

Coastlines – spatial planning for land and sea  
EDS CONFERENCE 2011

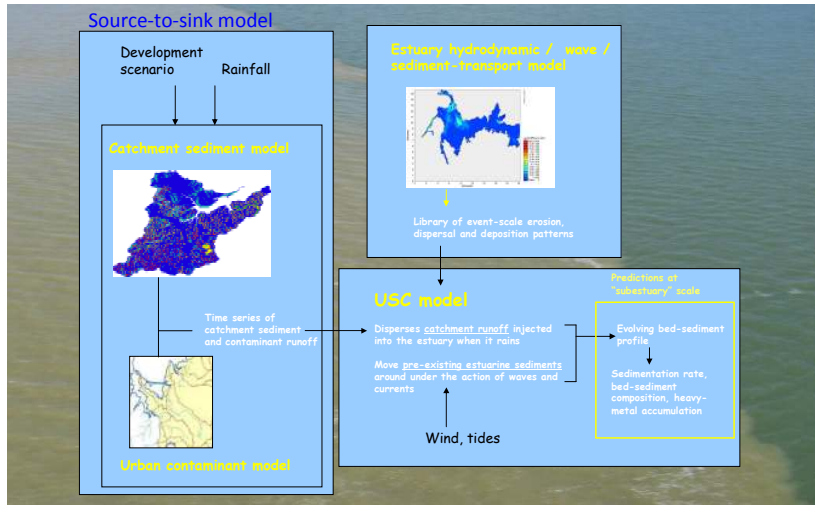
# Managing Sedimentation and Diffuse-Source Contaminants: a Limits-Based Approach

Malcolm Green

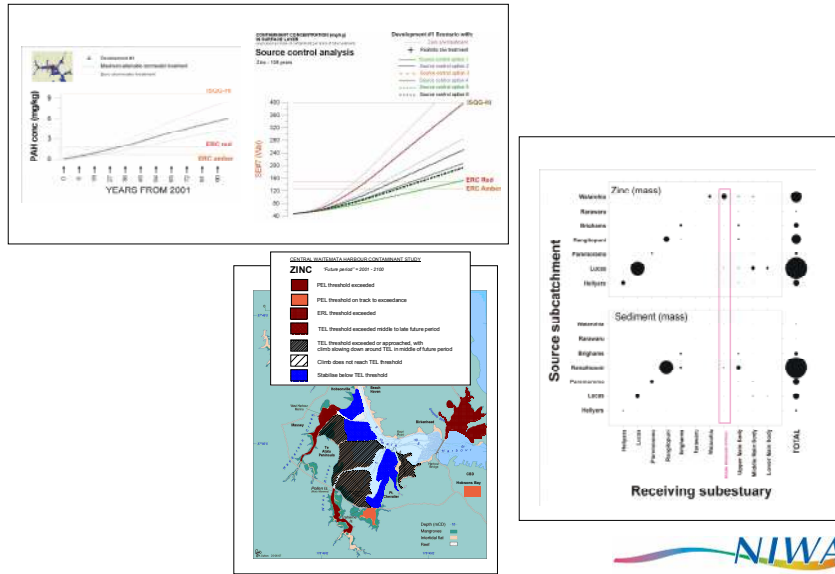
National Institute of Water and Atmospheric Research (NIWA)  
Hamilton



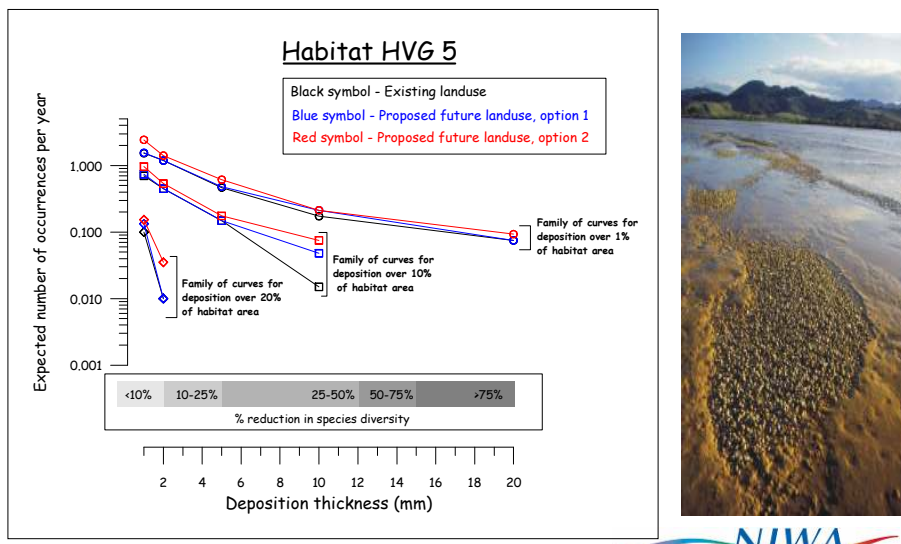
## Supporting effects-based management of diffuse-source contaminants



