

Part Three: Implementation

3.1 Developing capacity to implement the Strategy

The partner Governments will assist catchment communities to implement national, Basin and State initiatives by improving access to and use of the knowledge and decision tools generated by salinity R&D and other relevant investigations.

3.1.1 Basin-wide capacity

The Commission has responsibility for Basin-scale issues associated with implementing this Strategy. It requires enhanced capacity in knowledge of Basin scale bio-physical and socio-economic processes, design and management of Basin-scale salinity management actions, and design and operation of accountability arrangements supported by Basin-level monitoring, evaluation and reporting.

The Commission and partner Governments will administer a comprehensive 'knowledge generation' program to support Basin-scale and within-valley planning and implementation.

Priority project areas for knowledge generation include flow and salinity models for the Murray and Darling Rivers, regional catchment hydrology models, and Basin-scale geophysical, land use, ecological, and socioeconomic information.

Priority project areas for designing and managing Basin salinity actions include resolving cost sharing and benefit allocation arrangements for new joint interception works, further developing the vegetation bank concept, and researching new terrestrial and aquatic production systems that can meet water-use standards and productively utilise salinised land and water resources.

Priority actions for improving capacity in ensuring accountability through Basin-level monitoring, evaluation and reporting are discussed below in section 3.9.

3.1.2 Within-valley capacity

The States have responsibility for within-valley issues associated with implementing the Strategy, and will require adequate capacity in predicting salinity and salt load trends, assessing the effects and trade-offs associated with salinity management options, and assessing the merits of investing in salinity compared with other catchment health targets.

Priority project areas for salinity and salt load predictive tools include flow and salinity models for tributaries to the Murray and Darling Rivers, and local to regional catchment hydrology models that can interface with geophysical and

other spatial information (for example, the distribution of salt in the landscape).

Priority project areas for assessing the effects of options, working through the trade-offs and deciding whether to invest in salinity or other issues include gaining more information on socio-economic profiles and trends in catchment communities, developing tools to assess local and regional trade-offs associated with various salinity management options, and developing community processes for agreeing on preferred options.

The Commission supports the States by facilitating cross-border collaboration, coordinating data collection and analysis, encouraging the development of consistent salinity modelling and prediction tools, and assisting the States in communicating results.

3.1.3 Communication and education

Communication and education activities under this Strategy and the *ICM Policy Statement* will be planned and undertaken in conjunction with each other and coordinated by the Commission. Specifically, the Commission's *Communication Strategy Guide* will be applied to all relevant projects and activities to ensure 'best practice'.

There are three main communication tasks: information exchange, community involvement and support of networks. The Commission will invest in production, dissemination and sharing of technical knowledge, in collaboration with partner Governments, catchment communities and R&D knowledge providers. Community involvement will focus on the assessment and feedback in development of end-of-valley targets and salinity and catchment management plans. Existing information and community networks will be supported logistically and in the provision of knowledge from the Commission's investigations projects.

A key communication activity under this Strategy is the release of a series of companion documents providing more detail on each of its key elements.

3.1.4 Institutional reform

Challenges

Under Commonwealth, Basin and State salinity initiatives, catchment management organisations are developing new salinity and catchment management plans. With Government assistance, they will be expected to play key roles in achieving salinity targets specified in the plans.

The partner Governments will improve access to and use of the knowledge and decision tools generated by salinity research and development.



Basin and end-of-valley targets seek to maintain water quality of the rivers downstream and send the right signals for actions upstream.

Issues

The partner Governments recognise that there are a number of institutional issues to be resolved concerning the evolving roles of catchment management organisations and local Governments.

The level of involvement of catchment management organisations in delivering salinity targets will vary as they have different powers, responsibilities and capacities. In some States their principal roles are in coordination and communication, whereas in others they are decision makers and accountable for outcomes on investment.

Local Governments have legislative responsibility for planning, but they have yet to develop a clear brief for what they can do in relation to salinity targets. In the absence of regional planning mechanisms, local Governments can be limited in their ability to regulate new development at the scales required.

Developing institutional arrangements

This Strategy draws its direction from the *ICM Policy Statement* for the continued evolution of institutional arrangements that provide for community participation in salinity and catchment management planning, and coordinating salinity and natural resource management strategies with regional economic development strategies.

This is work-in-progress, with all States developing arrangements with catchment communities and the Commonwealth for the way in which natural resource management outcomes are delivered.

3.2 Identifying values and assets at risk

Consistent with the objectives of this Strategy, the Basin and end-of-valley river salinity targets are set to achieve two outcomes: maintenance of the water quality of the rivers downstream; and the 'right signals' for actions upstream to control river salinity and land degradation, and protect important natural values and built assets in the catchments.

3.2.1 Basin-wide

The MDBA provides the Commission with the power to coordinate the management of the Murray and Darling Rivers below Menindee Lakes (the shared rivers).

