



Major landscape issues and developments affecting the high rainfall southern zone of the Murray-Darling Basin

Don Blackmore

*Chief Executive, Murray-Darling Basin Commission
7 Moore Street, Canberra ACT 2600*

Abstract: This paper identifies four major landscape issues facing the high rainfall southern zone of the Murray-Darling Basin - dryland salinity, vegetation decline, degraded rivers and a lack of financial and managerial capacity in grazing industries to invest in landscape repair. A current audit of the salinity hazard shows an even greater threat. The Murray-Darling Basin Commission is working with community, government and research organisations to better address these issues. Its response ranges from setting a new vision for integrated catchment management to the development of new land use options. The Commission, with its partners, must take up the challenge of facilitating landscape scale change, in particular recommending new policies to government for expanding and targeting investment of public and community funds according to landscape values.

The Murray-Darling Basin is nationally significant in land area (14% of Australia), in agricultural production (40% nationally), and in the value of its natural resources (Crabb 1997). A unique multi-government agreement makes it one of the largest integrated catchment management programs in the world. Grasslands of the Basin are a significant resource and the current and proposed policies of the Murray-Darling Basin Commission give a useful insight into how they might be managed into the future.

This paper deals with the threats to sustainability of the Basin's natural resources, and summarises current developments for getting better, whole-of-landscape management of these resources.

Dryland Salinity

The Commission is completing an audit of salinity hazard to the Murray-Darling Basin, and already there is compelling evidence that the impact on agricultural and natural resources will be severe. The *Salt Trends* report (Williamson *et al.* 1996) identified increasing salt concentrations in most of the streams and rivers with headwaters in the high rainfall southern zone. Specifically, the salinity levels in the Murrumbidgee river are increasing at between 3% and 15% per annum, depending on the location, but at lower rates in the upper Murray.

The current audit is based on new modelling and predictions for ground-water rise over the coming 50-100 years. Without significant new policy interventions, the land area at risk from dryland salinity will expand from about 250,000 ha now, to about 8-10 million ha. With saline water tables within 2 me-

tres of the land surface, these areas will be discharging salt at levels damaging water resources, environmental values and regional and urban infrastructure.

Irrigated agriculture in the Murray-Darling Basin generates about \$4.5 billion in gross value of production per year. It accounts for 96% of the consumptive use of the Basin's water resources. Significantly, the catchments of the higher rainfall southern zone make the largest contribution to total water resources, with flows already carrying significant salt loads. For example, the Upper Murray, Murrumbidgee and Goulburn river catchments account for 45% of the Basin's mean annual runoff. The Upper Murray alone contributes 17% of runoff from 1.4% of the Basin's land area.

Dryland salinity is not just a dryland agriculture problem -the mobilisation and export of salt from dryland catchments has long term impacts and major costs for water users, including the City of Adelaide. The current audit estimates that, over the next 50 years, the median salinity of the Lower Murray (measured at Morgan, SA) will rise from 550 EC units to about 775 EC units. The cost to water users in South Australia under current conditions is already \$93,000 to \$142,000 per EC unit rise.

However, this does not include the impacts and costs in the upper catchments. The Commission's audit estimates that "end of valley" salinity concentrations for rivers rising in the high rainfall southern zone will increase moderately. However, many tertiary streams are already far in excess of these levels and the audit predicts their salinity will be so high as to remove options for human consumption and irrigated agriculture.

Another major cost attributable to ground-water rise and salt discharge is degradation of infrastructure. It has been estimated that 34% of State roads and 21% of national highways in south-western NSW are affected by high water tables, and the damage costs about \$9 million per year. The City of Wagga Wagga is one of the most affected urban areas, sustaining a cost of about \$0.5 million per year from salinity – induced damage to roads, footpaths, parks, sewage pipes, housing and industry. Many other towns are expecting problems with high water tables and salinity.

The impact of salinity on the environment is not as well understood. Saline discharge has a dramatic local impact, killing native vegetation, destroying soil cover and soil structure, exposing it to secondary degradation, and causing gross change to habitat. These areas are quite unattractive in a landscape aesthetic sense, impossible to restore to original biological diversity, and difficult to rehabilitate to any natural values. The impacts from increased stream and river salinity at the levels predicted on in-stream biological diversity and on the extensive wetland systems that are a feature of the Murray-Darling Basin, include both direct toxicological effects on organisms and indirect secondary effects on organisms and their habitats. In isolation, these impacts may be tolerable. However, in combination with other larger impacts such as flow regulation, they can be significant.

