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PROPOSED LAND AND WATER REGIONAL PLAN

Potential Submission Regarding the Protection of Inanga Spawning Sites

Submitted to:
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REPORT



Photo courtesy of Shelley McMurtrie at EOS ecology

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1.0 INTRODUCTION

This report provides the justification for and a re-wording of proposed rules in the LWRP around stock access to waterways which may potentially be sites of inanga spawning. This report is provided in support of a submission on the LWRP. In addition we provided a list of known inanga spawning sites in Canterbury to augment those currently listed in Schedule 17 of the LWRP (Appendix 2).

1.1 General Biology of Inanga (*Galaxius maculatus*) in Canterbury

Inanga are the small silvery fish which make up the majority of the whitebait fishery in Canterbury (Figure 1). Larval inanga migrate from the sea into freshwater during spring. The fish matures over one or two years and then migrates downstream to estuaries on full or new moons when the spring tides cover marginal vegetation. Inanga spawning generally occurs upstream of any tidal salt wedge in areas inundated during high tides.



Figure 1: The whitebait form of inanga. Photo. Jens Zollhoefer.

Eggs are deposited amongst dense, terrestrial vegetation (Figure 2 and Figure 3) along the stream edge and are effectively glued to stems and exposed roots where they develop for approximately four weeks (Taylor 1998; McDowall & Charteris 2006). Spawning locations often only cover a small area of stream bank and are consequently very hard to locate. Egg hatching is triggered by re-immersion on the following spring tide, but survival during the intervening period is a critical bottleneck for inanga populations (Hickford & Shiel 2011). In particular it is important that eggs are deposited in such a location as to avoid desiccation, excessive UVB radiation and sufficient stem density to prevent predation by mice and slugs (Hickford et al. 2010). Anthropogenic alterations to riparian vegetation density and composition may have significant implications for the success of inanga spawning. In particular damage to riparian vegetation by stock trampling is extremely damaging to the success of inanga spawning. The inanga is a threatened fish ranked as declining by Allibone et al. (2010).



Figure 2: Flags marking the location of inanga egg clusters alongside the Ōtākaro/Avon River. Photo. Mike Hickford, University of Canterbury.



Figure 3: Inanga eggs nestled within Tall Fescue roots. Photo. Mike Hickford, University of Canterbury.



Proposed Land and Water Regional Plan (PLWRP)

2.0 STOCK EXCLUSION FROM WATERWAYS

2.1 The specific provisions of the Proposed Plan that my submission relates to are:

Section 5 Region-wide Rules, 5.133 – 5.137 Stock Exclusion from Waterways

2.2 My submission is that:

2.2.1 Oppose / support (in part or full)

Support in part the rules surrounding stock exclusion from waterways.

2.2.2 Reasons

Rules surrounding stock exclusion from waterways are supported as necessary and appropriate. However the rules should provide for a fuller suite of waterways to be protected, and should be more stringent with regard to areas that are likely to be inanga spawning sites.

As well as the beds of lakes, rivers and wetlands, inanga also spawn in the beds (defined as including the immediate riparian area that is regularly inundated) of estuarine environments and within hapua (coastal lagoons). As these areas may fall outside of the coastal marine area, they are not covered by rules in the Regional Coastal Environment Plan for Canterbury, but are consistent with rules therein. Therefore, these environments should also be protected from the use or disturbance by stock in rules 5.133 to 5.137 of the Proposed Plan.

Although Schedule 17 lists known inanga spawning sites it is our submission that inanga spawning sites are incredibly difficult to identify due to the size of the eggs and the limited timeframe over which spawning occurs. For this reason it is highly likely that inanga spawning sites are evident in many more locations than those identified in Schedule 17, and the rules should be amended to reflect this and ensure that inanga are in fact protected to a more appropriate level within the rules.

The addition below seeks to protect the areas that are likely to be used by inanga for spawning. Specifically, the lower reaches of rivers, wetlands, lake margins, estuaries and hapua which are affected by tidal oscillations or associated with a lake.

