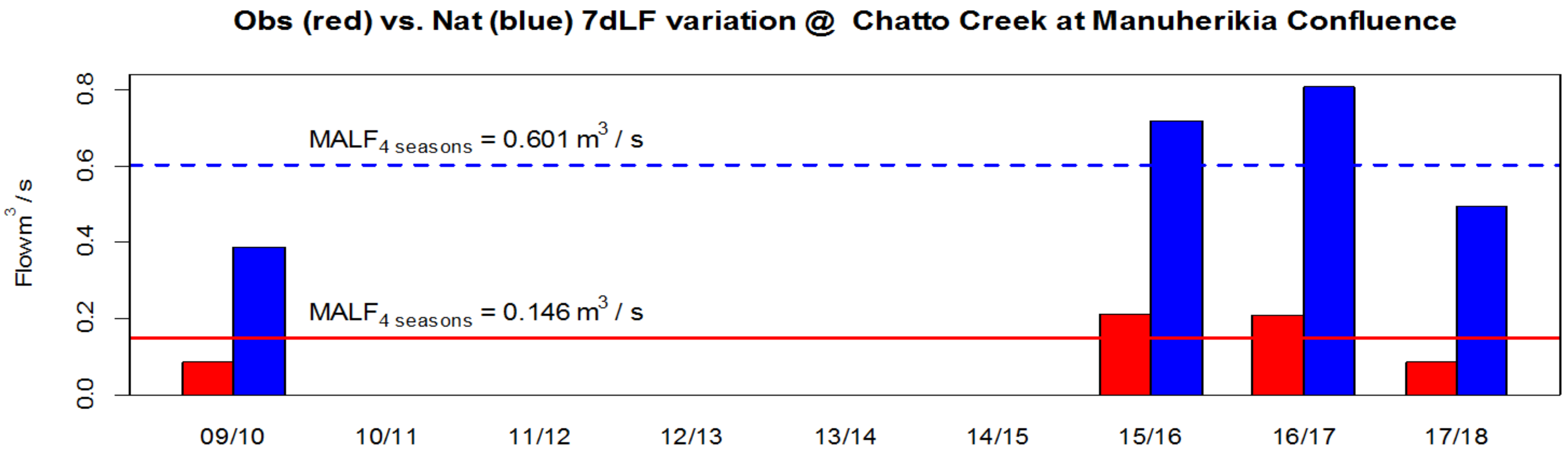
Patterns of use

Added context: the flat top take patterns from before 2014 indicate paper records opposed to digital water metering. Not a doubling in take.





Chatto Creek flow statistics



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Chatto Creek flow statistics

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Data availability	Type	Minimum (m^3/s)	Mean (m^3/s)	Median (m^3/s)	Maximum (m^3/s)	7dMALF (m^3/s)
2009-08-29 ~ 2018-05-13	Observed	0.030	0.745	0.342	9.808	0.146
2009-08-29 ~ 2018-05-13	Naturalised	0.319	1.170	0.902	10.493	0.601

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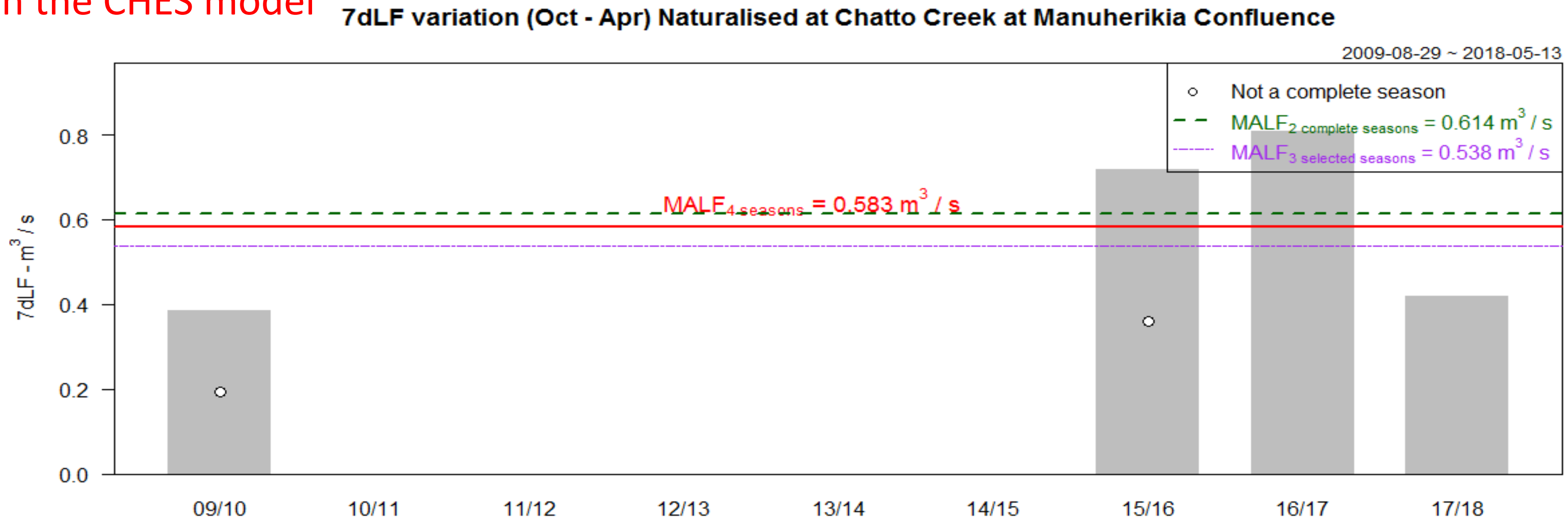