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### How do you manage cumulative effects?



*“without limits it is hard to manage diffuse discharges – nutrients, microbes, sediment and other contaminants that wash into water from the land – and impossible to deal with the cumulative effects on water bodies of water takes on the one hand and diffuse and direct discharges to water on the other”*

Land and Water Forum

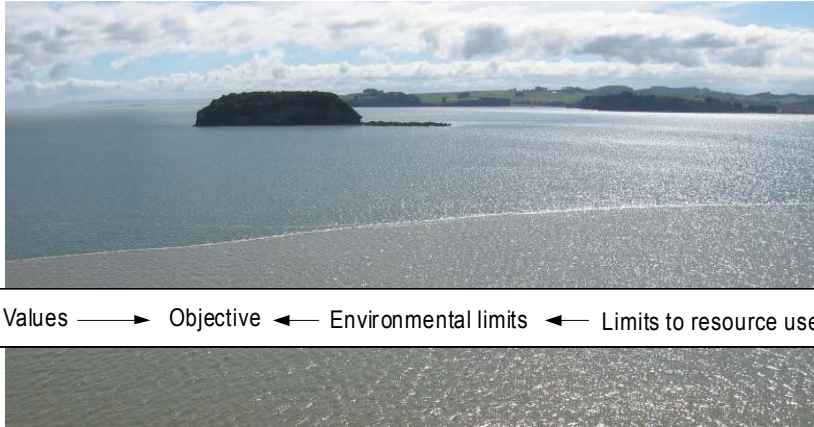
#### **Aims**

- Explore how the setting of limits and the management of cumulative effects of diffuse-source contaminants are connected
- Lay out some elements of a conceptual and technical framework for thinking about limits-based management of estuaries



### Definition of limits

- **Environmental limits** are intended to give effect to **objectives**. A **standard** (for water quality or sedimentation rate, for instance) is a type of environmental limit
- **Limits to resource use** are intended to give effect to environmental limits (catchment contaminant load limits or minimum lake water levels, for instance)