2.2.3 I seek the following decisions from Environment Canterbury:

2.2.3.1 Rule 5.133

Reword as follows (additions shown as **bold and underlined**, deletions shown with a ~~strike through~~):

5.133 The use and disturbance of the bed of a lake, or river, or a wetland, estuary, or hapua (coastal lagoon) by outdoor intensively farmed livestock for temporary or permanent stocking or temporary access is a prohibited activity.

2.2.3.2 Rule 5.134

Reword as follows (additions shown as **bold and underlined**, deletions shown with a ~~strike through~~):



- 5.134 The use and disturbance of the bed of a lake, ~~or river, or a wetland, estuary, or hapua (coastal lagoon)~~ by cattle or farmed deer for temporary or permanent stocking is a prohibited activity in the following areas:

2.2.3.3 Rule 5.135

Reword as follows (additions shown as **bold and underlined**, deletions shown with a ~~strikethrough~~):

- 5.135 The use and disturbance of the bed of a lake, ~~or river, or a wetland, estuary, or hapua (coastal lagoon)~~ for permanent stocking or temporary access and any associated discharges is a permitted activity, provided the following conditions are met:

Add new condition to be met as follows:

5. **The use or disturbance shall not be within 1,000 m of the upstream extent of tidal influence in a river or wetland, or within 1,000 m of a lake, estuary or hapua (coastal lagoon).**

2.2.3.4 Rule 5.136

Reword as follows (additions shown as **bold and underlined**, deletions shown with a ~~strikethrough~~):

- 5.136 The use and disturbance of a the bed of a lake, ~~or river, or a wetland, estuary, or hapua (coastal lagoon)~~ for a permanent stock crossing point and any associated discharges is a permitted activity, provided the following conditions are met:

2.2.3.5 Rule 5.137

Reword as follows (additions shown as **bold and underlined**, deletions shown with a ~~strikethrough~~):

- 5.137 The use and disturbance of the bed of a lake, ~~or river, or a wetland, estuary, or hapua (coastal lagoon)~~ for temporary or permanent stocking and any incidental discharges that does not comply with one or more of the conditions 2 to 4 ~~5~~ in Rule 5.135, and for a permanent stock crossing point that does not comply with one or more of conditions 2 to 6 in Rule 5.136, is a discretionary activity.

3.0 DEFINITIONS

3.1 The specific provisions of the Proposed Plan that my submission relates to are:

Section 2 How the Plan Works and Definitions, 2.10 Definitions, Translations and Abbreviations

3.2 My submission is that:

3.2.1 Oppose / support (in part or full)

Support in part the definitions in the Proposed Plan.



3.2.2 Reasons

Definitions within the Proposed Plan are supported as necessary and appropriate. However, an additional definition is necessary to reflect the additional wording within the rules surrounding the exclusion of stock from waterways, as detailed in this submission. The definition required is for the term 'tidal influence' in order for users of the Proposed Plan to have a clear understanding on the reaches of waterways influenced by the tides, and which therefore represent potential inanga spawning areas.

3.3 I seek the following decisions from Environment Canterbury:

On page 2 – 14, after the definition provided for territorial authority, insert the following definition:

Tidal influence means the extent of a river or wetland which shows some level response to the daily oscillation of the tides. This includes areas affected by the backing-up of freshwater as well as those inundated by brackish or saline water.

4.0 KNOWN INANGA SPAWNING LOCATIONS

4.1 The specific provisions of the Proposed Plan that my submission relates to are:

Schedule 17 – Salmon and Inanga Spawning Sites, Inanga Spawning Sites (page 16 – 29)

