Why is fish passage important?

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Statutory obligations

- Freshwater Fisheries Regulations 1983
- Resource Management Act 1991
- Regional & District policies, plans & rules
- Future – FW RMA reforms, NOF

Activity	DOC	Other	Legislation
Allow for fish passage	√	RCs	r.41 & r.42 FFR s.14 RMA
Fish facility - allow fish and water to pass and associated management functions	√		r.43-50 FFR

Background

Management of all fisheries types in NZ is governed by the Conservation Act 1987
(includes Freshwater Fish Regulations 1983, and the Fisheries Act 1983)

DOC has various statutory functions for freshwater fisheries management including:

- "Protecting freshwater fish habitats" (s.6ab; Conservation Act 1987)
- "Advocating the conservation of aquatic life and freshwater fisheries generally" (s.53(3)(d); Conservation Act 1987)
- Administering the fish passage provisions

(Part VI of the Freshwater Fisheries Regulations 1983 (FFR83)).

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Freshwater Fisheries Regulations 1983

Part VI (Regulations 41-50)

- **Culverts & fords** may not be built in such a way as to impede fish passage, without a permit from the DG.
- The DG may require that **any dam or diversion structure has a fish facility** (fish pass, fish screen or similar) included & set conditions on their design and performance.

*Apply to all defined structures built after 1 January 1984

- Authorisations required regardless of any other consents (e.g. RMA, Building Act etc) or landowner approvals
- Rely on advocacy to Regional Councils under RMA consent process

- Environment Court ruling in 2002 found no conflicts between RMA & FFR
- So increased expectation for DOC to fulfil obligations

DOC Plans

- Agreed protocol
- National fish passage project established 2013
  - Develop application form and assessment process
  - Ensure DOC standards allow for fish passage
  - Collate best practice and guidance
  - Establish prioritisation process

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Resource Management Act 1991

- "safeguarding the life-supporting capacity"
- "**Avoiding, remedying, or mitigating** any adverse effects of activities on the environment"
- "the preservation of the natural character... wetlands, and lakes and **rivers** and their margins"
- "the **protection** of outstanding natural features....**areas of significant habitats of indigenous fauna**"
- "Maintenance and enhancement of quality of environment"....

S13, 14, 17...

Future Change & Opportunities

- FW RMA reforms
  - greater collaborative processes
- National Objectives Framework
  - Set management objectives for communities/councils (Fish)

Value	Ecosystem Health	
Freshwater Body Type	Rivers	
Attribute	Periphyton	
Attribute Unit	mg chl-a/m^2 (milligrams chlorophyll-a per square metre)	
Attribute State	Numeric Attribute State	Narrative Attribute State
	Annual Maximum*	
A	<50	Rare blooms reflecting negligible nutrient enrichment and/or alteration of the natural flow regime or habitat.
B	50-120	Occasional blooms reflecting low nutrient enrichment and/or alteration of the natural flow regime or habitat.
C	120-200	Periodic short-duration nuisance blooms reflecting moderate nutrient enrichment and/or alteration of the natural flow regime or habitat.
National Bottom Line	200	
D	>200	Regular and/or extended-duration nuisance blooms reflecting high nutrient enrichment and/or significant alteration of the natural flow regime or habitat.

Attribute – fish passage
Attribute unit – e.g. Barrier parameters (height, downstream pool) or Threatened NMG locations

What are the key parameters for fish passage that we would want included?

Regional & District Policies, Plans & Rules

Varies around the country

Some still don't have water plans

	Regional Councils (13)	District Councils (8)
What are the rules in your organisation's Plan for new structures?	9 Yes 1 Developing 3 Unsure	3 yes 1 no 4 No answer
What are the rules in your organisation's Plan for existing structures?	6 Yes 4 No 3 Unsure	2 Yes 2 No 4 Unsure
Have you ever taken enforcement action to require fish passage?	4 Yes 7 No 2 No answer	8 No

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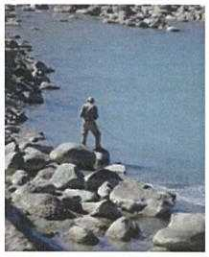
What are the rules in your organisation's Plan for new structures?