Finally, there is the threat to agricultural land itself, in the high rainfall southern zone. While the dryland salinity audit cannot yet be precise, it is likely that about 15% of land will be salt-affected in 50-100 years.

Vegetation decline

The remnant vegetation of the high rainfall southern zone of the Basin, as for other regions, plays a key role in maintaining and enhancing landscape values. Society holds many values for native bush – natural resource values, nature conservation and environmental values, economic production values and landscape aesthetics.

We now have a good understanding of the processes leading to dryland salinity. The replacement of native vegetation with annual pastures and crops has resulted in significant increases in deep drainage (rainfall infiltrating past the root zone) and in surface run-off, with consequent rises in water tables and in discharges direct to streams and rivers. To the extent that deep-rooted, perennial species remain in the landscape this hydrological imbalance is buffered. Further decline in area and condition of vegetation will exacerbate the dryland salinity problem.

Native vegetation, depending on its distribution, also protects the natural resources of agriculture in other ways. It provides shade and shelter for livestock, for other land uses, and for human habitation.

Importantly, it gives protection to the land surface, reducing the risk of erosion.

The importance of remnant native vegetation to protection and maintenance of the region's biological diversity is increasingly recognised but not well quantified. There is increasing priority placed on managing nature conservation values "off conservation reserves" in current policies, ranging from the National Strategy for Conservation of Biological Diversity, to the New South Wales Government's controls on vegetation clearance.

A poorly recognised and under-estimated value of native vegetation is its 'landscape aesthetics' value. That is, it is an inherent component of our cultural history in the southern uplands of the Basin and a vitally important part of the viewsapes which are highly appreciated by people living in and visiting these areas.

There are indirect economic benefits to retaining existing vegetation cover. It forms a backdrop to the orchards, farms and towns of the region, and enhances their attractiveness for tourism, the fastest growing industry. It provides site-specific values for farm-stay tourism. However, despite these values, the range and condition of remnant vegetation continues to decline.

Degraded rivers

Rivers and streams, like vegetation, have many values to regional communities and society generally, yet their natural condition has been highly modified and this degradation continues. About half of the median annual runoff from the Basin is diverted for consumptive use. For several decades now the signs of environmental stress have magnified; most commonly increasing levels of salinity and turbidity, increasing frequency of algal blooms, and a declining water quality. Also, there has been a contraction in the area and number of floodplain wetlands and billabongs.

More recently, ecological studies have identified the dramatic change in flows of 'regulated' rivers as a cause of decline in native plants and animals in the riverine environment. The main rivers of the southern zone have stable flow levels with high summer flows, in stark contrast to the highly variable and winter dominant natural flows. Structures such as reservoirs, weirs and locks impede fish migration, release waters of lower temperature, and reduce the frequency of small and medium floods and dry conditions. De-snagging and flood control works also contribute to significant loss of habitat and an environment favouring pest plants and animals.

The extent of environmental decline in rivers and streams is still being identified and measured. Meanwhile two significant policy initiatives have

been taken - a "Cap" on diversions of water resources and a commitment to improving environmental flows (Whittington and Hillman 1999).

Grazing industries

Extensive grazing for wool and meat production is the dominant land use in the high rainfall southern zone of the Basin. It has been a large contributor to the national and regional economies but is associated with declining natural values, to the point where productive capacity is now threatened. The current production system has impacted enormously on the landscape.

Of major concern to the Commission and increasingly to governments is the lack of capacity in grazing industries to invest in improved productivity which can offset the decline in natural resource values, particularly in the scale of landscape protection and management increasingly expected by others in the community. For wool enterprises, current farm incomes are generally low or even negative, there is little prospect of prices improving far enough to sustain many producers, and the industry faces significant contraction. Beef producers are also currently experiencing low prices.

This lack of financial capacity is compounded by demographic trends. A recent study undertaken for the Commission confirms that districts in the southern Basin with a high dependence on grazing industries have older farm managers and few exits and entries to land holdings. Properties are "tightly bound" in existing farm families and more likely to be dependent on off-farm income. The managerial capacity to innovate and improve farm practices is highly constrained.