In 1988 the MDBMC adopted the *S&D Strategy* to reduce salinity in the River Murray as measured

at Morgan on the basis that the River Murray and most irrigation areas in the southern Basin were at risk from salinity. At that time it was also considered that dryland salinity would have a modest impact that could be offset by Strategy works for at least several decades and the effects of irrigation and dryland salinity on the Darling River were insignificant.

The *Basin Salinity Audit* has shown that since 1988 the situation has changed and future irrigation and dryland salinity rises could threaten the values of not only the River Murray but also the health of the Basin as a whole. While a principal value affected is water quality for consumptive uses (including irrigation, domestic and industrial use), other equally important values are now recognised as being at risk, including environmental values, farm productivity and infrastructure (including roads, services and towns).

Under this Strategy and State initiatives, partner Governments are identifying values and assets at risk of salinity and setting end-of-valley and within-valley salinity targets to protect key values and assets. These values and assets include surface and groundwater resources, terrestrial and aquatic ecosystems and species, highly productive farmland, indigenous cultural heritage, and built infrastructure.

3.2.2 Commission/Council roles in protecting values and assets

An important consideration is the capacity of salinity and catchment management plans, LWMPs and major actions to contribute to this Strategy's objectives within valleys and across valleys. In assessing plans and actions for inclusion on the Commission Registers, the Commission will provide advice to the relevant governments, and as part of a State's consultative process in developing these plans may advise the catchment bodies.

The States, through annual reporting via the Commission to Council, will advise on the level of protection being afforded to within-valley values and assets, and on progress towards end-of-valley targets adopted by the Council to protect Basin-wide values and assets, including the shared rivers (see section 3.3 below). The Commission in the consolidated annual report to Council will advise on the balance of effort across valleys and the capacity to meet Strategy objectives. The end-of-valley and Basin targets, in conjunction with the accountability arrangements in the form of monitoring, evaluating and reporting will ensure the protection of Basin-wide values and assets.

3.3 Setting salinity targets

3.3.1 The need for targets

Through the *ICM Policy Statement*, the Council has indicated its commitment to targets for catchment health. River salinity and salt loads are important indicators of catchment and Basin health. While the Basin's river flows and salinities are naturally variable, trends in salinity and salt loads can provide important information on catchment condition.

Within this Strategy, the concept of targets has been applied to river salinity and salt load at various points across the Basin. In setting the quantum of targets, consideration needs to be given to key values and assets that are put at risk from salinity and the nature and scale of action to protect them.

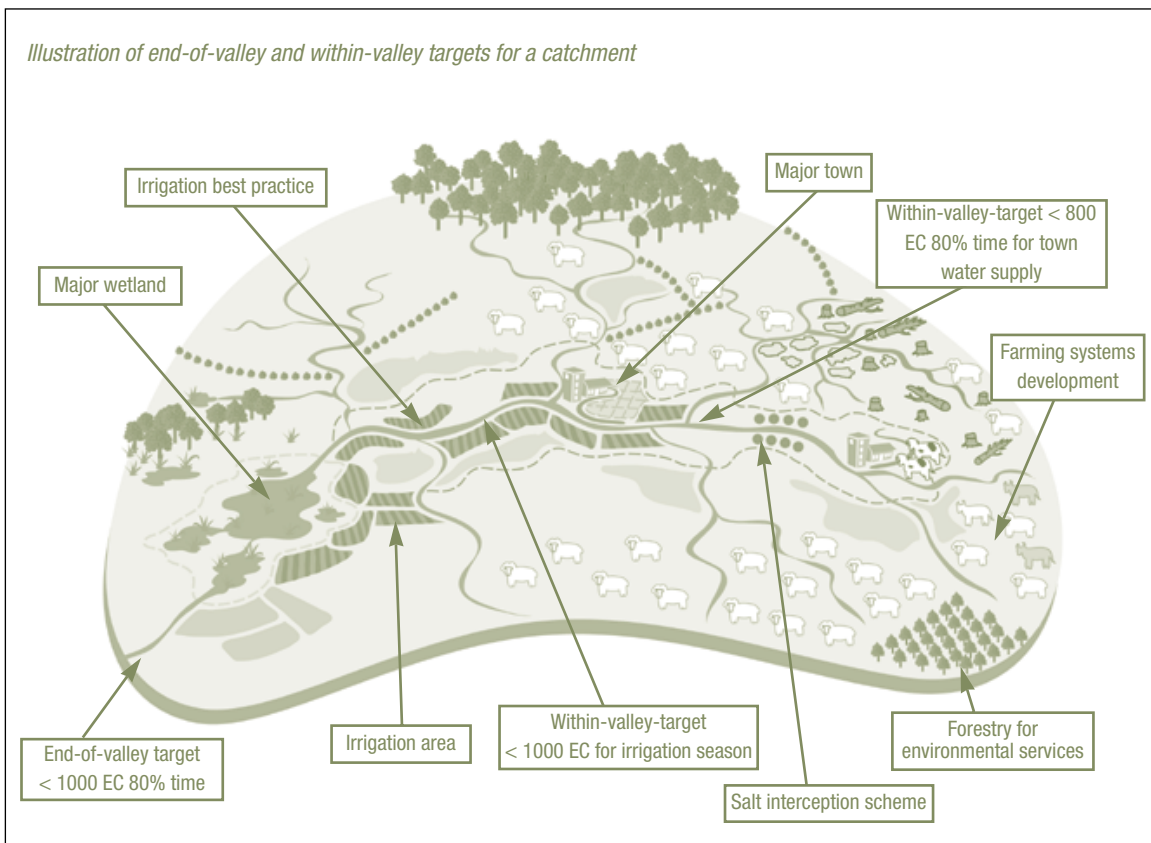
3.3.2 Council's target sites at end-of-valley and Morgan

