NDSP Fact Sheet

National DRYLAND SALINITY Program

Assessment of a system to predict the loss of aquatic biodiversity from changes in salinity

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Current predictions suggest that the area of land affected by dryland salinity will increase for the next 30 to 50 years even if land management changes dramatically. In the short-term, it would appear that nothing can stop this rise in salinisation, but we need to be able to determine if predicted changes will result in acceptable or unacceptable environmental impact on aquatic biodiversity. For example, if it could be shown that unacceptable impacts on aquatic biodiversity due to salinisation are likely to occur it would then be very important that healthy water bodies where salinisation is not likely to occur are protected from other disturbances.

Rivers and wetlands naturally have a wide range of salinity. In many cases their salinity naturally exceeds current fixed maximum salinity guidelines. For example, the ANZECC (1999) proposed trigger value for salinity in lowland rivers is 500 mS/cm but many lowland rivers regularly and naturally have salinities above this fixed value. A better approach is to determine how much maximum salinity can rise from a natural or initial value before unacceptable environmental impacts occur. A methodology to do this has recently been proposed (Kefford in prep), however appropriate data to use this methodology does not presently exist. This project plans to collect the data, and apply this methodology, test its application and aid in the adoption of the methodology if it proves successful.

We have chosen to test the feasibility of the proposed system in the Barwon River Catchment, in south-west Victoria because we have reasonable knowledge of invertebrate distributions; it has a wide range of salinity within it; and its salinity is expected to increase in the future. Laboratory and/or field based ecotoxicological experiments will be conducted on a sample of macroinvertebrate species from the Barwon River Catchment. For most species only lethal responses will be examined but for a sub-set of these species sub-lethal responses (e.g. respiration rate, growth, % emergence) will be examined. Results from these experiments will be compared to results of field samples and historical data. The salinity tolerance of each species will be determined. A mathematical equation will then be developed that predicts what proportion of species will be lost from a system if salinity rises from any initial to any final level. For example, if salinity of a water body is currently 500 mS/cm and it rises to 5000 mS/cm, the model will predict what percentage of species will be lost. Conversely, this equation can be used to calculate the maximum rise in salinity that can occur before a predetermined proportion of species are lost from a system. If, for example, a 5% loss of species from a water body is considered unacceptable and the current salinity is 500 mS/cm, the model will be able to predict the increase above 500 mS/cm before 5% of species are lost. This represents the maximum rise in salinity that can occur before an unacceptable impact will occur.

The community and catchment mangers can use the model for several purposes, including:

1. Evaluating the effect of predicted rises on aquatic biodiversity in salinity in specific water body. If the model predicts that unacceptable impacts on biodiversity are likely and it is not feasible to reduce salinity then it will be very important that healthy water bodies where salinisation is not likely to occur are protected from other disturbances. On the other hand, if it was feasible to lower salinity in the particular water body (e.g. by environmental flows) the model would indicate how much salinity should be lowered in order to stop unacceptable environmental impacts.
2. Evaluating the likely effects of salinity reducing strategies. If a salinity reduction strategy is not likely to prevent unacceptable environmental impacts its utility may have to be re-evaluated.
3. Evaluating the likely effect of saline water disposal and other management action that raises salinity in wetlands or rivers.
4. Setting local specific guidelines for salinity in rivers and wetlands in order to prevent unacceptable impacts of aquatic biodiversity.