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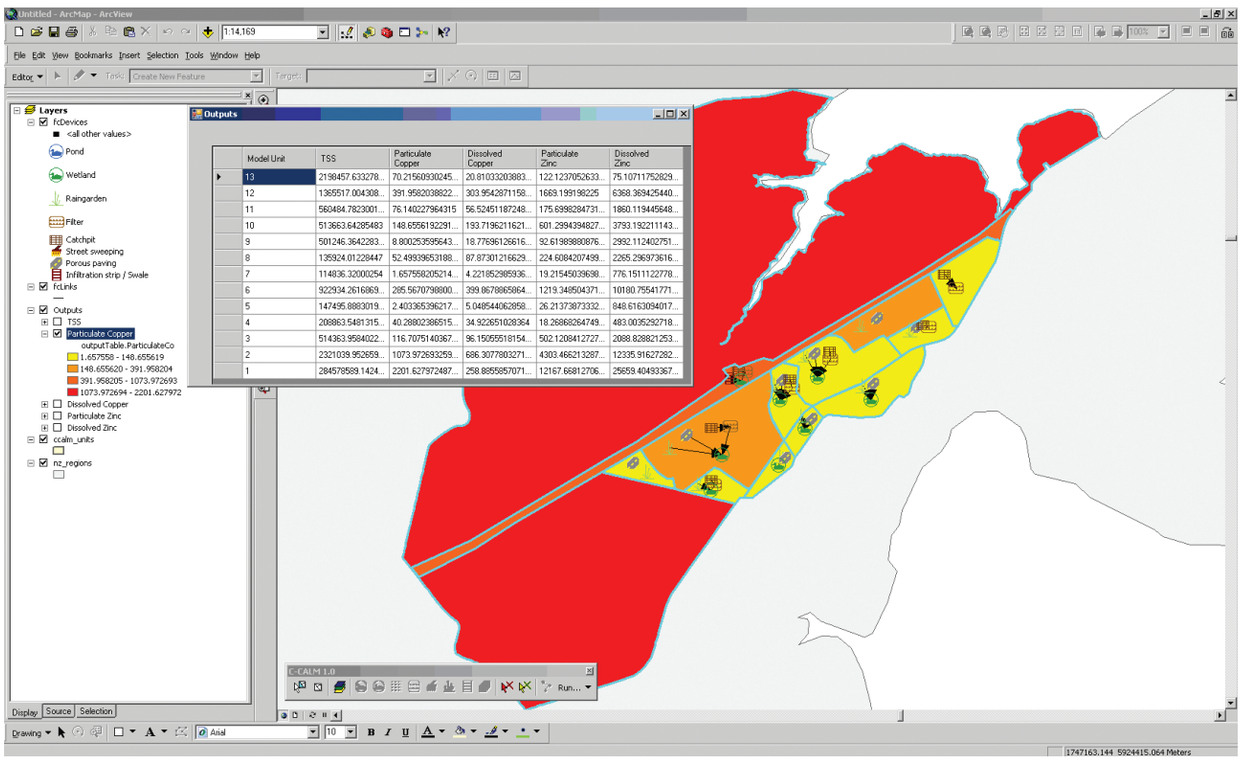
Catchment-scale water quality modelling

C-CALM

Catchment Contaminant Loads Model (C-CALM) is a spatial decision support system for urban planning applications. It estimates annual contaminant loads at the sub-catchment or stormwater management scale, from diffuse sources for total suspended solids (TSS) and particulate and dissolved zinc and copper. The estimated load is then adjusted for water treatment.

Treatment options that can be simulated are:

- wet detention ponds
- wetlands
- filters and raingardens (i.e., bio-retention)
- swales and infiltration surfaces (i.e., vegetated bio-filters)
- catch-pits (with and without inserts)
- street sweeping
- porous paving
- treatment trains



For detailed information on C-CALM see www.niwa.co.nz or contact:

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CLUES – Catchment Land Use for Environmental Sustainability model

CLUES is a GIS based modelling system which assesses the effects of land use change on water quality and socio-economic indicators. It was developed by NIWA for MAF and is an amalgamation of existing modelling and mapping procedures contributed by various research organisations, including MfE, AgResearch, Landcare Research, Plant and Food Research and Harris Consulting.