Current developments

The Murray-Darling Basin Commission, working closely with regional communities, agricultural industries, State and Commonwealth governments, and research organisations is doing a "stocktake" on how to address the necessary landscape scale change, within the economic constraints facing the region. Solutions are not immediately obvious or readily available. It is clear that a program of landscape repair over 10-25 years must be attempted.

There is already evidence that continued improvement in farm practices, in both productivity and conservation terms, is not adequate to control or reverse the landscape decline described in this paper. Modelling the estimated hazard of dryland salinity, for instance, assumed "no new interventions" in land use. Current work by CSIRO Land and Water demonstrates that even best management practices under grazing will continue to allow 'leakage' to ground-water systems. Preliminary findings from Victoria indicate that perennial grass or lucerne pastures have little impact on catchment dis-

charge rates compared with annual pasture in rainfall zones greater than 600 mm rainfall per annum.

The high rainfall, southern zone of the Murray-Darling Basin requires wholesale change in land uses, in association with better management practices under current enterprises. However, on the basis of current knowledge, there are major impediments to the necessary landscape scale changes:

- Land use options are not available, that can give sustainability outcomes in all situations
- Current industries and landholders lack the financial and managerial capacity to invest in the sorts of changes necessary
- In considering options for land use change there are some very difficult trade-offs involved
- The current programs based on voluntary community catchment groups and central government landcare grants are not sufficient for this scale of response.

A comprehensive submission for overcoming these impediments has been published in the influential report to the Prime Minister's Science, Engineering and Innovation Council (Anon. 1999), in the context of dryland salinity.

As stated earlier, there is a limit to the water use capacity of introduced perennial pastures. Under grazing best practice, the landscape decline associated with rising ground-water, salt mobilisation and discharge to waterways will continue. A proven land use option does exist for rainfall zones above about 900 mm - plantation forestry. However, there are major issues associated with forestry. The capital required to establish this land use can only come from outside the current industries in the region. Although there will be up to 30,000 ha of radiata pine established in association with the planned new processing plant at Tumut, there are no indications of the larger scale investment needed.

In any case there are some major dilemmas with large scale plantation forestry. First, in achieving the degree of ground-water control necessary for preventing salinity, the reduction in water yield to streams and rivers will be so great as to reduce security of water supply for other uses. Also, extensive plantation forestry significantly changes the social makeup of rural and regional communities and alters the landscape aesthetic values that are important to the region. Local community resistance to plantation forestry is common.

Beyond plantation forestry, the options for land use change are not well enough developed or other impediments come into play. Integrated farm forestry has been very slowly adopted; it is generally beyond the resources of current land holders, and is not attracting external investment. The conversion of current livestock production systems to low input, perennial native grasses shows promise in

terms of natural resource, landscape aesthetics and broader environmental values, but implicates property amalgamations and major adjustments out of agriculture, to get the scale of production that is economically sustainable. Incentives for adoption of 'less than fully commercial' tree crop options do not yet exist. For instance, it is very unlikely that institutional arrangements for international trading in carbon credits will be established under the current protocol for reducing Greenhouse emissions.

Nevertheless, the Commission, with its R&D partners, will continue to invest in the pursuit of new land use options that may give better environmental, economic and social sustainability prospects.

It is unrealistic to have a landscape management objective which requires reversal of past and current trends. For instance, many salt affected areas will remain landscape features, but they can be treated to protect the land, provide for some livestock production and become ecosystems in their own right. The challenge is to make decisions on a scale where local and regional interests are taken into account and there is a 'win-win' outcome for landscape values.

Finally, perhaps the greatest challenge is rethinking how such developments, ranging from 'blue sky' R&D to on-ground action, will be paid for. They are not affordable by current landholders dependent on wool and meat production. Nor are they likely to be achieved under current grants programs, such as the National Heritage Trust. The potential answer lies with highly targeted investment of public and private funds, under accountable regional planning and administration, and according to principles of investment-sharing related to landscape value. Current developments in this area which the Commission will monitor closely are:

- Conservation rating under Catchment Management Authorities in Victoria
- Targeted investment and accountability under Land and Water Management Plans in New South Wales
- Local application of cost-sharing principles in South Australia
- The pros and cons of purpose-specific landscape repair programs in the European Union and North America.

The Murray-Darling Basin Commission has already commenced its stock-take of integrated catchment management under its 1992 Natural Resources Management Strategy. A new vision for landscape management will give direction to landscape protection and management in the high rainfall southern zone of the Basin over the next 10-25 years.

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