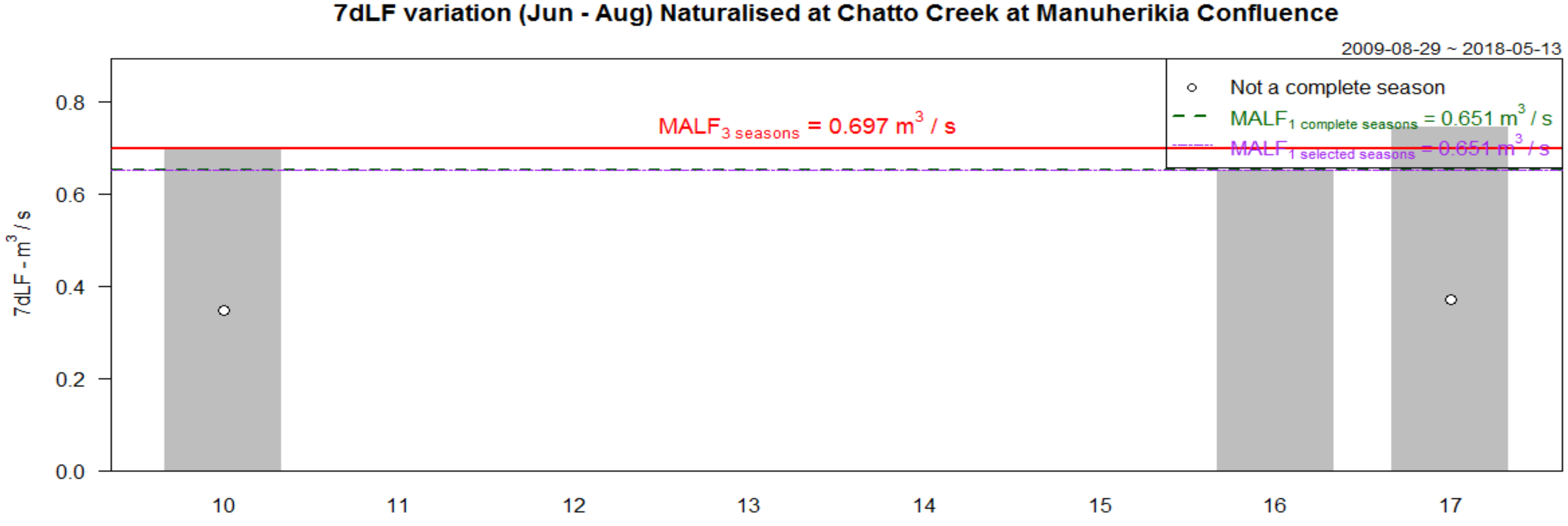

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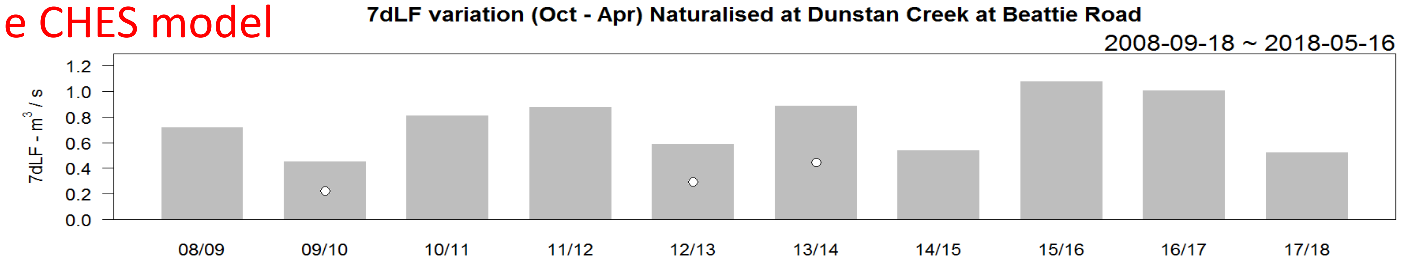
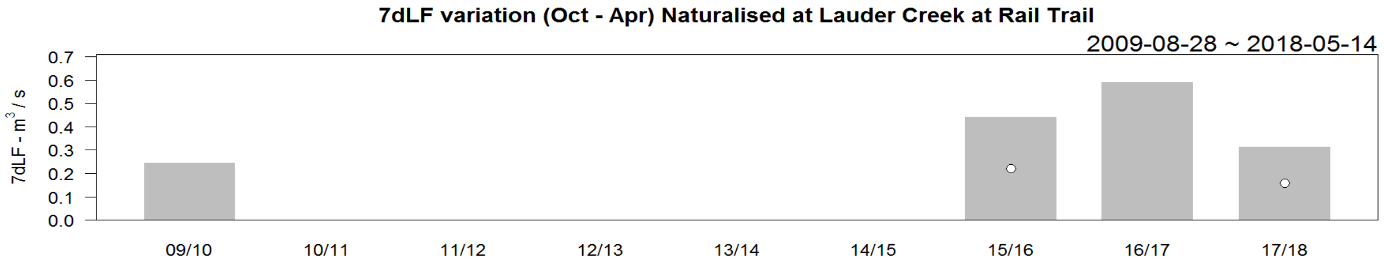
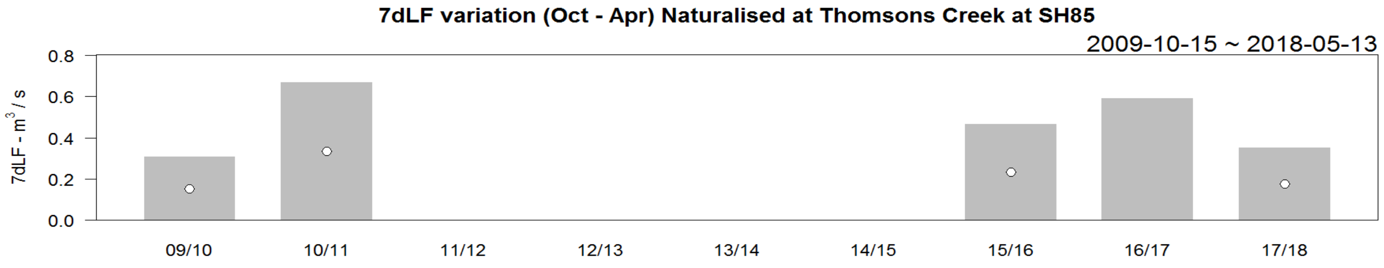
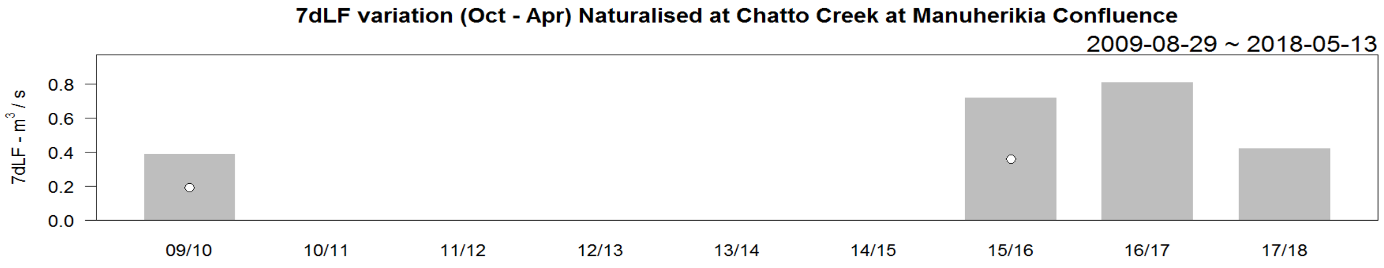