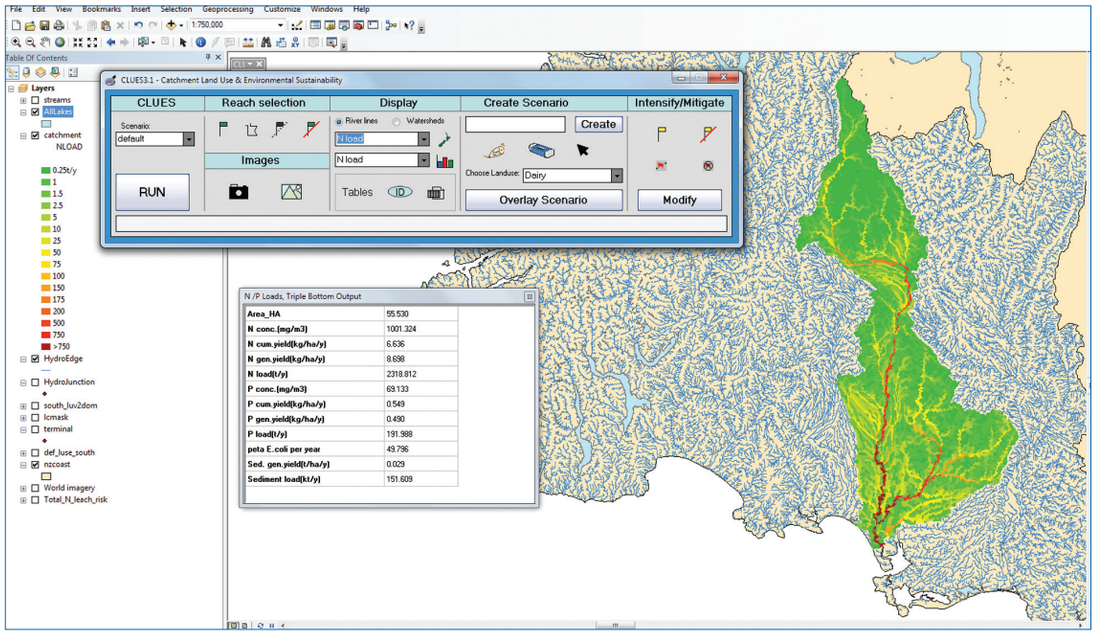
CLUES allows users to create both land use and farm practice change scenarios (stocking rates, mitigation) using a range of tools. Results are available in map and tabular displays.

CLUES software and the user manual are publically available for download from:

ftp://ftp.niwa.co.nz/clues/

For more information see:

www.maf.co.nz/environmental-natural-resources/water/clues



Map display of N load from catchments to the south of Raglan Harbour assuming current land use.

N /P Loads, Triple Bottom Output

Indicator	Total	per Ha	per FTE
Area_HA	20.070		
Revenue	$34,078.80	$1,698.00	$119,995.78
Farm Expenses	$21,813.40	$1,086.87	$76,807.75
Cash surplus	$12,265.50	$611.14	$43,188.38
Total GDP	$27,560.10	$1,373.20	$97,042.61
On Farm FTE	0.167	0.008	0.588
Total FTE	0.284	0.014	1.000
Fossil fuel(GJ)	0	0.000	0
Total energy use(GJ)	0	0.000	0.000
Energy produced by farm(GJ)	173.842	8.662	612.120
Protein(t)	3	0.149	10.563
Direct GHG(co2 equiv t)	90	4.484	316.901
Total GHG(co2 equiv t)	0	0.000	0.000
Transport	$0.00	$0.00	$0.00
Local govt revenue	$0.00	$0.00	$0.00

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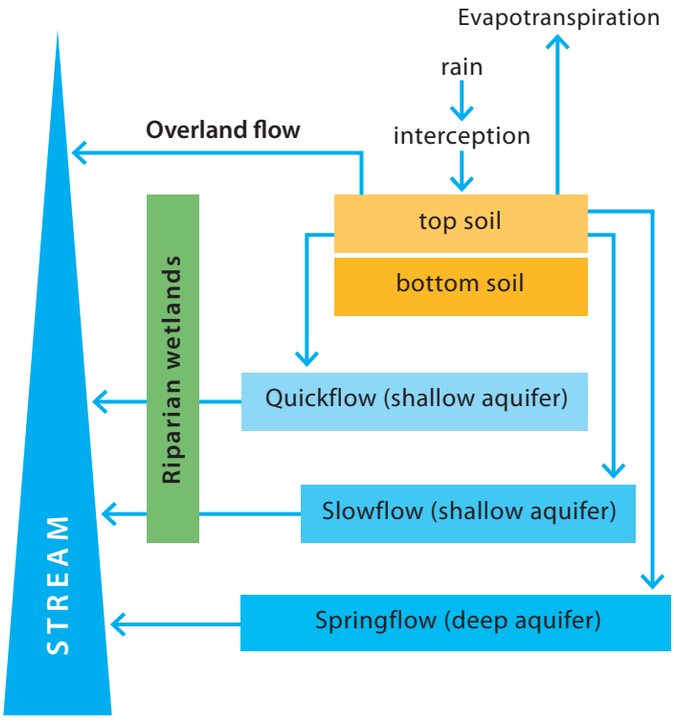
ROTAN – ROtorua and TAupo Nitrogen model