Values → Objective ← Environmental limits ← Limits to resource use

### What does it mean to set a limit?

- Set **objectives**

*return recreational shellfish harvest to the 1950s level*

- Set **environmental limit**

*annual-average sedimentation rate of 6 mm/year*

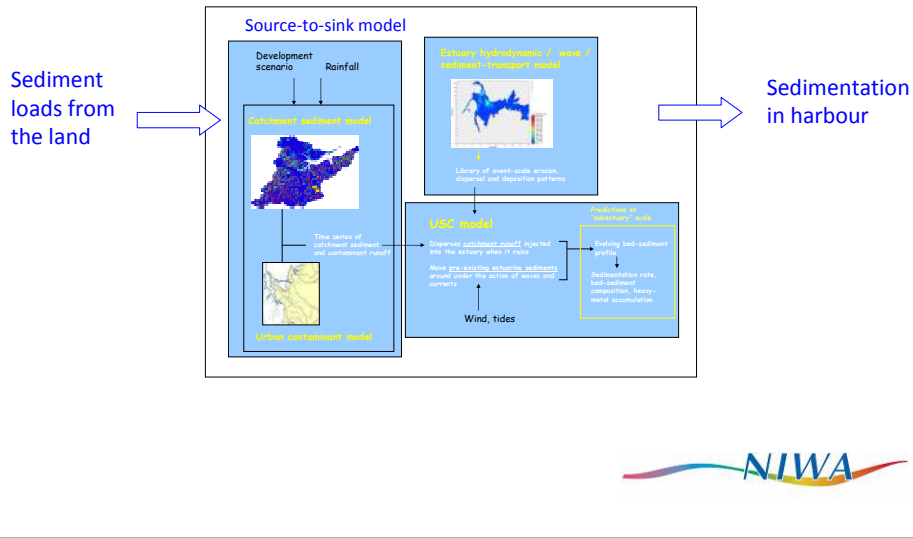
- Set **limits to resource use**

*in this case, it will be a sediment load limit*

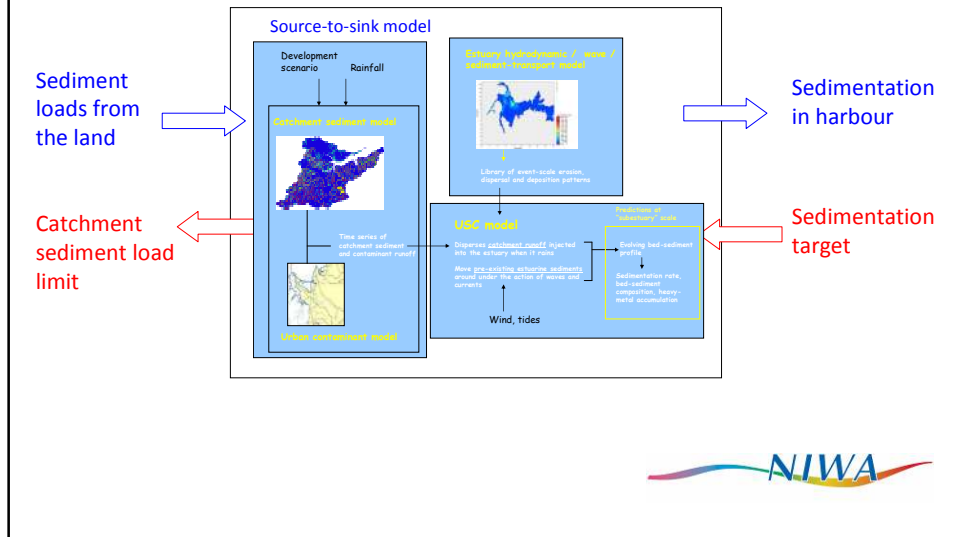
Values → Objective ← Environmental limits ← Limits to resource use



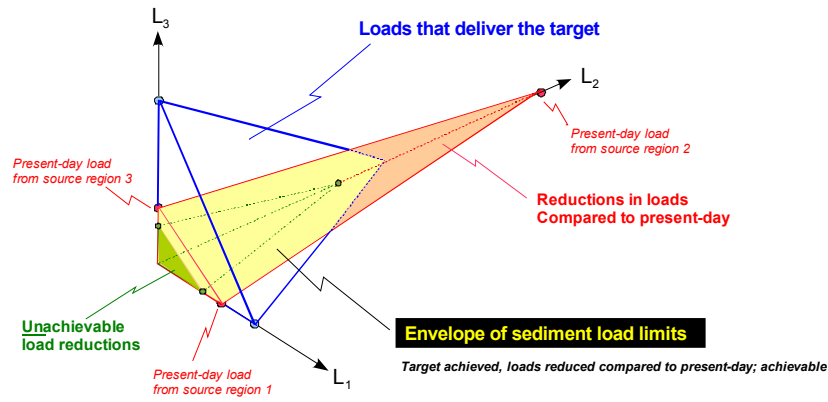
### Calculating the sediment load limit ...



### ... requires inversion of the source-to-sink model ...



... which gives the envelope of sediment load limits

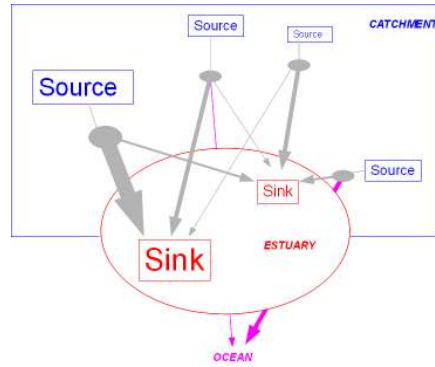
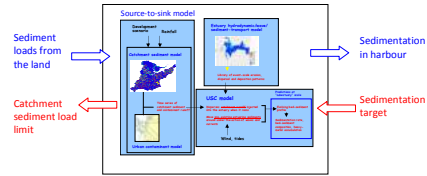


### Managing by sediment load limits

- Allocate
- Monitor



What does it really mean to “invert a source-to-sink model”?