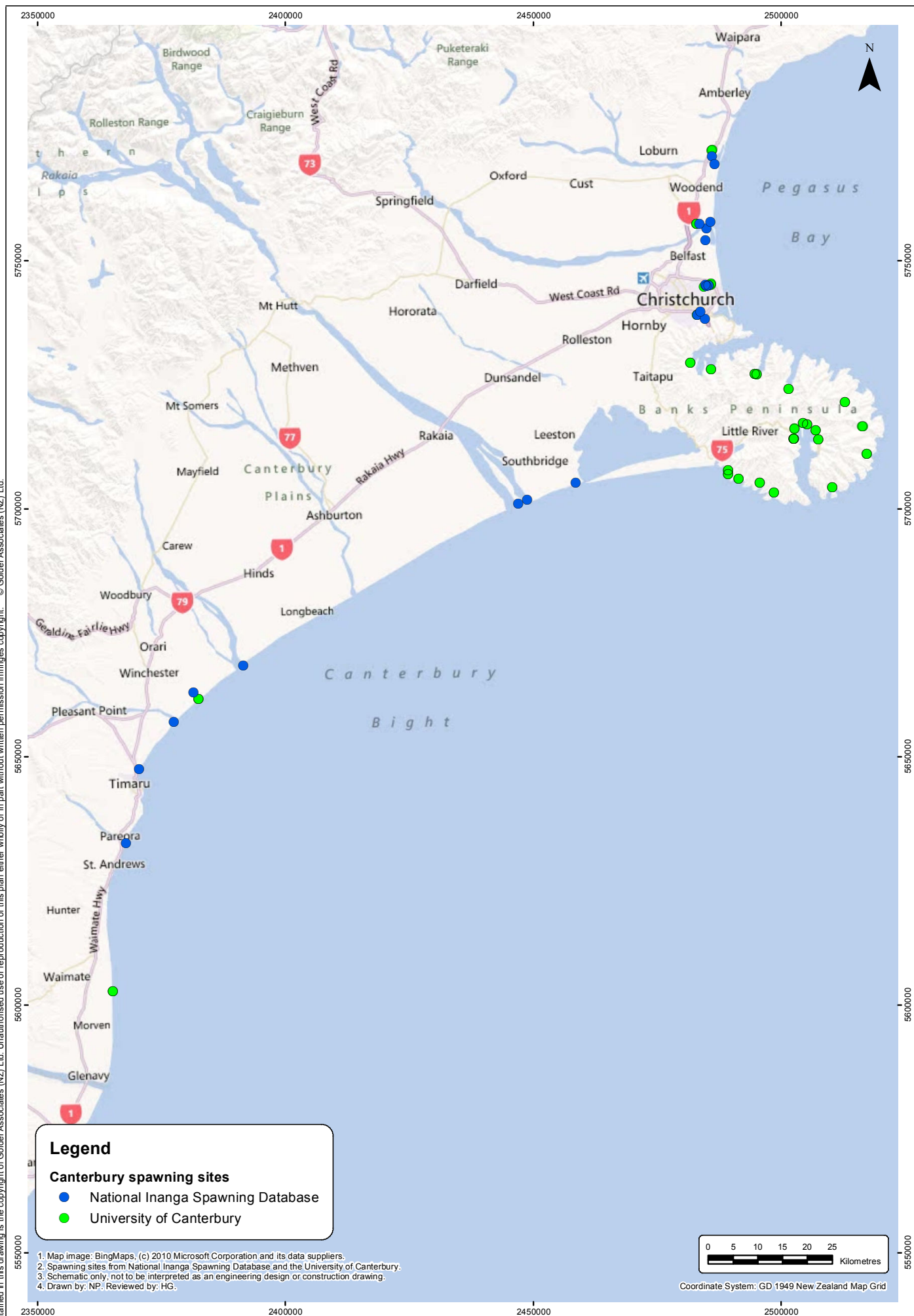
4.2 My submission is that:

4.2.1 Oppose / support (in part or full)

Support in part the list of inanga spawning sites in Schedule 17 of the Proposed Plan

4.2.2 Reasons

In addition to the current list of inanga spawning sites, we provide a list of additional known Canterbury inanga spawning sites for inclusion into Schedule 17 (Figure 4). Site details are listed in Appendix B. The majority of these sites were provided by Dr Mike Hickford at the University of Canterbury whom wished to convey the considerable effort involved in locating and characterising sites. Dr Hickford also stated that given the lack of information on the overall number of spawning sites these sites should all be regarded as important.