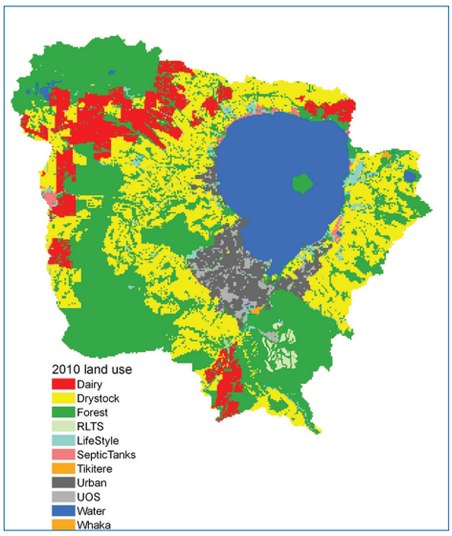
ROTAN is a daily/weekly time-step, GIS-based, rainfall-runoff-groundwater model which can predict the water flows and nitrogen concentrations in streams.

Used at a catchment scale, it can be used to predict nitrogen loads to lakes.

Using ROTAN we can provide information such as:

- tables/graphs showing the relationship between historic trends in land use, rainfall, and stream nitrogen concentrations
- maps showing the flow and nitrogen delivery pathways from each part of the catchment to the lake
- the effects of both historical and future land use changes, climate change and mitigation measures on lake nitrogen loads.





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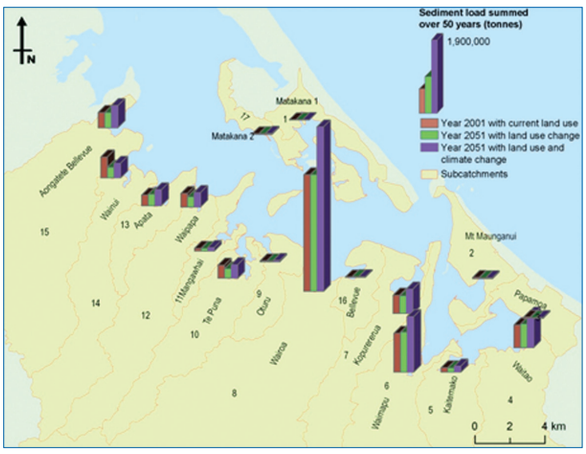
GLEAMS-Catchment – a model for predicting sediment loadings on an estuary

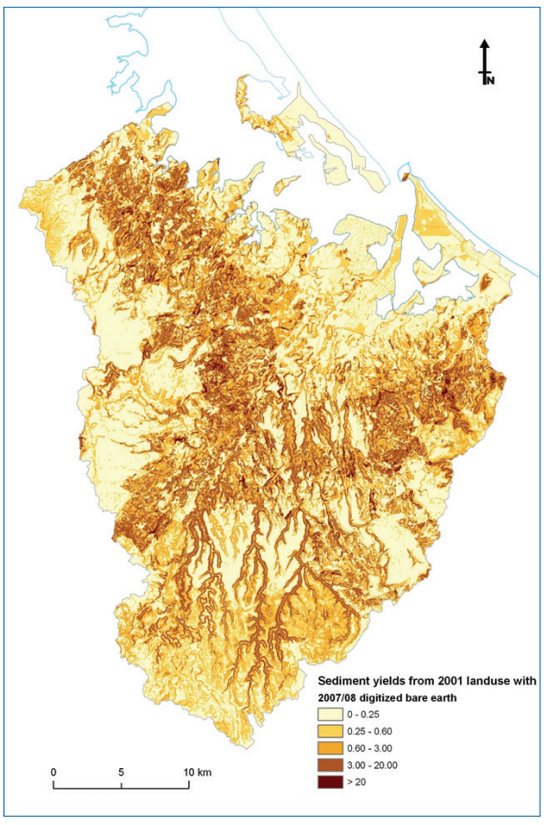
GLEAMS-Catchment. This is a model for predicting sediment loadings from catchments and has been linked to estuarine sedimentation models. The model is a catchment-scale extension of the USDA GLEAMS model. It predicts loadings of sediment from catchments following climate and land-use changes to a harbour with a time period of up to 50 years. Sediment generation is simulated in rural and urban areas of a catchment surrounding a Harbour, passing it through sedimentation ponds, if necessary and routing sediment through the stream network to the estuary. The model is intended to be used as much as possible within a GIS framework.

The GLEAMS-Catchment model has been used in New Zealand to:

- evaluate erosion and deposition in streams
- provide guidelines to protect estuaries
- evaluate impacts of development and urbanisation
- determine the effects of climate and land-use change
- determine flows and loads in the stream network
- identify sediment loading "hotspots"
- determine the effectiveness of urban and agricultural detention ponds
- evaluate the impacts of changing land-use management
- predict sediment accumulation and runoff from impervious surfaces



Sediment yield for different subcatchments for the current land use and climate, current climate and 2051 land use, and the 2051 climate and 2051 land use.



Sediment yields (t ha^{-1} y^{-1}) for the Tauranga Harbour catchment using 2001 land use with 2007/08 digitised bare earth data.

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