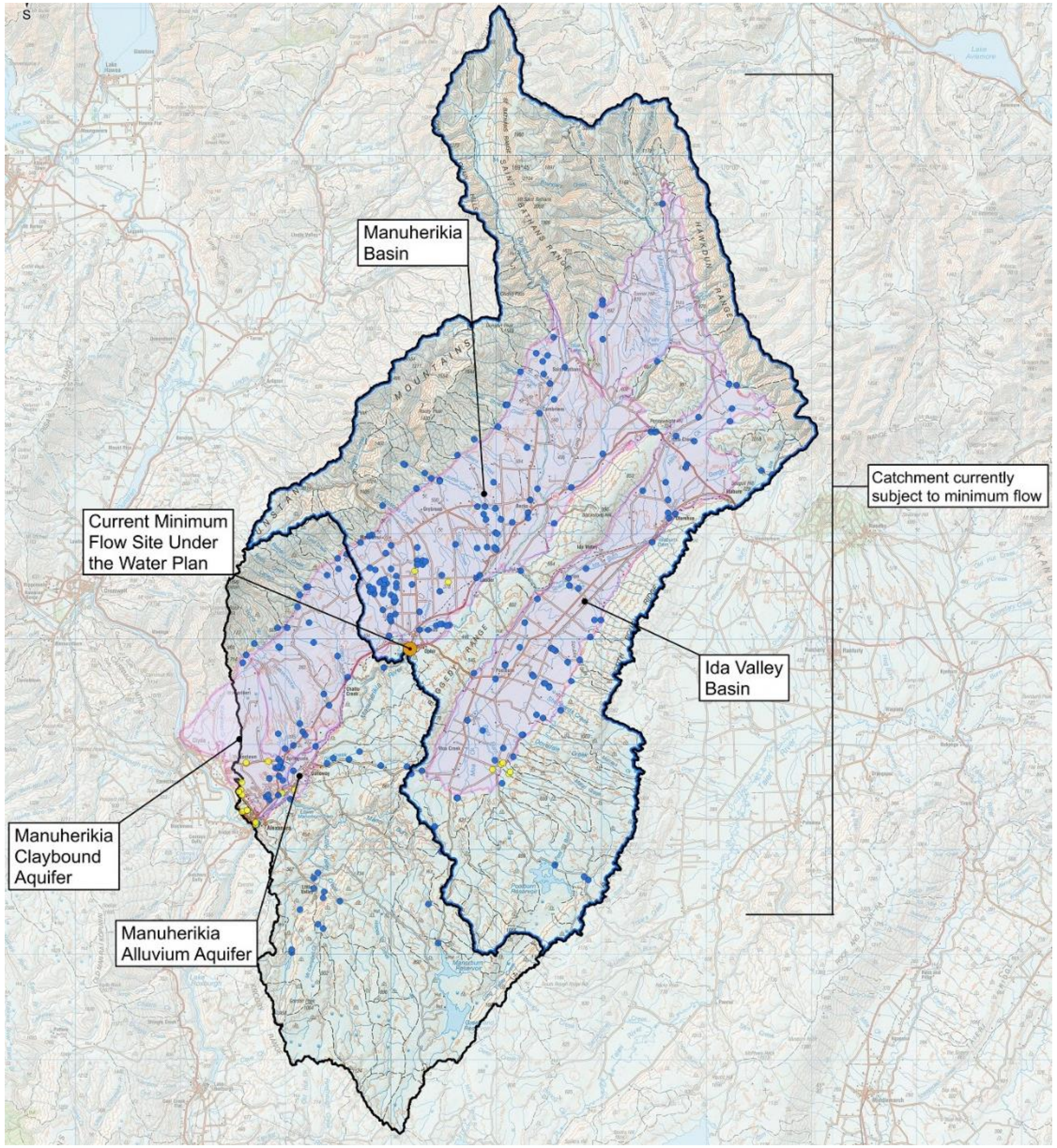




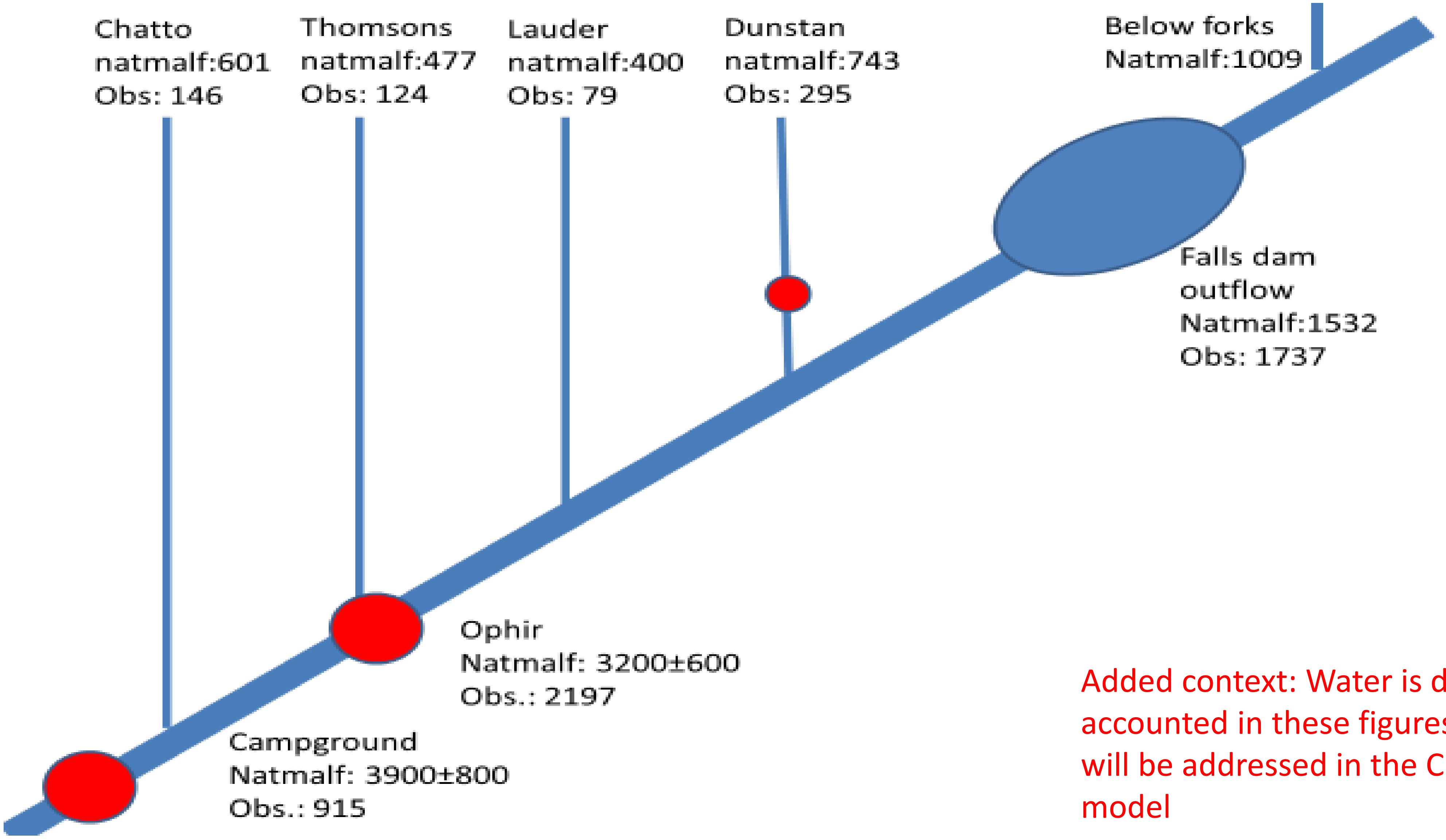


Manuherikia River

Perennial river that would flow all year round irrespective of the influence of Falls Dam