PROPOSED LWRP - PROTECTION OF INANGA SPAWNING SITES

4.3 I seek the following decisions from Environment Canterbury:

Add the following inanga spawning sites to the list provided in Schedule 17 after the Rakaia Mouth, Boat Creek site.

Table 1: Inanga spawning sites identified by the Marine Ecology Research Group at the University of Canterbury.

Catchment	Location	Upstream margin		Downstream margin		~ extent
Waihao River	Vegetated area on True Right (TR) in hapua 400m north of Waihao Box	2365224	5602782	2365223	5602783	<1 m ²
Orari River	Vegetated area on True Left (TL) 300m upstream of culvert to oxbow	2382446	5661688	2382453	5661682	<1 m ²
Hikuraki Bay Stream	TR 45m upstream of beach	2489372	5707849	2489368	5707836	<1 m ²
Magnet Bay Stream	Just below footbridge 200m upstream of beach	2489305	5707113	2489304	5707101	<1 m ²
Tumbledown Bay Stream	Below road bridge, 45m upstream of beach	2491488	5706059	2491488	5706046	<1 m ²
Peraki Creek	TR on small reach 100m upstream of beach	2495702	5705319	2495707	5705300	<1 m ²
Long Bay Stream	TL 20m upstream of beach	2498569	5703399	2498560	5703395	<1 m ²
French Farm Bay Stream #1	Small creek near to Bantry Lodge road, 25m upstream of culvert	2502560	5714164	2502558	5714159	<1 m ²
French Farm Bay Stream #2	TL 25m upstream of Wainui Main road bridge	2502560	5714259	2502601	5714236	<10 m ²
Barrys Bay Stream	TL 20m upstream of Christchurch Akaroa Road bridge	2502767	5716226	2502760	5716177	<10 m ²
Pawsons Stream, Duvauchelle Bay	TL 2m upstream of Christchurch Akaroa Road bridge	2504436	5717394	2504438	5717392	<1 m ²
Pipers Stream, Duvauchelle Bay	TL 50m upstream of Seafield Road bridge	2505326	5717096	2505321	5717087	<1 m ²
Robinsons Bay Stream	TL 10m upstream of Christchurch Akaroa Road bridge	2507029	5715937	2507013	5715925	<3 m ²
Takamatua Stream	TL 20m upstream of end of Old French Road	2507504	5713992	2507482	5713987	<3 m ²
Flea Bay Stream	Western stream, 40m downstream of Flea Bay Road bridge	2510393	5704376	2510409	5704373	<1 m ²
Goughs Bay Stream	150 m reach 650m upstream of beach	2517249	5711151	2517377	5711131	>10 m ²
Le Bons Stream	160m reach on TR (including side stream) 400m upstream of lower Le Bons Bay Road bridge	2516382	5716774	2516535	5716800	>10 m ²
Opara Stream, Okains Bay	100m reach upstream from Schoolhouse Road bridge	2512885	5721603	2512950	5721681	<10 m ²
Pigeon Bay Stream	170m upstream of Wharf Road Bridge	2501580	5724148	2501553	5724181	<3 m ²
Te Kawa Stream, Port Levy	115m reach upstream from Fernlea Point Road bridge	2495132	5727186	2495085	5727096	<10 m ²



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Wharf Road Stream, Port Levy	Small creek in Port Levy, 100m east of Purau Port Levy Road, 145m upstream of Wharf Road bridge	2494747	5727244	2494753	5727232	<3 m ²
Te Wharau Stream, Charteris Bay	110m downstream of Marine Drive bridge	2485908	5728213	2485937	5728187	<3 m ²
Allandale Stream, Governors Bay	10m upstream of Governors Bay Teddington Road bridge	2481719	5729548	2481721	5729552	<3 m ²
Heathcote River	TR on reach from 100m downstream of rail bridge to Opawa Road Bridge	2483086	5739225	2483248	5739354	<10 m ²
Lake Kate Sheppard	PRE-EARTHQUAKE All banks in south west corner	2485920	5745215	2485925	5745547	>10 m ²
Avon River (multiple sites)	Reach from Dixons Reserve to Alloway Street	2484439	5744919	2485466	5745081	>10 m ²
Courtenay Stream, Kaiapoi	TR on small reach 15m upstream of stopbank/tide gates	2482957	5757562	2482964	5757568	<3 m ²
Saltwater Creek ¹	200m reach west of Broad Road bridge	2486018	5772352	2486209	5772387	>10 m ²