A key feature of this Strategy is Council's adoption of salinity targets for each tributary valley and a Basin target at Morgan in South Australia. The Basin target, which is for the shared rivers, is to maintain the salinity at Morgan at less than 800 EC for 95 per cent of the time.

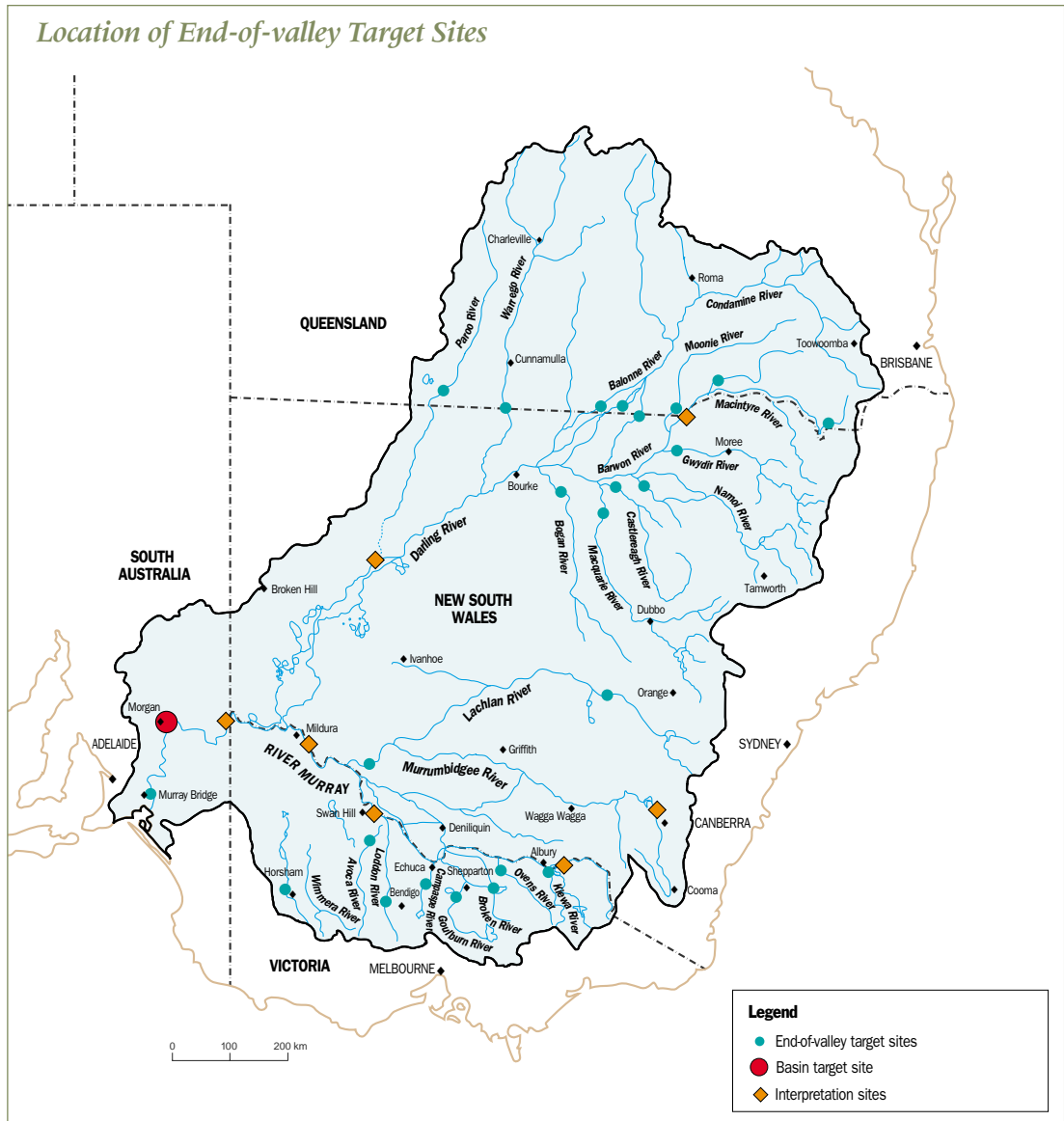
These targets themselves do not represent the full range of outcomes sought, but they are a way of measuring progress towards achieving the Strategy's objectives. Council's adoption of these targets will provide the impetus for actions across the Basin, and the basis for accountability arrangements for the partner Governments.