Manuherikia River (main-stem)



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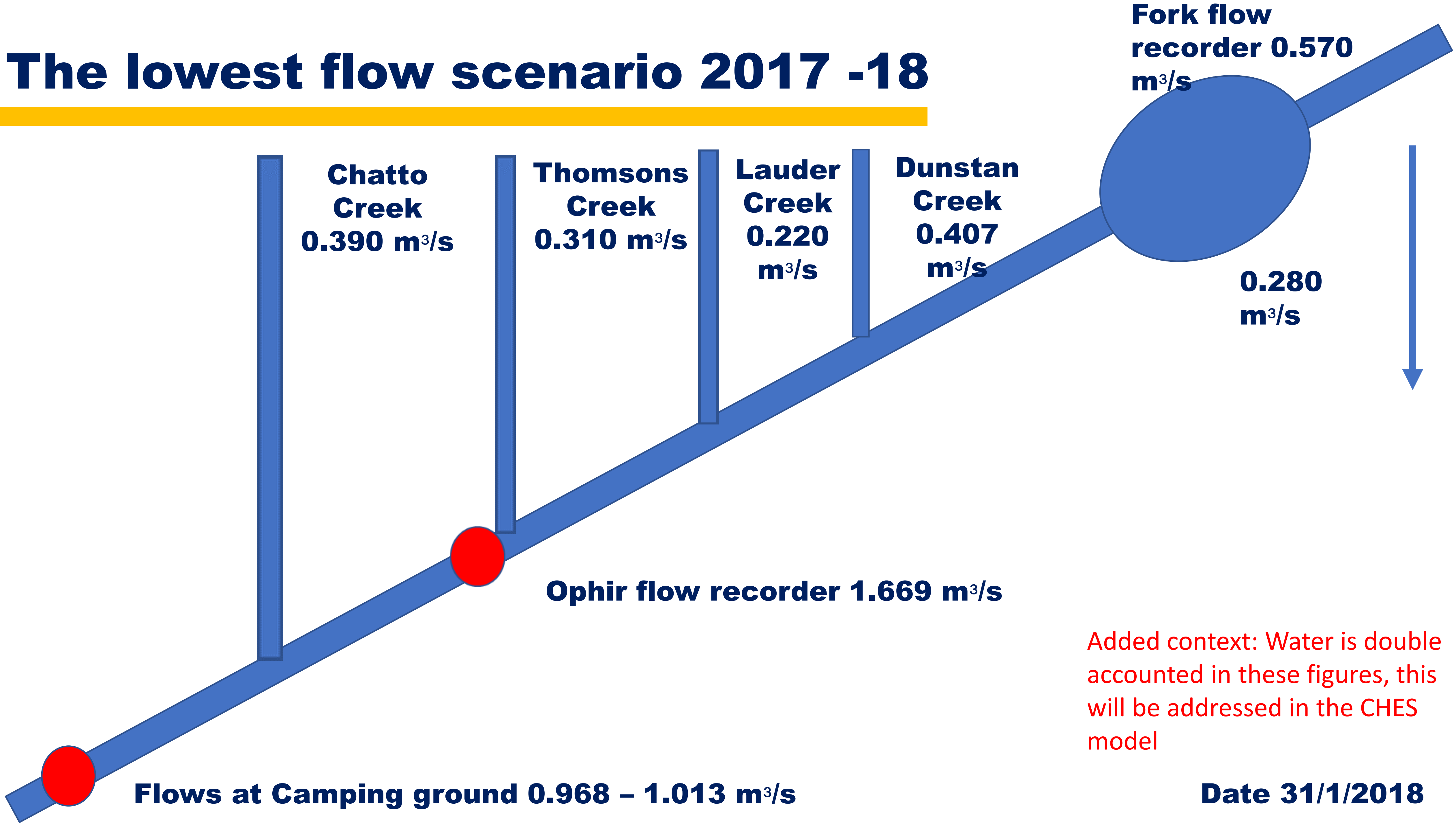
The lowest flow scenario 2017 -18



