

Freshwater - Fresh Thinking

Enhancing impact assessment in water management



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Modification and loss of waterways: assessing impacts and reversing the trend

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At a glance

- ~ 425,000 km of rivers and streams
 - ~ 4,000 lakes (> 1 ha)
 - ~ 200 aquifers
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- NZ rivers with little or no farming or urban development make up approx. 50% of NZ rivers – and generally have good water quality
 - Two thirds of lakes in natural or partially developed catchments and likely to have good water quality
 - ~ 60% of aquifers have normal nitrate levels



Modification and loss of waterways

- Is the physical nature and extent of waterways neglected?
- Is the modification and loss of freshwaters acceptable?
- Does the NPS-Freshwater Management address this and does it offer solutions?

- Focus on:
 - Single multi-impact projects on freshwaters
 - Multiple (often small) projects with impacts on freshwaters



Wetlands

- Wetlands once covered 2.4 million hectares - nearly 10% - of the country; less than 250,000 hectares remain
- Loss greatest in the North Island: <5% of wetlands remain.
- In the South Island, ~16% remain.
- In all, 90% of our wet places have been lost or modified in NZ.



Modification and loss of waterways

- Less known of loss of streams to culverts/piping etc.
- Truncation/fragmentation of waterways
- Few developments that don't encounter streams/rivers
- Necessary component of most land developments
- Permitted activity in some regions/circumstances



Multi-impact assessments: Roads

- **Mackays to Peka Peka Expressway (16 km):**
 - 4,183 m of stream length affected by works
 - 2,350 m (22 culverts for 1,119 m of valued streams)
 - 1,530 m of stream diversion (9 diversions)
 - 312 m of stream bank armouring (8 bridges)
- **Ara Tūhono: Pūhoi to Warkworth Motorway (18.5 km):**
 - 1,788m of permanent stream habitat
 - 7,151m of intermittent stream habitat
 - 40 culverts, 7 large viaducts, 5 bridges (9 required because of stream / river crossings)
- Typically lowland streams, intermittent, ephemeral





Multi-impact assessments: Wind Farms

- Large amount of earthworks (> 1 million m^3)
- Typically ephemeral waterways or wetlands affected
- Road crossings typically minimal
- Headwater gullies/streams at risk





Multi-impact assessments: Wind Farms



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Multi-impact assessments

Issues:

- Large projects: roads, windfarms, large greenfield subdivisions
- Linear routes that may be flexible
- Cross several catchments and streams
- Large volumes of earthworks ($\sim 800 - 1$ million m^3)



Multi-impact assessments

Solutions

- Routes can be flexible – avoidance of features
- Sediment management a priority; guidelines exist
- Several outcomes: Bridges, culverts, dams, diversions
- Ecology - early consideration in design
- Mitigation hierarchy typically well applied

Issues

- Multiple - but fragmented mitigation?
- Single integrated mitigation/offset



Multiple losses of small (or parts of) streams

- Large number of developments with small stream losses (~ 100 m)
 - Mostly urban environments, increasingly peri-urban developments
 - Upper and lower catchments
 - Encroach on rural environments/bush
 - Streams/wetlands highly modified
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- 'Daylighting'





Multiple losses of small streams





Loss of stream length (consented: Auckland)

Financial year	Stream Length (m)
1999-2000	9,197
2000-2001	11,368
2001-2002	11,961
2002-2003	11,035
2003-2004	7,058
2004-2005	12,159
2005-2006	7,146
2006-2007	3,669
2007-2008	7,146

Nine year mean = 8,971 m; total = 80,739 m (~ 80 kms)

NB excludes Permitted activities and Category 2 stream



Valuing aquatic ecosystems

- No unifying or nationally accepted approach to assessments of significance or values in aquatic environments
- Council significance criteria often not used for aquatic ecosystems or not seen as applicable (generally seen as developed for terrestrial ecosystems)
 - Distinctiveness,
 - Rarity
 - Representativeness,
 - Context,
 - sustainability etc.
- Approaches to assessing ecological integrity of freshwaters



Assessing aquatic ecosystems

- Focus on single or narrow suite of attributes
- Habitat measured but largely not valued in impact assessment
- Focus on single scores/indices
- Lack of context, especially geographical location and scale (NPS attempt to overcome this)
- Offset mitigation can overshadow the 'significance' or 'value-establishing' content
- Less relevance as get closer to decision-making process?



