Major Storages Water Quality Study

Project Information Sheet No. 4:
EMSS-Goulburn Update

The fourth in a series of project information sheets being distributed by Goulburn-Murray Water (G-MW) about the Major Storages Water Quality Study project.

This information sheet provides a progress report on the ongoing development and preliminary outcomes form the application of a new surface water quality software model (**EMSS-Goulburn**) built for the Upper-Mid Goulburn catchment. This work comprises part of the Goulburn Murray Water (G-MW) **Major Storages Water Quality Study (MSWQS)** project**.**

Where are we at?

The project is progressing well. An EMSS framework (EMSS-Goulburn) has been built for the Upper-Mid Goulburn catchment, and we are starting to communicate initial modelling results. A more comprehensive analysis of preliminary findings of the catchment modelling component of this study is provided in the main project report '*Upper-Mid Goulburn EMSS - A Preliminary Report on Catchment Surface Water Quality Investigations*' (G-MW unpublished report, July 2004 available from S. Papworth, Project Officer).

What can we do with EMSS-Goulburn?

EMSS is a regional catchment scale computer surface water quality model developed by scientists from the Cooperative Research Centre (CRC) for Catchment Hydrology. EMSS predicts runoff, and daily and long-term loads of water quality pollutants. At present, EMSS-Goulburn models three priority water quality pollutants, **Total Suspended Solids (TSS), Total Nitrogen (TN) and Total Phosphorous (TP).**

The potential applications of EMSS-Goulburn are many and varied, and include a scenario testing capability providing a means to evaluate the relative effectiveness of targeting subcatchments for rehabilitation. For example, a catchment manager could consider a number of scenarios for rehabilitating different sections of stream riparian zones, progressive land use change, improved land management practices or point source management.

In this way the effectiveness of these strategies at reducing pollutant export rates could be compared and selection of the most cost-effective strategies evaluated.

However the primary application of EMSS-Goulburn is to make informed estimates of catchment and sub-catchment scale pollutant loads generated (*i.e.* in tonnes/year) and specific yields (tonnes/hectare/year) under current catchment conditions. High and low priority catchments and subcatchments can be identified and prioritised for possible remedial action.

Some early EMSS-Goulburn predictions

Key findings of preliminary investigations that should be considered by managers of Upper-Mid Goulburn catchment include the following:

- On a 'whole catchment' scale, average long-term (20 year) pollutant generation rates in the catchment upstream of Goulburn Weir are approximately 75,000 t/yr (TSS), 1,800 t/yr (TN) and 250 t/yr (TP). However these predictions do not include pollutants trapped within the 'in-line' storages Lake Eildon and Goulburn Weir, or deposited in rivers, streams and floodplains in transit. Estimated long-term average pollutant loads *actually exported* to the Lower Goulburn system (*i.e.* below Goulburn Weir) are **approximately 19,900 t/yr (TSS), 480 t/yr (TN) and 70 t/yr (TP).**

- Pollutant generation rates vary considerably both in space and time, and are highly dependent upon on climatic conditions.
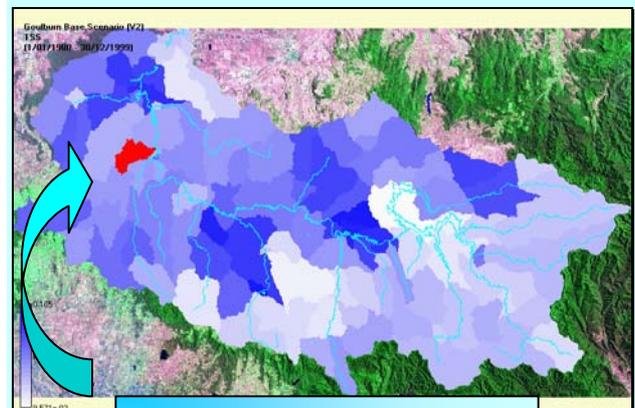
On average, highest TSS yields from the *Stony Creek 1* subcatchment (165 kg/ha/yr)