Minimum flow options

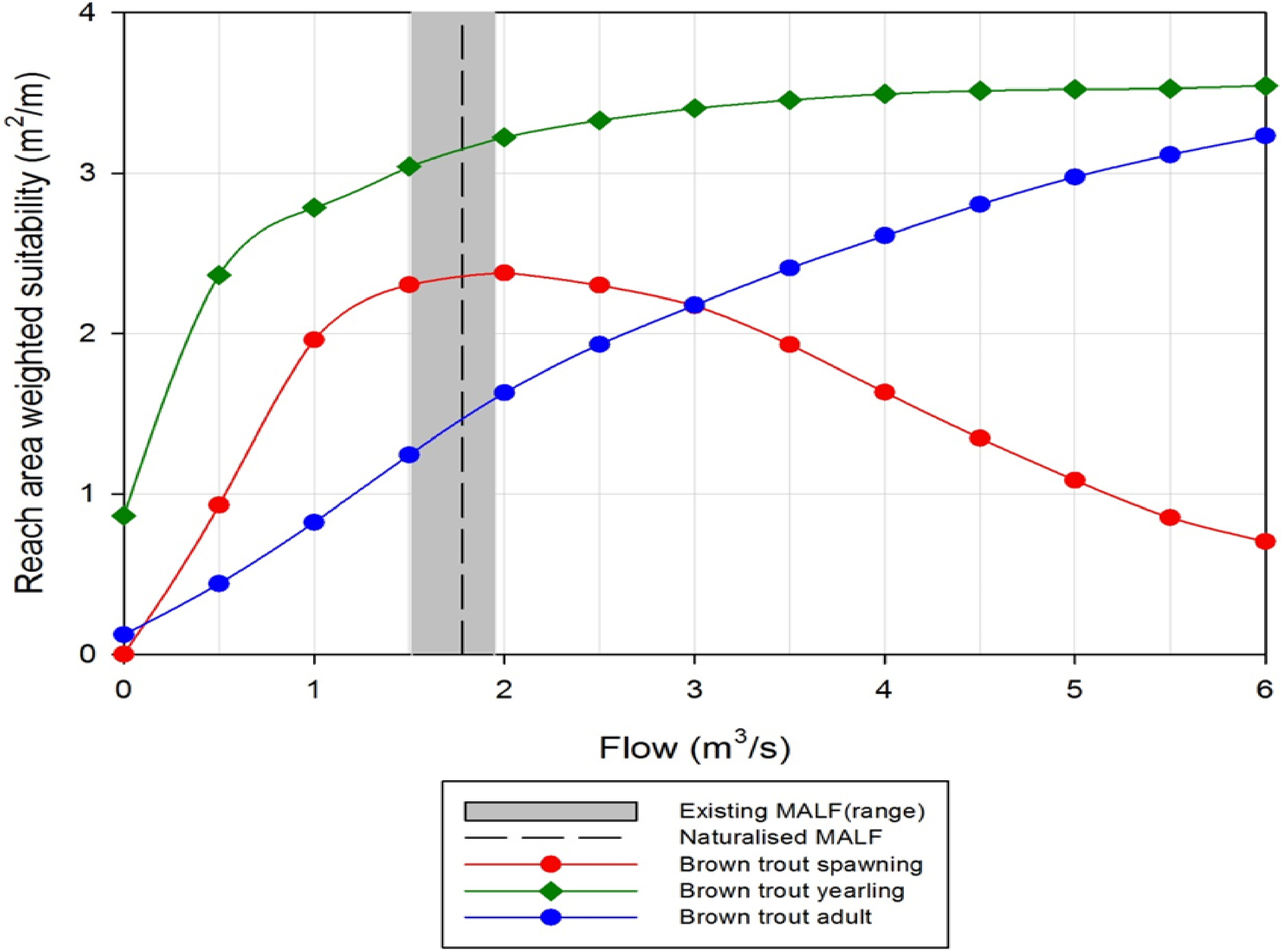
- Proposed minimum flow
  - Ophir: 1500-1750
  - Campground: 1250-1600
  - Dunstan: 400-600
- Naturalised 7-d MALF
  - Ophir: 3200 (±600)
    - Observed: 2500
  - Campground: 3900(±800)
    - Observed: 915

Upper Manuherikia (1500-1750)

Values

- **Regionally significant brown trout fishery**
- **Native fishery**
- **Natural character**
- **Birds**

Instream habitat modelling for brown trout



Habitat modelling for brown trout

Species	Optimum flow (m^3/s)	Flow below which habitat rapidly declines (m^3/s)	Flow at which % habitat retention occurs (m^3/s)		
			70%	80%	90%
Compared to existing flows					
Brown trout adult	>6.0	-	1.065–1.345	1.214–1.536	1.363–1.742
Brown trout yearling	>6.0	1.0	0.423–0.459	0.587–0.736	0.951–1.192
Brown trout spawning	2.0	1.0	0.831–0.854	0.943–0.968	1.166–1.252
Compared to naturalised flows					
Brown trout adult	>6.0	-	1.237	1.410	1.591
Brown trout yearling	>6.0	1.0	0.445	0.679	1.087
Brown trout spawning	2.0	1.0	0.845	0.959	1.218

Summary

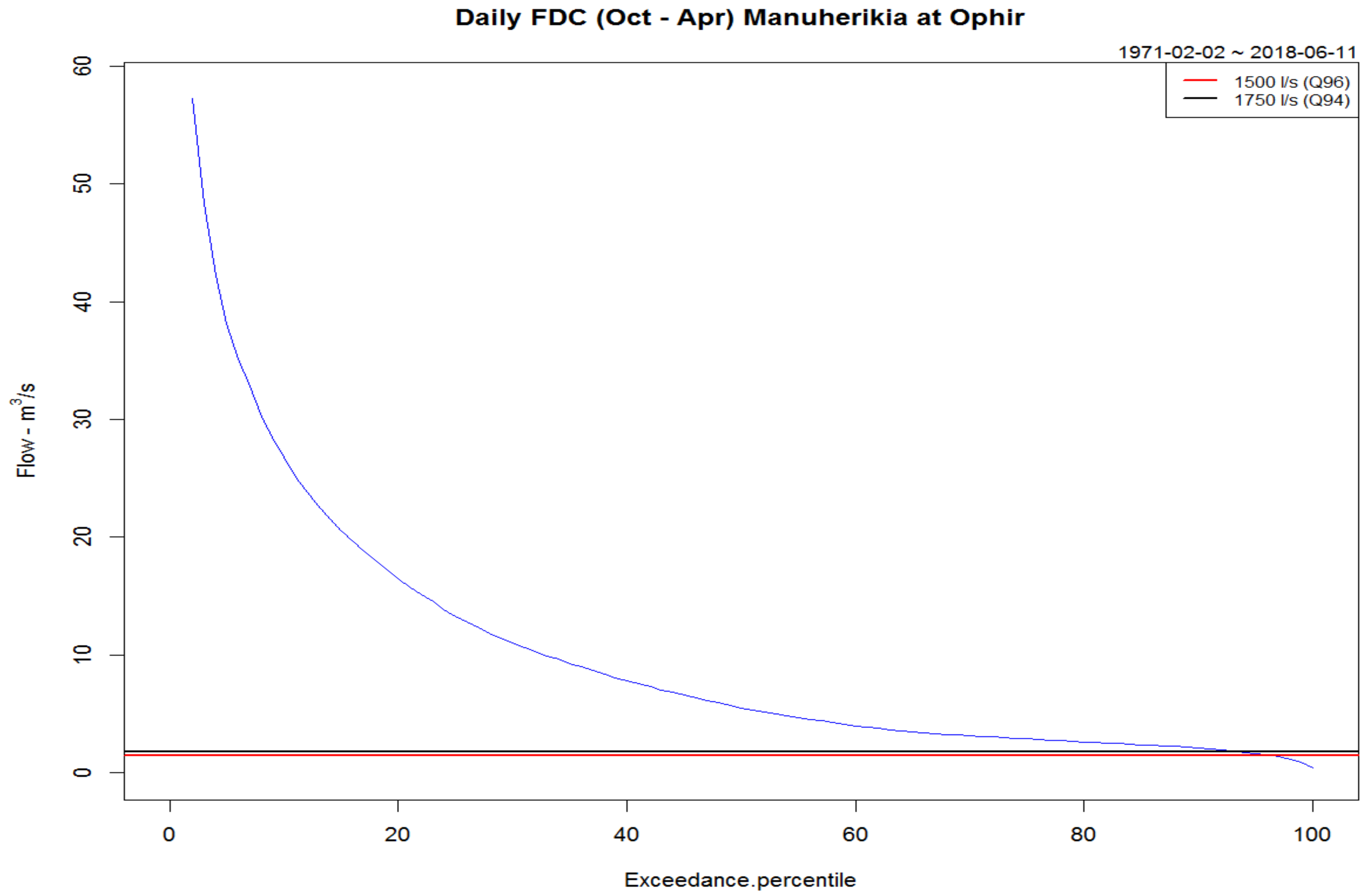
Value	Season	Significance	Suggested level of habitat retention	Flow to maintain suggested level of habitat retention (m^3/s)		Flow below which habitat rapidly declines (m^3/s)
				Naturalised	Existing	
Upper Manuherikia						
Brown trout	All year	Regionally significant†	80%	1.410	1.214–1.536	1.000
Food producing	All year	Life-supporting capacity	80%	1.311	1.163–1.404	2.000
Long filamentous algae	Summer	Nuisance	<150%	0.782	0.577–0.912	-