Ecosystem health and integrity

Ecosystem health is indicative of the preferred state of sites that have been modified by human activity, ensuring that their ongoing use does not degrade them for future use.

Ecological integrity is fully realised when human actions have little or no influence on sites and when the biological community reflects the influence of ecological, rather than human, processes.

‘... the ability to support and maintain a balanced, integrated, adaptive biologic system having the full range of elements and processes expected in the natural habitat of a region.’ Karr 1996



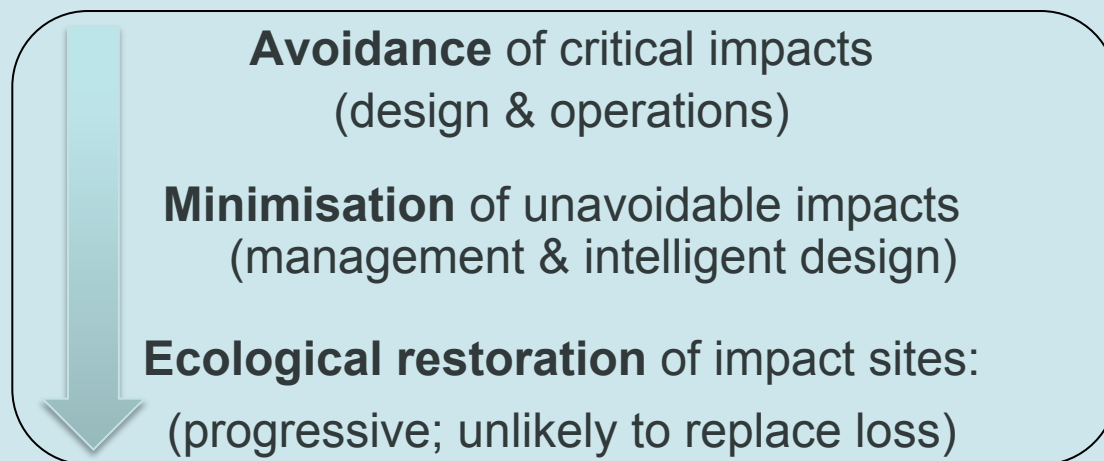
Mitigation and Offsets

- Offsets unfamiliar term for use/loss of aquatic resources (exception of wetlands)
 - 'No net loss' policies (especially wetlands)
 - 'Like for Like' assumption
 - Expert settlement is a driver as get closer to decision-making process exercise
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- No net loss vs Net gains
 - Manage impacts on-site
 - On-site vs Off-site compensation (residual impacts)



'The mitigation' hierarchy

Project impacts



Residual impacts

Biodiversity offsetting

Additional conservation actions
(compensation; including for loss of
ecosystem services)

Environmental compensation – residual effects that cannot be mitigated – not default position



Proposed NPS Freshwater Management

- Focus on water quality and quantity
- Ecosystem health as a compulsory value?
- Will bottom lines for water quality achieve ecosystem health?
- Attributes of Ecosystem health values:
 - Biophysical condition
 - Connectivity
 - Extent of waterway
 - Ecosystem benefits of mitigation