Note: NZ map grid coordinates are provided for the up and downstream extent of the reach. The approximate extent of the spawning area is also included.

Table 2: National inanga spawning records from the Canterbury region.

Catchment/Waterway	Location	Easting	Northing
Ellesmere	Waikewai Creek	2458600	5705400
Ashley River	Taranaki Stream	2486600	5769600
Ashley River	Saltwater Creek (main branch)	2485800	5758000
Opihi River	Tributary on TR bank downstream of Waipopo River confluence	2377500	5657000
Orari	Ohapi Creek confluence	2381496	5663001
Washdyke Creek	Channelised section near lagoon	2370496	5647601
Benzies Creek	Bankside grasses between willow trees	2486100	5771200
Pareora	Waterway draining swamp into lagoon at mouth	2367796	5632601
Boat Creek, Rakaia Lagoon	TR bank	2448800	5701800
Rakaia	Mathias Creek	2447000	5701100
Rangitata	Side branch of mainstem, near fishing huts	2391496	5668401
Waimakariri	Kaiapoi River	2483500	5757600
Heathcote	Opawa Road bridge	2483098	5739201
Heathcote	Wilsons Road bridge	2481800	5739300
Avon	Avondale Bridge area (TL and TR bank)	2484798	5745201
Avon	Avondale Road Bridge	2484798	5754201
Avon	Corsers Stream, Avondale, Christchurch	2485398	5745101
Avon	Amelia Rogers Reserve, Avondale, Christchurch	2484998	5745001
Styx	Just upstream of tide gates, both banks	2485016	5756635

Note: Records have been extracted from the national inanga spawning database, and/or have been kindly provided by Mark Taylor (AEL).



5.0 CLOSING

This report provides the justification for, and a re-wording of proposed rules in the PLWRP around stock access to waterways which may potentially be sites of inanga spawning. In addition we provide a list of known inanga spawning sites in Canterbury to augment those currently listed in Schedule 17 of the PLWRP.

Please note that a submission to the Canterbury Regional Council on the Proposed Land and Water Regional Plan will require the full extent of Form 5 to be filled in as part of the submission which can be found here: <http://ecan.govt.nz/publications/Plans/proposed-clwrp-submission-form.pdf>.

6.0 REFERENCES

- Allibone R, David B, Hitchmough R, Jellyman D, Ling N, Ravenscroft P, Waters J 2010. Conservation status of New Zealand freshwater fish, 2009. *New Zealand Journal of Marine and Freshwater Research* 44: 129-148.
- Hickford MJH, Cagnon M, Shiel DR 2009. Predation, vegetation and habitat-specific survival of terrestrial eggs of a diadromous fish, *Galaxias maculatus* (Jenyns, 1842). *Journal of experimental marine biology and ecology* 385: 66-72.
- Hickford JH, Shiel DR 2011 Synergistic interactions within disturbed habitats between temperature, relative humidity and UVB radiation on egg survival in a diadromous fish. *PLoS ONE* 6:e24318.
- McDowall RM, Charteris SC 2006. The possible adaptive advantages of terrestrial egg deposition in some fluvial diadromous galaxiid fishes (Teleostei : Galaxiidae). *Fish and Fisheries* 7:153-164.
- Taylor, M. J. 1998. Inanga spawning in the Avon and Heathcote Rivers, April 1998. NIWA client report CHC98/42, National Institute of Water and Atmospheric Research Ltd, Christchurch, 12p.



APPENDIX A

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