Brown trout instream habitat modelling
(naturalised flows)

Ophir (m^3/s)

- **0.820 provides 15% habitat retention**
- **1.5 provides 35% habitat retention**
- **1.75 provides 40% habitat retention**

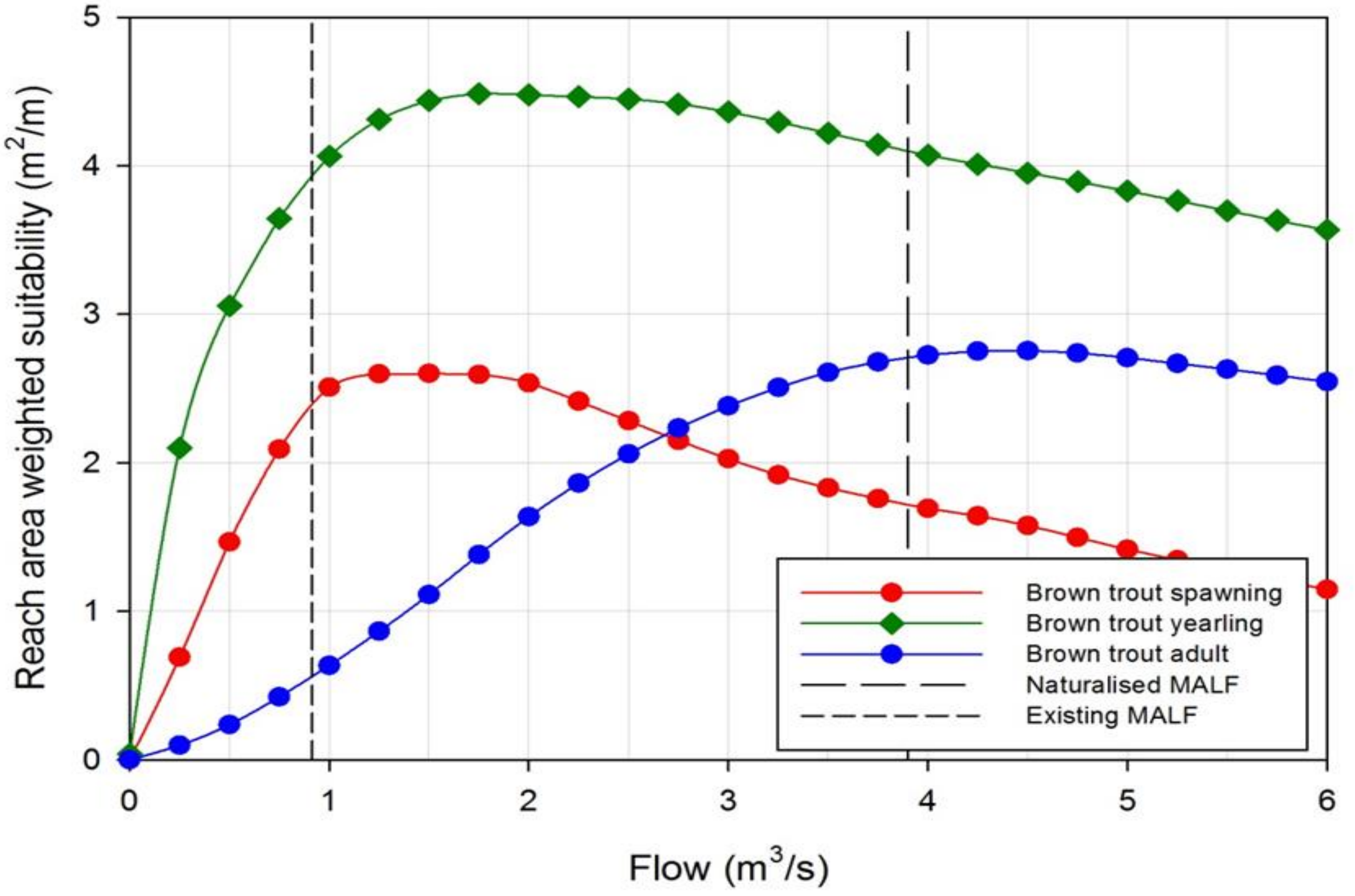
Flow duration curve



Lower Manuherikia (1250 – 1600)

- **Values:**
  - **Regionally significant brown trout fishery**
  - **Native fish**
  - **Natural character**
  - **Recreation**

Instream habitat modelling for brown trout



Instream habitat modelling for brown trout

Species	Optimum flow (m^3/s)	Flow below which habitat rapidly declines (m^3/s)	Flow at which % habitat retention occurs (m^3/s)		
			70%	80%	90%
Compared to existing flows					
Brown trout adult	4.50	3.00	0.636	0.711	0.782
Brown trout yearling	1.50–2.00	1.00	0.316	0.419	0.534
Brown trout spawning	1.00–2.00	1.00	0.485	0.576	0.671
Compared to naturalised flows					
Brown trout adult	4.50	3.00	2.292 (2.074–2.324)	2.652 (2.357–2.693)	3.107 (2.686–3.172)
Brown trout yearling	1.50–2.00	1.00	0.451 (0.494–0.415)	0.594 (0.674–0.528)	0.776 (0.903–0.694)
Brown trout spawning	1.00–2.00	1.00	0.415 (0.475–0.369)	0.471 (0.548–0.417)	0.532 (0.627–0.466)