- Contrary to expectations, many of the catchments and subcatchments with the highest nutrient production rates appear to be the heavily vegetated, largely undisturbed catchments in the south-eastern parts of the Upper-Mid Goulburn catchment. High rainfall, combined with steep topography are thought to be main the reasons for this, despite the relatively intact vegetation cover in these areas.
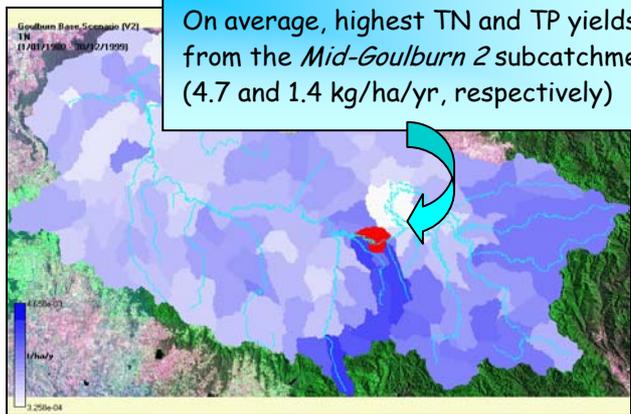
On average, highest TN and TP yields from the *Mid-Goulburn 2* subcatchment (4.7 and 1.4 kg/ha/yr, respectively)

- Lake Eildon and Goulburn Weir act as sediment and nutrient sinks, trapping most of the pollutant loads entering from upper catchment rivers and streams. Lake Eildon is particularly efficient, **trapping approximately 96-97% of pollutants entering the storage**.

- Most pollutant load is generated during wetter climatic periods as high flow events over short duration flow periods. Often, much of annual pollutant load is generated during short lived (1-2 day) rainfall events. As a general rule, EMSS-Goulburn predicts that pollutant loads generated during wetter years are **between 5 and 20 times higher** than those generated during the drier years.

- Pollutant yields generated under **pre-European land use** were typically much lower than current rates, often less than 50% of current rates. However, mean pollutant loads *exported* to the lower Goulburn system (*i.e.* below Goulburn Weir) appear to have, on average, **decreased by 30-60%** due to pollutant trapping within Lake Eildon and Goulburn Weir.

- Under a hypothetical **'Forest Plantations' future land use** scenario where all land in the catchment with 'high' potential for hardwood (bluegum) plantation forestry and some of the 'moderate' potential land is converted to plantations, on average pollutant yields are predicted to **decrease by between 5 and 20%**. Average pollutant loads actually exported to the lower Goulburn system would likely **decrease by approximately 10%.**

Note that the prediction of water quality pollutant loads with any surface water model carries with it a degree of uncertainty. EMSS-Goulburn is no different in this regard, and model outputs must be interpreted and used with a degree of caution.

Where to next?

Time and budget constraints permitting, it is desirable that as additional data becomes available it should be progressively added to this model, to improve and refine model predictions.

Re-releases of the EMSS modelling system ('E2') are anticipated, and would provide enhanced functionality and greater surety of the accuracy of model outputs. In particular, the ability to model at a finer scale would greatly enhance the usefulness of EMSS-Goulburn. Other models, including catchment salt and pathogen models are scheduled to be available for incorporation into the EMSS framework in the near future.

While verification and enhancement of the model is an on-going process, the model in its current form provides a useful tool to assist catchment management decision making. G-MW has made EMSS-Goulburn freely available to key catchment management stakeholders for use in reviewing, planning and prioritising works and evaluating performance against catchment management action targets, and risk ranking/prioritization processes. G-MW also sees EMSS-Goulburn being used as a tool to assist local government, where the predictive capability of the model could be used to provide scientifically based input to large scale planning processes, such as relevant planning scheme reviews and amendments.

Another goal is to link EMSS-Goulburn with storage water quality models currently being constructed for Lake Eildon and Goulburn Weir as a separate phase of the Water Quality Study Project.

More information?