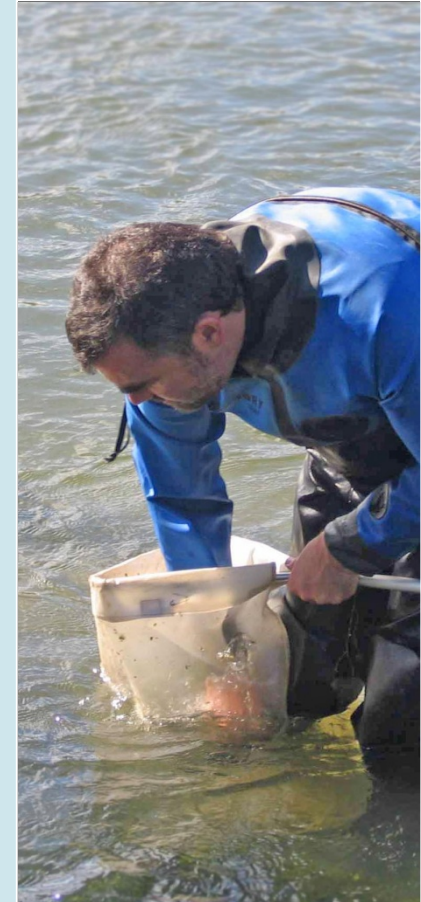
Proposed NPS Freshwater Management

- Compulsory mitigation ratios?
- Peka Peka to Otaki
 - 2:1 for High aquatic ecological value streams;
 - 1.5:1 for Moderate aquatic ecological value streams; and
 - 0.7:1 for Low aquatic ecological value streams.
- Should permanent diversions will reflect a no-net loss of ecological condition and value?
- NPS to include provisions/process for mitigation/offset



Benefits of mitigation for loss of waterways

- Standard methodology (SEV for small streams)
- Based on credible systems used overseas
- SEV accepted practice in Auckland
- Applies to all permanent streams (not intermittent or ephemeral streams)
- General policy framework applies (no net loss)
- Largely unchallenged at higher levels of decision-making but increasing
- Other compensation mechanisms are available (e.g., habitat hectares)





Disadvantages of mitigation for loss of waterways

- Standard methodology narrows use of other available information
- Generally does not apply to intermittent or ephemeral streams
- ‘One size fits all’?
- Database information is unused
- Other tools not used (e.g., REC)
- Sensitivity to judgements is untested
- Lacks objective for restoration
- Difficulties in application to multi-impact projects



Disadvantages of mitigation for loss of waterways

- No net loss vs Net gains
- Manage impacts on-site
- On-site vs Off-site compensation (residual impacts) – often difficult to achieve in practice – move to constrain on-site
- In perpetuity?
- Other attributes ignored or ambiguous (i.e., rarity, distinctiveness)
- Increasingly a default tool (*‘a silver bullet?’*)
- Values assessment and mitigation settlement can become disconnected and isolated



Final thoughts

- Is the modification and loss of freshwaters acceptable?
- Should the NPS-Freshwater Management provide guidance on loss of waterways?
- Should intactness of waterways be a compulsory value?
- Develop guidance on assessing stream values/integrity
- *Should we develop ‘a priori’* mitigation/compensation ratios for loss of freshwaters?



'Daylighting'



- Opening piped waterways
- Multiple benefits





Thank you – Any questions?





Ecosystem integrity

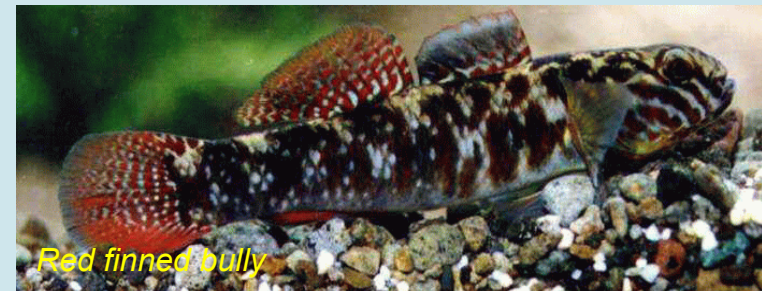
- **Nativeness** - the degree to which an ecosystem's structural composition is dominated by the indigenous biota characteristic of the particular region.
- **Pristineness** - relates to a wide array of structural, functional and physico-chemical elements (including connectivity), but is not necessarily dependent on indigenous biota constituting structural and functional elements.
- **Diversity** - richness (the number of taxa) and evenness (the distribution of individuals amongst taxa); link to a reference condition?; the use abundance weighting?; and geographical scale.
- **Resilience (or adaptability)** - quantifying the probability of maintaining an ecosystem's structural and functional characteristics under varying degrees of human pressure.