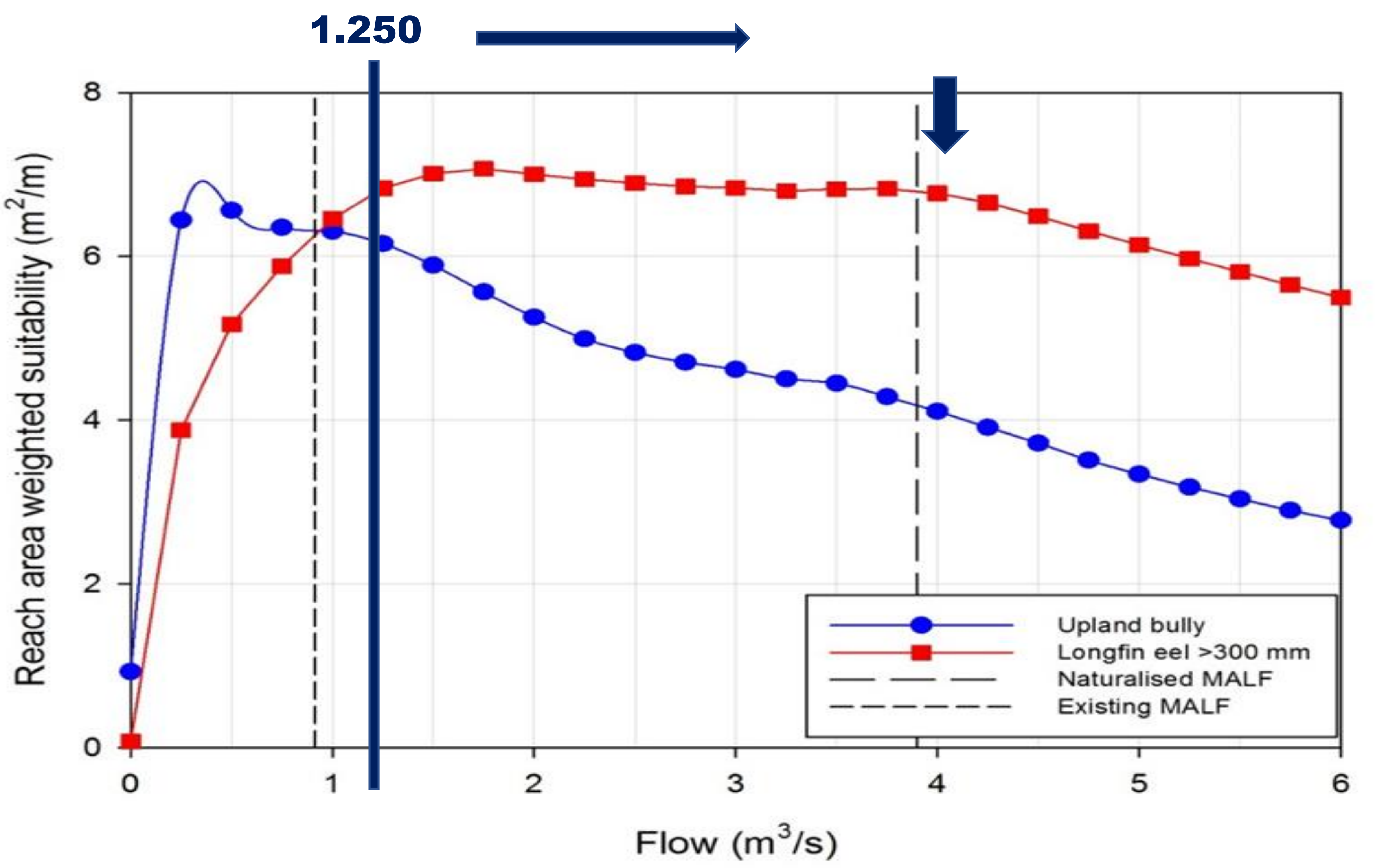
What do the proposed options provide

Flows m^3/s

3.14	2.652	1.600	1.250	0.900	0.782
90	80	45	32	20	16

% Habitat retention for brown trout

Instream habitat modelling for longfin eel



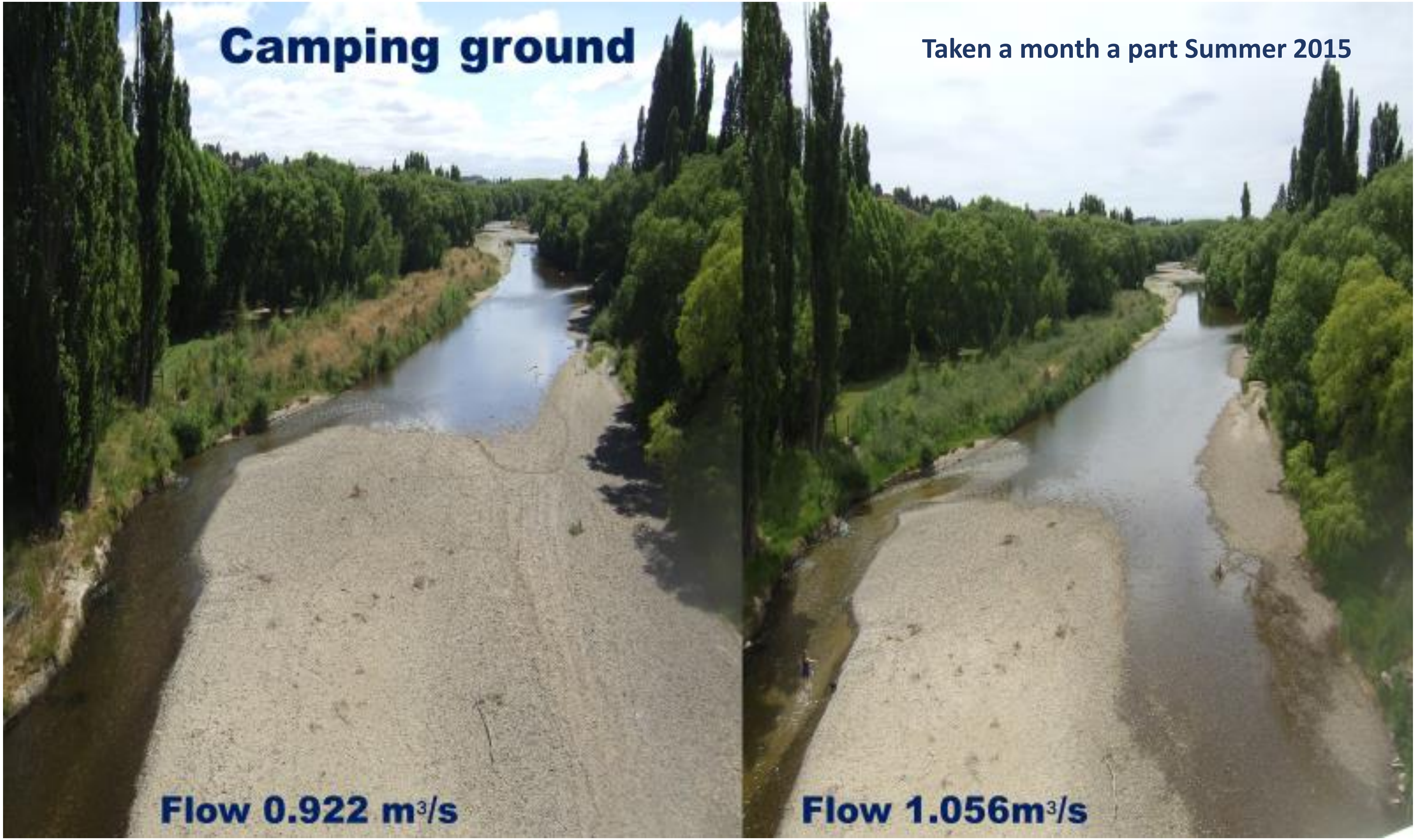
Habitat modelling for longfin eel

Species	Optimum flow (m^3/s)	Flow below which habitat rapidly declines (m^3/s)	Flow at which % habitat retention occurs (m^3/s)			
			60%	70%	80%	90%
Compared to <u>existing</u> flows						
Longfin eel >300 mm	1.75	1.00	0.242	0.348	0.468	0.664
Upland bully	0.50	0.25	0.130	0.159	0.187	0.216
Compared to <u>naturalised</u> flows						
Longfin eel >300 mm	1.75	1.00	0.288 (0.292–0.245)	0.419 (0.423–0.359)	0.592 (0.600–0.481)	0.850 (0.862–0.691)
Upland bully	0.50	0.25	0.072 (0.082–0.055)	0.091 (0.103–0.071)	0.110 (0.124–0.087)	0.128 (0.145–0.103)

Natural character

Flows at Camping–ground
1.021m³/s

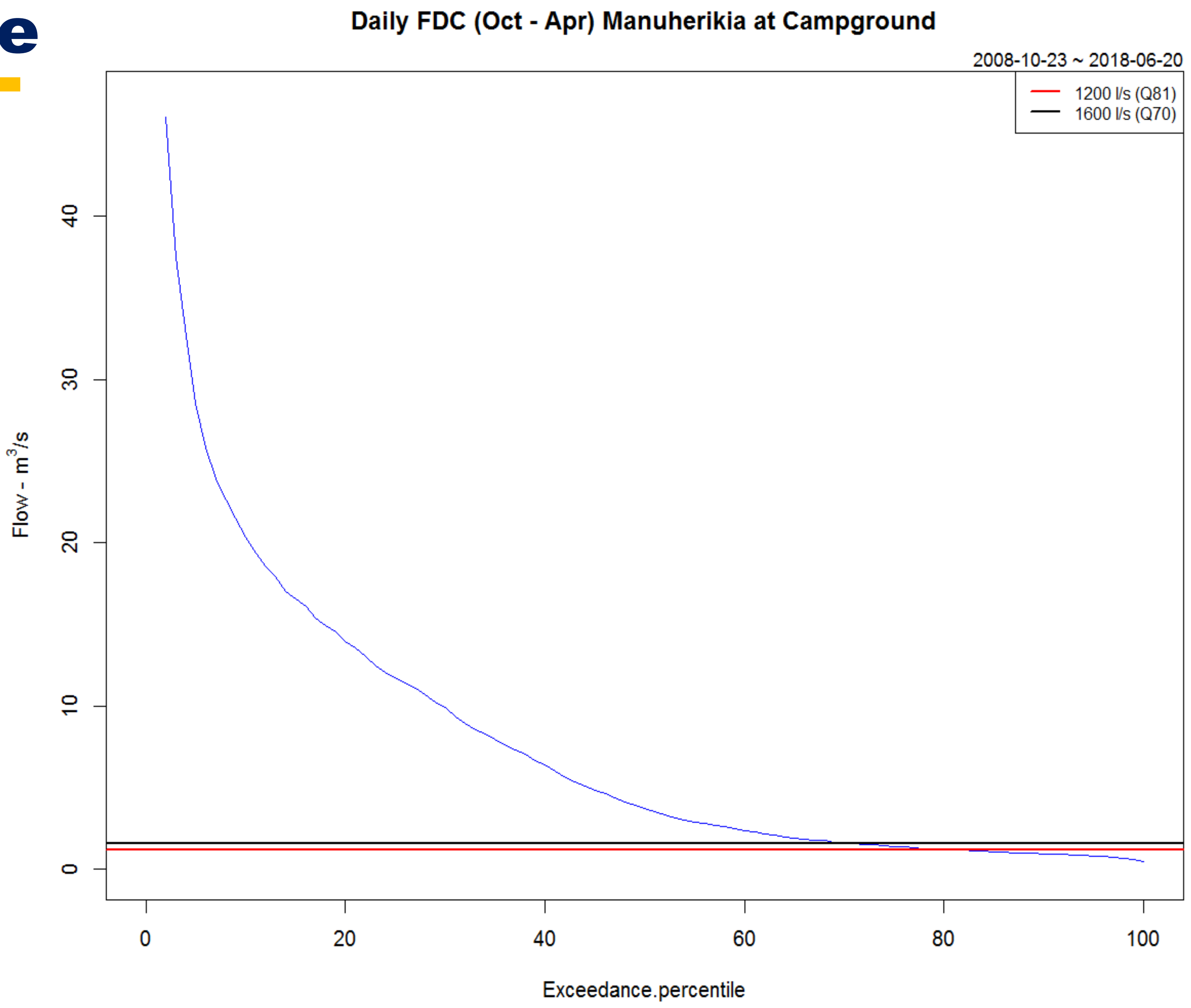
Photo 3/3/2016


Camping ground
Taken a month a part Summer 2015
Flow 0.922 m3/s
Flow 1.056m3/s

Summary

Value	Season	Significance	Suggested level of habitat retention	Flow to maintain suggested level of habitat retention (m³/s)		Flow below which habitat rapidly declines (m³/s)