While end-of-valley targets allow for further rises in salinity, they are in effect a 'cap' on salinity that gives the appropriate signals for protecting key values and assets in the valleys, and also encourage the States to meet their obligations to protect the shared rivers.

Council, through the ICM Policy Statement, is committed to targets for catchment health. Salinity and salt load targets at various points across the Basin drive actions to achieve catchment health while protecting key values and assets.



Location of End-of-valley Target Sites



3.3.3 Processes for Council target setting and review

The partner Governments nominated an interim set of end-of-valley targets for stream salinity and salt loads, and these were considered by catchment communities during the public comment period for the draft Strategy. Each State has set its own program for finalisation of targets. The interim, Council adopted targets are listed in Table 1.

While there is a need for targets to be adaptive, they will only be changed where there is adequate justification. This will provide certainty and integrity for the Strategy and will ensure that stakeholders' efforts are directed to finding creative and innovative ways to meet the targets.

In some parts of the Basin, end-of-valley target sites will be augmented with 'interpretation sites' to assist in attributing salinity to its source, however these sites will not include targets or specific accountability provisions.

Table 1. Summary of Basin Salinity Management Strategy Targets as at July 2001

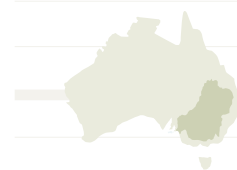
Valley	2015 Target ¹			Valley Reporting Site (Interpretation sites shown in italics)	Without Intervention Salinity Audit Prediction Contribution to Morgan Salinity - 2015 (EC - (µS/cm))
	Salinity		Salt load		
All partner Govts.	Median	95%ile	Average		
Murray-Darling Basin	110%	98%	110%	Murray at Morgan	+88
South Australia	Median	95%ile	Average		
Lock 6 to Morgan	tba	tba	110%	Murray at Morgan	+50
Below Morgan	tba	tba	tba	Murray at Murray Bridge	-
NSW	Median	80%ile	Average		
Murrumbidgee	108%	112%	tba	Murrumbidgee at Balranald	+6
Lachlan	108%	106%	103%	Lachlan at Forbes	0
Bogan	137%	93%	133%	Bogan at Gongolgon	+3.2
Macquarie	108%	126%	114%	Macquarie at Carinda	+4.3
Castlereagh	105%	tba	tba	Castlereagh at EoV	+0.2
Namoi	108%	110%	116%	Namoi at Goangra	+6.4
Gwydir	103%	101%	100%	Gwydir at Collarenebri	+0.1
NSW Border Rivers	100%	100%	100%	Barwon at Mungindi	+0.1
NSW Upper Murray	tba	tba	tba	<i>Murray at Heywoods</i>	tba
Barwon-Darling				<i>Darling at Wilcannia</i>	tba
NSW Riverine Plains				<i>Murray at Redcliffs</i>	tba
NSW Mallee Zone				<i>Murray at Lock 6</i>	tba
Victoria	Median	80%ile	Average		
Wimmera	tba	tba	tba	Wimmera at Horsham Weir	0
Avoca	102%	102%	102%	Avoca at Quambatook	0
Loddon	103%	101%	101%	Loddon at Laanecoorie	+0.7
Campaspe	101%	101%	101%	Campaspe at Pumps	0
Goulburn	100%	100%	100%	Goulburn at Goulburn Weir	+0.8
Broken	136%	136%	136%	Broken at Casey's Weir	0
Ovens	100%	tba	101%	Ovens at Peechelba East	0
Kiewa	100%	tba	100%	Kiewa at Bandiana	0
Vic Upper Murray	tba	tba	tba	<i>Murray at Heywoods</i>	tba
Vic Riverine Plains				<i>Murray at Swan Hill</i>	tba
Vic Mallee Zone				<i>Murray at Lock 6</i>	+15
Queensland	Median	80%ile	Average		
Qld Border Rivers	tba	tba	tba	Barwon at Mungindi	+0.5
Moonie	tba	tba	tba	Moonie at Fenton	0
Condamine Balonne	tba	tba	tba	Culgoa at Hastings	+0.5
Warrego	tba	tba	tba	Warrego at Cunnamulla	0
Paroo	tba	tba	tba	Paroo at Caiwarro	0
ACT	Median	80%ile	Average		
ACT				<i>Murrumbidgee at Hall's Crossing</i>	tba

Notes:

1. Percentage of 2000 conditions, utilising 1975-2000 climatic benchmark

tba = to be advised

The States have established processes for finalising the interim end-of-valley targets.



Once adopted by Council end-of-valley targets will only be changed where there is adequate justification, to provide certainty and integrity for this Strategy.

Choosing within-valley options is challenging because some are more certain than others, options vary in the time they take to have an effect, and there are trade-offs with adoption.



3.3.4 State within-valley targets

The States have initiated processes to establish within-valley management targets to protect important values and assets from salinity, and to assist in meeting Council adopted end-of-valley and Basin targets.