What we really need to know are sources, sinks and transport pathways...

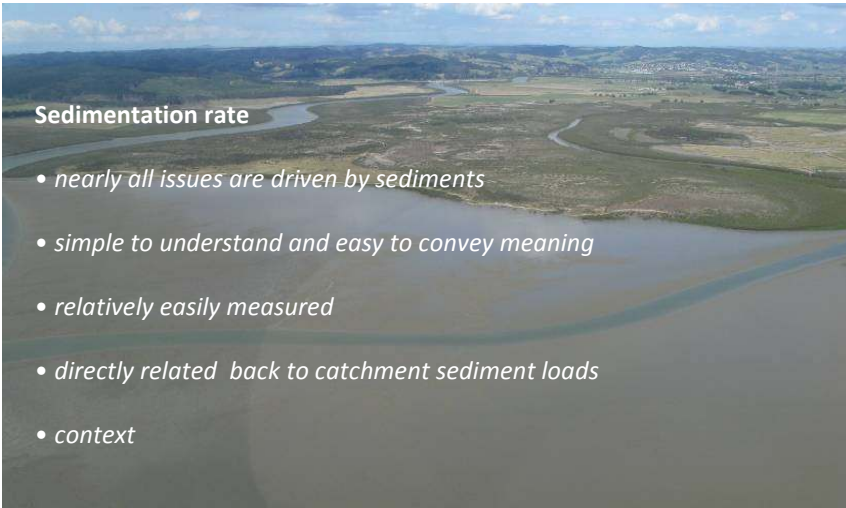
... and the rest is just algebra



### Co-benefits



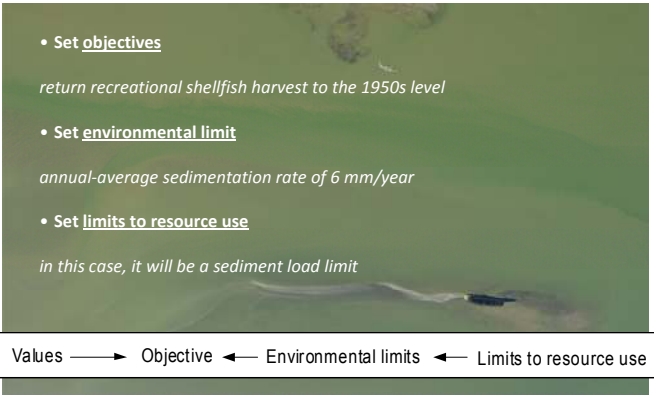
## Co-benefits



**Sedimentation rate**

- *nearly all issues are driven by sediments*
- *simple to understand and easy to convey meaning*
- *relatively easily measured*
- *directly related back to catchment sediment loads*
- *context*

## Setting the objective, and then relating that objective to the environmental limit



• Set objectives  
*return recreational shellfish harvest to the 1950s level*

• Set environmental limit  
*annual-average sedimentation rate of 6 mm/year*

• Set limits to resource use  
*in this case, it will be a sediment load limit*

Values → Objective ← Environmental limits ← Limits to resource use



## Management of Cumulative Effects of Stressors on Aquatic Ecosystems

(MSI-funded, CO1X1005, NIWA)

1. Establish a theory of sediment load limits based on inverting source-to-sink contaminant models, including determining exactly what information is needed from the S2S model
2. Extend the theory to multiple contaminant stressors
3. Scope schemes for contaminant offset trading
4. Examine the concept of co-benefits as a legitimate management goal
5. Identify obstacles and opportunities for limits-based management under the RMA
6. Establish sediment load limits for Porirua Harbour working with GWRC and PCC on the back of harbour sedimentation rate objectives
7. Apply wider results to Kaipara Harbour, working in partnership with AC and NRC, and steered by the KRPG



### CONCLUSIONS

Limits-based management is required to manage cumulative effects and to achieve standards

We are building conceptual and technical foundations for limits-based management of estuaries

### ACKNOWLEDGEMENTS

Ministry of Science and Innovation  
[CO1X1005, Management of Cumulative Effects of Stressors on Aquatic Ecosystems]

Auckland Council