				Naturalised	Existing	
Upper Manuherikia						
Brown trout	All year	Regionally significant†	80%	1.410	1.214–1.536	1.000
Food producing	All year	Life-supporting capacity	80%	1.311	1.163–1.404	2.000
Long filamentous algae	Summer	Nuisance	<150%	0.782	0.577–0.912	-
Lower Manuherikia						
Brown trout	All year	Regionally significant†	80%	2.652 (2.357–2.693)	0.782	3.250
Longfin eel	All year	At risk, declining	80%	0.592 (0.600–0.481)	0.468	1.000
Food producing	All year	Life-supporting capacity	80%	2.474 (2.064–2.862)	0.733	-
Long filamentous algae	Summer	Nuisance	<150%	2.491 (1.850–3.381)	0.161	-

Flow duration curve



What do the minimum flow options achieve

- **Ophir**

  - 1500 l/s, 35% adult trout habitat
  - 1700 l/s, 40% adult trout habitat

- **Camping ground**

  - 1250 l/s, <50% but, over 50% increase from current adult trout habitat
  - 1600 l/s, <50% but, double from current adult trout habitat

- **Dunstan Creek**

  - 400 l/s, 80% adult trout habitat
  - 600 l/s, >90% adult trout habitat

Remaining Work

- Science
  - Hydrological model for water-surety
- Economic Assessment
- Social Assessment
- Cultural Assessment