Waikato	Structures may not prevent fish passage if catchment greater than 100 ha, depth >3m and dam does not retain >20,000m3
Greater Wellington, ORC	Must provide fish passage
BOP, CCC	Maintain fish passage
TRC	Shall not restrict the passage of fish
Horizons	Required for structure to meet permitted activity status
Tasman	Threshold for piping 15m
WCRC	Fish passage when dealing with damming and diversion (12.4)
ECAN	Differ for structures prior to 1 Nov 2010 and after (use and maintenance, reconstruction, alteration, extension, demolition, removal, erection, placement and use..)
Nelson City	Fish passage should be considered
Southland	Shall not be impeded

What are the rules in your organisation's Plan for existing structures?	
Northland	Maintaining life supporting capacity
Auckland	No rules to require fish ramps
Greater Wellington	New non-regulatory programme will be developed to assist with the remediation of existing barriers
TRC	Shall not restrict the passage
Horizons	In order to have permitted status, fish passage is required. Therefore by default if fish passage is not allowed for a structure it is no longer permitted and a consent/permission from DG of DOC is required
Tasman	Same as previous + those existing before Feb 2010 have 5 years from the operative date of the plan to provide for fish passage
WCRC	Damming and diversion (12.4)
ECAN	BLR4 - specific limits on length, diameters of culverts, catchment area above a dam or weir....
ORC	Must provide fish passage if it is under the permitted activity rule. If consent is required a decision on whether fish passage was needed would have been made
Wellington City	minimise/remove barriers to fish passage
Nelson	Structures can be improved if damaged; changes to the Freshwater Plan are required to deal with permitted structures (e.g. retention dams)that need fish passage improvements.

Why are freshwater fish important?

- Recreational
- Commercial
- Customary
- Ecological
- Conservation






Who are our freshwater fish?

- Native fish


51 taxa recognised

67% of native fish threatened or at risk in NZ

No legal protection

- Sport fish


- Pest fish







- ⅔ native fish are migratory

- Remaining resident





- Landlocked populations



Why is fish passage important in New Zealand

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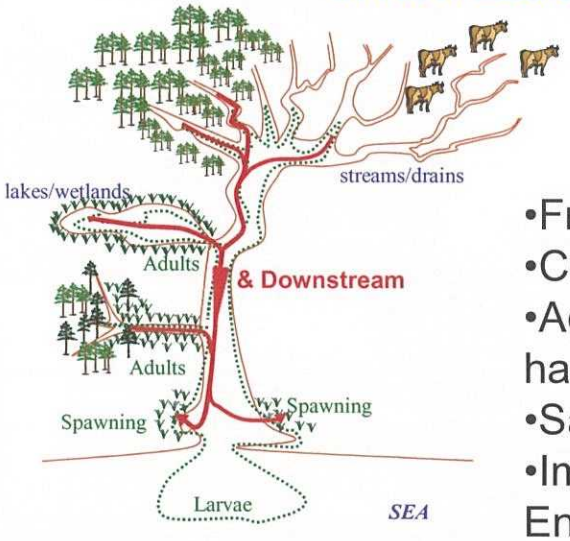
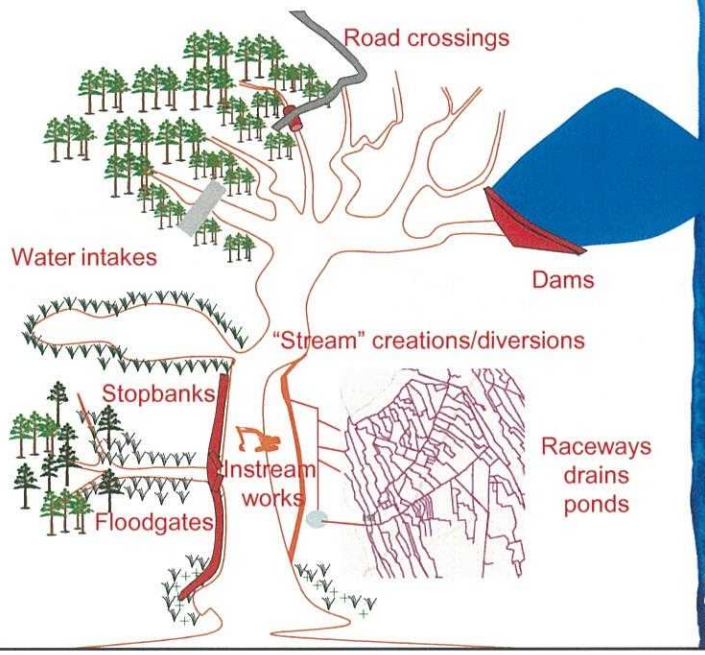