Within-valley management targets will recognise local priorities such as land area protected and priority ecological outcomes, and while they may be used for reporting this Strategy's progress to Council, their resolution is a State matter. However, they will be consistent with the targets adopted by Council for end-of-valley river salinity, salt load and flow.

3.4 Managing trade-offs with the available within-valley options

Options for salinity management range from the more immediate and certain outcomes of salt interception schemes to longer-term and less certain benefits associated with reforestation. Optimising their adoption on a catchment scale faces two significant challenges: the inability of current farming systems to address salinity in many areas, and the trade-offs associated with their adoption. Many options affect profitability, can reduce water resource security and have social impacts. A key task for this Strategy is to assist catchment management planning deal with these challenges.

3.4.1 Land management options

Irrigation

For irrigation areas, there are a number of land management options that can achieve effective groundwater control and enhance profitability. They include more efficient water use, water re-use schemes, repairing or replacing water supply infrastructure, and the siting of new irrigation development into low salinity impact areas. However, even best-practice irrigation can have salinity impacts and additional interventions such as drain diversion or groundwater interception may be required.

Broadacre dryland

For broadacre dryland areas, effective options are limited.

In the more productive areas of the wheatbelt, opportunity cropping in summer rainfall areas and incorporating lucerne into cereal cropping systems in winter rainfall areas can achieve a degree of groundwater control whilst

maintaining productivity. These are less effective or not appropriate for drier parts of the wheatbelt and in the Mallee zone, where groundwater response times are much longer.

For the high rainfall zone (>600 mm average annual rainfall) used for sheep and cattle grazing, there are no effective options at present. New systems involving careful targeting and management of woody plants in the landscape will be required. These systems include forestry and farm forestry, and conservation, rehabilitation and stewardship of native vegetation.



Irrigated horticulture

NSW Agriculture

3.4.2 Engineering options

Drainage and conversion of open channels

Responsible drainage and re-use of low salinity drainage water are features of best-practice irrigation. Conversion of open channels to piped water supplies or treatment of the channels, to reduce seepage, can also assist in minimising impacts.

Salt interception and disposal schemes

Salt interception and disposal schemes divert groundwater or irrigation drainage water to safe disposal sites. They can also provide site-specific protection of highly-valued community assets such as urban infrastructure and biodiversity.

Groundwater pumping

Relatively fresh rising groundwater can sometimes be pumped to the surface in sufficient quantities for irrigation, achieving a dual benefit of increasing production while maintaining or reducing groundwater levels.

3.4.3 Flow management

Dilution and environmental flows

Dilution flows are intentional storage releases that reduce salinity concentrations. Environmental flows are flows, or characteristics of flow patterns, that are either maintained or created to improve riverine ecosystem and floodplain wetland condition.

Maintaining flows from high rainfall areas

A high proportion of the Basin's total river flows originate from relatively small areas, for example the Upper Murray that receives >800 mm average annual rainfall. Maintaining these flows is particularly important for managing salinity concentrations.

Principled approach to flows

Water supply and management throughout the Basin has historically been focussed on ensuring reliable supplies for irrigation, mainly because of the undisputed benefits to regional economies and to the Basin as a whole.

It is becoming apparent, however, that increased priority must be given to maintaining flows from high rainfall areas and providing for more dilution and environmental flows. Unless this more balanced approach prevails, urban and other water users will have less water of poorer quality, and entire riverine ecosystems will be threatened.

Further clarification of water property rights will assist in achieving a more balanced approach.

3.4.4 Living with salt

'Living with salt' options are currently limited but could include saltland agronomy, 'shandyng' saline irrigation water with fresh water, applying irrigation re-use water to salt tolerant crops, changing crop selection, salt harvesting and processing, timber production using moderate salinity groundwater, rehabilitation and land stewardship and experimental saline aquaculture.

3.4.5 Managing trade-offs

Almost all of the above options involve trade-offs. In addition to the trade-offs that can be associated with managing flows for irrigation, dilution and environmental purposes, there can be large trade-offs associated with change in land use. For example, large-scale revegetation has to be carefully planned to ensure that the long-term salinity and salt load benefits outweigh the costs of establishment, structural adjustment and reduced flows.

The optimal mix of options will vary according to valley-specific targets and circumstances, and will need to be dynamic and subject to periodic revision. The Commission will assist the partner governments with improved knowledge and techniques to support these decisions, and work with them on appropriate policies.

3.5 Implementing salinity management plans

3.5.1 Current status

The partner Governments have for over a decade supported development and implementation of irrigation LWMPs, salinity management plans and catchment management plans. There are about 200 plans throughout the Basin. In many cases, partnerships between the Landcare movement and non-government organisations have been major factors in plan success.

Currently, catchment management organisations are developing new plans or reviewing existing plans. This is happening in the context of this Strategy, the NAP and State salinity strategies.