(From: Schallenberg et al. 2010: Approaches to assessing ecological integrity of New Zealand freshwaters.



Recent advances

- NPS Freshwater Management
- NES Ecological Flows and Levels
- Land and Water Forum
 - Water quality
 - Water quantity
 - Urban streams
 - Iwi
- Approaches to assessing ecological integrity of freshwaters
- Conservation threat status of native fish
 - Macroinvertebrates to come





Riparian zone planting and management





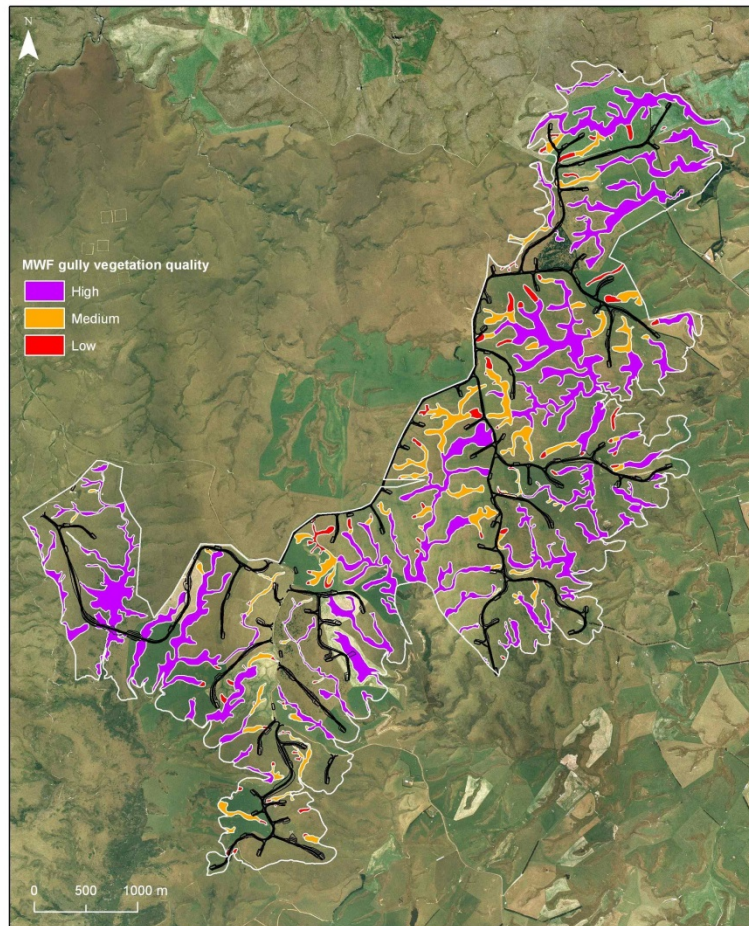
Modification and loss of waterways

- Trends:
 - Riparian planting
 - Offset mitigation
 - Stream diversions
 - Wetland enhancement
- Is this enough?



Final thoughts

- Caution to application of Auckland-based compensation mechanism elsewhere (ex- Auckland)
- *Should we develop ‘a priori’ mitigation/compensation ratios?*
- Multi-impact especially linear projects (e.g., roads, windfarms)
- Increasing use of expert caucus to settle differences
- Divergence of values and mitigation



Gully Vegetation Quality	Total Area ha	Percentage
High	270.0 ha	75.2%
Medium	63.0 ha	17.6%
Low	26.0 ha	7.2%

Potential Effects

Disposal of fill in gully headwaters
Construction of tracks

Management

Avoidance of high quality gullies
and waterways
Criteria for gully selection
developed
Rehabilitation of fill sites