- Free passage
- Connectivity
- Access to suitable habitat
- Safe areas
- Impingement/ Entrainment

We've changed our rivers…



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To understand what makes a barrier we need to understand the fish…

- Distribution
  - Available habitat
  - Recruitment potential
- Habitat preferences
- Migration & Spawning timing
- Swimming ability
  - Climbers
  - Jumpers
  - Swimmers
- Behaviour
  - Access provision
- Size

NIWA's experimental ramps to test fish swimming abilities (source NIWA)

Migration and spawning timing

TABLE 3. MAIN SPAWNING AND MIGRATION PERIODS FOR NATIVE FISH SPECIES FOUND IN CANTERBURY (FOCUSSING ON DIADROMOUS POPULATIONS) (BLACK= DOWNSTREAM MOVEMENT; STRIPED = UPSTREAM MOVEMENT; GREY = NON DIADROMOUS)

Species	Moving	Life Stage	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov
			Summer	Summer	Summer	Autumn	Autumn	Autumn	Winter	Winter	Winter	Spring	Spring	Spring
Lamprey	Up	Adult												
	Down	Juvenile												
Longfin eel	Up	Juvenile												
	Down	Adult												
Shortfin eel	Up	Juvenile												
	Down	Adult												
Giant kokopu	Up	Juvenile												
	Down	Larva					?	?	?	?	?			
Shortjaw kokopu	Up	Juvenile												
	Down	Larva												
Kaoro	Up	Juvenile												
	Down	Larva												
Banded kokopu	Up	Juvenile												
	Down	Larva												
Inanga	Up	Juvenile												
	Down	Larva												
Stokell's smelt	Up	Adult												
	Down	Larva												
Common smelt	Up	Adult												
	Down	larva												
Black flounder	Up	Juvenile												
	Down	Adult												
Yellowbelly flounder	Up													
	Down													
Torrentfish	Up	Juvenile												
	Down	Larva												
Common bully	Up	Juvenile												
	Down	Larva												
Giant bully	Up	Juvenile												
	Down	Larva												
Bluegill bully	Up	Juvenile												
	Down	Larva												
Redfin bully	Up	Juvenile												
	Down	Larva												
Lowland longjaw galaxias			?	?					?	?	?	?	?	
Dwarf galaxias						?	?	?						
Upland longjaw galaxias						?	?	?						
Bignose galaxias						?	?	?		?	?	?		
Alpine galaxias										?	?	?	?	?
Canterbury galaxias														
Canterbury mudfish														
Upland bully														

Fish physiology, behaviour, size, life-history

Climbers

Jumpers

Swimmers

+ combination

- Varying styles & abilities,
- Vary with life stage

Swimming ability

RELATIONSHIP BETWEEN SWIMMING SPEEDS (VF M/S), FISH LENGTH (L M) AND TIME (T SECS) (BOUBEE ET AL.1999)