3.5.2 More action in irrigation regions

Irrigation LWMPs and joint salt interception works under the *S&D Strategy* have delivered substantial improvements in water quality in the Lower Murray. But these improvements are at risk from dryland salinity and also from the growing requirement in irrigation regions for SDEs. These include entitlements required for new developments arising from water trading.

This Strategy continues and enhances support for LWMPs, and for recording salinity outcomes of LWMPs on a salinity register. Accounting for offsetting the impacts of future development and for maintaining the Commission Registers in positive balance will provide the incentive for LWMP implementation and review.

Salinity plans have been supported by the partner Governments for over a decade. Catchment organisations are developing new plans or reviewing existing plans in the context of this Strategy the NAP and State initiatives.



The States and the Commission will assist individual catchment plans to assess their contribution to salinity targets.



3.5.3 More action in dryland regions

This Strategy also enhances support for further development and implementation of plans for dryland regions.

In particular, it will assist in meeting community demand for improved capacity to predict and quantify the effects of various salinity management options, and to assess the trade-offs associated with different mixes of options. Key Strategy initiatives such as further developing the vegetation bank concept will attract significantly increased resources for plan implementation.

Under Commonwealth, Basin and State salinity initiatives salinity management plans are being developed or reviewed, to take end-of-valley and within-valley salinity targets into account and improve accountability arrangements.

3.5.4 Assessing contribution of plans to meeting targets

The design and delivery of outcomes from individual catchment plans will be essential to achieve Basin-wide outcomes. Under this Strategy, States and the Commission will assist individual catchment plans to assess the contribution of proposed works to meeting the end-of-valley and Basin targets.

To assess the effectiveness of proposed actions, individual catchment plans will need to document:

- assessed baseline conditions (as at 1 January 2000) for end-of-valley salinity, salt load and flow regimes;
- expected 'legacy of history' impacts on end-of-valley salinity, salt load and flow for 2015, 2050 and 2100;
- agreed end-of-valley salinity and salt load targets; and

- predicted effects of proposed significant in-valley actions on end-of-valley salinity, salt load and flow conditions at 2015, 2050 and 2100.

3.5.5 Additional works to meet Basin target

It is apparent that river salinity and salt loads would respond only slowly to within-valley landscape-change options and would therefore allow salinity rises in the medium term. Under the *SeD Strategy* the partner Governments have undertaken a joint works program which has reduced river salinity in the River Murray. The anticipated slow reduction in the rate of increase in salt exports from dryland regions as a result of within-valley action threatens this reduction and the Basin target at Morgan.

While the essence of this Strategy is to cap salt mobilisation and export from across the Basin landscape, thereby avoiding the need for further salt interception schemes, it is clear that this is achievable only in the longer term. In the short term it is necessary to continue with salt interception schemes to buy time for the benefits of actions to cap salt mobilisation and export from the landscape to take effect.

A new joint program of salt interception works will be undertaken over the first seven years of this Strategy. The aim is to maintain benefits to water users drawing on the shared rivers, and to provide an additional contribution to preserving water quality as measured at Morgan, beyond that deliverable by actions addressing the 'legacy of history' within the tributary valleys. There is also an incentive under this Strategy to develop other, complementary, mitigation works. More details on the works program are in section 3.8.2.



Saltbush in ryegrass pasture

NSW Agriculture (Simon Gibbs)

3.6 Redesigning farming systems

3.6.1 Collaboration in research and development

This Strategy will coordinate a range of initiatives researching new farming systems that can use more rainfall than existing systems. These initiatives include the Cooperative Research Centre (CRC) for Plant-based Management of Dryland Salinity, the CRC for Catchment Hydrology, the Joint Venture Agroforestry Program (JVAP), the Redesigning Agriculture for Australian Landscapes Program, and industry R&D organisations.

The *National Dryland Salinity Program* (NDSP) will continue to play a key role in national priority setting and coordinating activities under the above initiatives. Through its participation, the Commission will seek to extend collaboration to commodity R&D corporations, and their capacity to develop new, sustainable options.

3.6.2 Mimicking natural systems

Recent reviews of farming systems for their current effectiveness and future prospects in salinity control have pointed to the need for R&D into new farming and forestry systems that are a radical change from the present. The CSIRO has indicated that recharge rates under future land uses will need to mimic the average recharge rates of natural vegetation (0.5 mm to 10 mm annual rainfall equivalent) if salinity is to be controlled. This is a major reduction from current rates under annual crops and pastures (15 mm to 130 mm).

The challenge is to develop commercial systems with this characteristic. Depending on profitability, they will have their place, particularly where important values and assets are under threat. But they may not be universally adopted across the Basin for technical and social reasons.

3.6.3 Criteria-based assessment of R&D potential

The Commission, through its involvement in the CRC for Plant-based Management of Dryland Salinity, is party to a new and potentially powerful 'criteria-based approach' to targeting R&D investment. The CRC's Board has adopted the following parameters within which projects are selected and progress is assessed for programs and the CRC as a whole:

- Impact on recharge: the primary measure of salinity control, estimated as deep drainage in rainfall equivalents (see above 3.6.2), or in

proportion to the discharge capacity of the target catchment;

- Impact on productivity and profitability: a farm or paddock level measure, often gross margin analysis;
- Area of which solutions are applied: an estimate of the scale of application;
- Time to complete development and dependence on other activities: the CSIRO has estimated up to 25 years for R&D to produce new perennial options;
- Economic benefits: incorporating the broader non-farm considerations of benefits and costs, from regional economic development to off-site environmental impacts; and
- Environmental indicators of success: as yet measures of environmental protection are undeveloped.

The Commission will continue to develop this criteria-based approach and seek to apply it to R&D investment into options for the agro-ecological zones of the Basin.

3.6.4 Current prospects for agro-ecological zones

For the purposes of this Strategy, there are three agro-ecological zones with different prospects for current and future salinity management.

High rainfall grazing

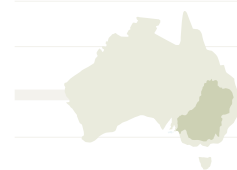
Defined as land receiving >600 mm average annual rainfall, options for this zone include changing land use from grazing to forestry and farm forestry, and managing native vegetation (both grasslands and woodlands) for a more appropriate balance between production and provision of ecosystem services.

There are two key challenges for R&D into new land-use systems for the high rainfall grazing zone. Firstly, to ensure that the new systems are profitable, or in the case of native vegetation management, that ecosystem services can be valued. And secondly, to ensure the new systems offer sufficient flexibility for managers to achieve a balance between maintaining river flows, managing salinity, and meeting broader, regional socio-economic aspirations.

Winter rainfall cropping

Defined as land receiving 250 mm to 600 mm in uniform or winter dominant average annual rainfall and also including the Mallee which receives <400 mm average annual rainfall, this zone contains most of the wheatbelt.

This Strategy will coordinate initiatives researching new farming systems. Future land uses will need to mimic natural vegetation recharge rates if salinity is to be controlled. The challenge is to develop commercial systems with this characteristic.



Some current farming systems in this zone can be profitable and achieve the required balance between recharge control and surface water runoff (e.g., phase farming using lucerne with cereal cropping, and perennial pasture-grazing systems). However, reliance on these is risky and more options need to be developed. While extension of traditional plantation forestry into this zone could be feasible, perennial cropping and grazing systems are expected to be more popular.

For the Mallee zone, such options do not offer the same prospects for sustainability and profitability. Short rotation tree crops are a possible future option throughout the winter rainfall cropping zone, including the Mallee.

Summer rainfall cropping

Defined as land receiving 400 mm to 600 mm summer dominant average annual rainfall, this zone contains some of the most productive soils in the Basin. The Liverpool Plains and Darling Downs are in this zone.

One option is to sow crops opportunistically in both winter and summer, when rainfall and soil conditions allow. However, best-practice opportunity cropping still results in almost twice the amount of recharge that occurred under the native perennial grasslands that covered the extensive plains in this zone.

Potential new options include phase farming (discussed above under winter rainfall cropping) and companion farming. Companion farming is oversowing annual crops into perennial pastures. However, phase farming and companion farming present challenges for R&D. They are both likely to have productivity trade-offs, and there are no guarantees that the perennial component of the system will be at maximum growth during wetter than average years.

As with the winter rainfall cropping zone, short rotation tree crops, providing they can be proven commercially, may prove to be an effective option in the longer term for this zone.

3.6.5 New industries based on salinised resources

'Living with salinity' at levels of damage greater than now is inevitable for a range of reasons, and this is reflected in the 2015 end-of-valley targets being higher than 2000 baseline conditions. While the options considered above are designed to prevent further rises in salinity, other enterprises can profit from salinity.

This Strategy will enhance investment in R&D into new industries based on salinised land and

water resources. Potential new opportunities include developing more cost effective desalination plants, generating heat and electricity from salt disposal ponds, expanding saline aquaculture, producing more products from salt harvesting, developing improved saltland agronomy systems, breeding salt tolerant tree crops, and developing new irrigation technologies that allow the use of low-to-moderate salinity groundwater.

3.7 Targeting reforestation and vegetation management

Achieving the objectives of this Strategy is dependent on key parts of catchments and the Basin being planted or managed under perennial plants. Options for reforestation and vegetation management fall into three categories: forestry outside its traditional zone, native vegetation management and short rotation tree crops. Specific challenges include the targeting of areas at a scale of planting that maximises salinity benefits and minimises costs and other adverse impacts, and facilitating innovation in developing and trialling new revegetation options.

3.7.1 The vegetation bank concept

Under this Strategy, Council has agreed to further development of the concept of a vegetation bank, into which it would contribute funds for targeted investment in reforestation and vegetation management. The intention is for the vegetation bank to invest only in areas where there will be measurable salinity benefits. Consistent with the *ICM Policy Statement*, it will seek to maximise multiple objectives in catchment health. It will not compete directly with fully commercial forestry.