	EELS	INANGA/SMELT/BULLIES
SUSTAINED VF	1.87L^0.5t^-0.13	5.29L^0.63t^-0.16
BURST VF	5.6L^0.5t^-0.33	14.4L^0.63t^-0.43

COMMON NAME	SWIMMING VELOCITY GENERAL (ADULT)	SWIMMING VELOCITY GENERAL (JUVENILE)	SWIMMING VELOCITY OVER <15M (JUVENILE)	SWIMMING VELOCITY OVER >15 M (JUVENILE)
Eels	<1.5 2	<0.2 0.5		
Shortfin eel		Preferred <0.3 0.15 >0.6*	<0.3	<0.25
Longfin eel		<0.15 >1.0*		
Giant kokopu	<0.1			
Shortjaw kokopu	<0.05			
Koaro	<0.8*	0.1 0.24*		
Banded kokopu	0 0.05	0.04 0.29	<0.3	<0.25
Inanga	<0.15 0.36	0.007 0.39	<0.3	<0.25
Lowland longjaw galaxias	0.07 preferred 0.1 0.5	0.1 (fry)		
Alpine galaxias		0.1 (fry)		
Canterbury galaxias	<0.15 0.6*	0.1 (fry)		
Torrentfish	0.3<1.1*			
Common bully	0.15 0.6*	0.24 0.28	<0.3	<0.25
Upland bully	<0.15 0.7*			
Bluegill bully	0.3 >1.0*			
Redfin bully	<0.15 0.6*			
Common smelt	0.15 0.6*	0.19 0.27	<0.3	<0.25
Mean NZ species (based on observation obtained with juvenile shortfin eel, common bully, common smelt, inanga and banded kokopu)		0.2 0.32		

- Most occur over a range of velocities
- Generally <0.3 ms^{-1} to enable them to swim
- <0.1ms^{-1} if important spawning or migration area
- >1.5 ms^{-1} would exclude all species climbing or clinging species

Size

COMMON NAME	APPROXIMATE SIZE RANGES (MM)			
	ON HATCHING	JUVENILE	ADULT	EGGS
Lamprey	11	90 100	200 750	1
Longfin eel	6 9	60 200	400 1500	n/a
Shortfin eel	6 9	50 200	400 1200	n/a
Giant kokopu	9	45 50	70 580	2
Shortjaw kokopu	9	45 50	70 350	2
Koaro	9	45 50	70 290	2
Banded kokopu	8	40 45	70 260	2
Inanga	7	50 65	70 150	2
Lowland longjaw galaxias	7	15 20	60 90	
Dwarf galaxias		20 30	60 90	2
Upland longjaw galaxias		30 55	60 90	2
Bignose galaxias		15 30	60 80	
Alpine galaxias		20 35	60 110	2
Canterbury galaxias	7	20 35	70 150	2.5
Canterbury mudfish	6	35 50	70 150	1.5
Stokell's smelt	5	50 60	70 100	0.7
Common smelt	5	45 55	60 120	1
Black flounder			200 300	n/a
Yellowbelly flounder			200 500	n/a
Torrentfish		16 20	60 160	
Upland bully		10 20	60 130	2
Common bully	3	10 20	60 150	1
Giant bully		10 20	70 240	1
Bluegill bully	3	20	50 90	1
Redfin bully	3	15 20	60 120	1

- Most < 150 mm

Some;
As large as 580-2000mm
As small as 3-10 mm

Behaviour

- In addition to upstream and downstream movement fish also move within the water column
- From limited observations migrating fish generally near surface or the bottom

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Barriers to fish passage

- **Unintentional barriers**
  - Man-made structures e.g. culverts, dams, weirs, fords…..
  - Natural waterfalls or cascades
- **Intentional barriers**
  - Built barriers
  - Water intake structure and design

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Unintentional barriers

- Road crossings, Culverts, Weirs, Fords




- Dams


- Floodgates

- Natural barriers

Sometimes barriers are protecting native fish that can not compete with others e.g. Trout..... best not to fix

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Natural barriers

Swimburn waterfall protecting Central Otago Roundhead galaxias from brown trout

Hakataramea waterfall protecting native fish upstream from brook char downstream

Intentional Barriers

Built barriers

- Barriers that are installed to protect native fisheries or other values
- Natural Barriers altered to ensure protection

Water intakes

Built to try & prevent entrainment & impingement as fish that get into water intakes often have no way out

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Key points

- Legal obligations
  - DOC
  - FW RMA reforms
  - NOF
- Fish are important
- Need to understand the fish
- Barriers can be good & bad
- Best to consider fish passage when installing not have to retrofit
- Connectivity is the key

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