Financing arrangements under the vegetation bank will evolve to accommodate R&D outcomes as they occur. It is the intention over the duration of this Strategy, for the vegetation bank to provide finance for the following options:

- forestry outside of its traditional zone where it would not be commercial otherwise;
- native vegetation management, rehabilitation and land stewardship; and
- innovation for short rotation tree crops.

These options are considered to be the three most technically effective and socially acceptable vegetation related options for salinity management in the Basin. They also provide other benefits, for instance, forestry companion plantings contributing to biodiversity.

'Living with salinity' at levels of damage greater than now is inevitable, and this Strategy will enhance R&D into new industries based on salinised land and water resources.



3.7.2 Forestry outside of its traditional zone

The Commission is working with partner Governments to attract corporate and public investment in plantation and farm forestry outside of its traditional >800 mm average annual rainfall zone. The objective is to direct investments to salinised catchments in the uplands receiving 500 mm to 800 mm average annual rainfall. Under the vegetation bank concept, investors' contributions to forest establishment and maintenance will be in proportion to the commercial and public benefits generated by the new forests.

Commercial benefits include timber, other wood products, and carbon credits. Public benefits include salinity management, nutrient management, and biodiversity enhancement. While there is adequate scientific and market knowledge to accurately quantify forest and wood values, and substantial progress is being made with valuing carbon sequestration, knowledge of the net public benefits of forestry is still uncertain, particularly at the regional scale.

The Commission is supporting a comprehensive research and investigations program to address this.

3.7.3 Native vegetation management, rehabilitation and land stewardship

Large areas of undulating and steep-hill country in the higher rainfall uplands of the Basin, are used for grazing, but profits are generally low. There is an emerging view that where these lands are not reforested they should be rehabilitated and stewarded for a range of ecological services, including salinity management.

In addition to the higher rainfall uplands, this option is expected to be available in medium

rainfall areas (mainly the more productive areas of the wheatbelt, receiving from 400 mm to 600 mm average annual rainfall) and in the Mallee (receiving <400 mm average annual rainfall).

To minimise the level of Government investment necessary to achieve agreed outcomes, Government funds could be allocated through a competitive process. An auction based system is being trialled in the Basin, where individual landholders and groups bid for public assistance to manage vegetation. Experience has shown that this can target investment to deliver higher conservation values, at least cost to Government, and with genuine commitment from landholders.

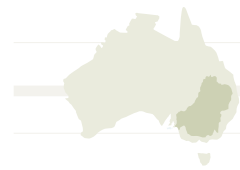
3.7.4 Short rotation tree crops

Short rotation tree crops have considerable potential to overcome the economic and social impediments encountered in extending forestry outside of its traditional zone and into the wheatbelt. These crops may prove a better long-term option for cleared areas of the Mallee region.

The development of new large-scale tree-crop industries is risky, expensive and difficult. Without a large public investment in early stage R&D, prospective new industries cannot get to the point where private investors become sufficiently convinced of their potential to be willing to invest in further development. Existing R&D initiatives (discussed above in section 3.6) have the capability to overcome this, given more resources.

At present, arrangements for joint public and private investment in commercialising short rotation tree crops that have passed early-stage R&D are undeveloped. This issue confronts salinity strategies generally, and is being addressed through initiatives such as the Environmental Services Investment Fund under the *NSW Salinity Strategy*.

Key areas need to be under perennial plants to achieve this Strategy's objectives. Perennial plant options include forestry outside of its traditional zone, native vegetation management, and short rotation tree crops.



River redgum reforestation - Mumbil, NSW

Peter Solness/Network Photographers

The Basin Salinity Audit found that a reduction of about 100 EC at Morgan would have to be found by new interventions.

States can address the 'legacy of history' and offset downstream impacts of future developments by investing either in works within their borders or in joint works.

3.8 Constructing joint (Commission) salt interception works

3.8.1 Joint works under the *S&D Strategy*

Salt interception works are large-scale groundwater pumping and drainage projects that intercept saline flows and dispose of them, generally by evaporation.

The *S&D Strategy* provided for improving salinity at Morgan through a joint works program equivalent to 80 EC. Out of this 80 EC, 30 EC was provided to Victoria and NSW, as SDEs to offset accountable actions (implemented after 1 January 1988). In effect, under this arrangement, the partner Governments agreed to undertake salinity mitigation works to offset the historical legacy of salinity on the assumption it was less than 50 EC.

At the time it was considered that the underlying salinity trend was an increase of 1.5 EC per year and that the net 50 EC reduction would provide a buffer for 20 to 30 years. However, the *Basin Salinity Audit* estimated future salinity trends to be about 4 EC per year and that the buffer will be used up much sooner.

The *S&D Strategy* works program is jointly funded by the Commonwealth and the Governments of NSW, Victoria and South Australia, with the salinity benefits arising from the Commonwealth and South Australian contributions being allocated to river health.

3.8.2 New joint works

To maintain Morgan salinity at 800 EC or less for 95 per cent of the time for the duration of this Strategy, the *1999 Basin Salinity Audit* found that a reduction in salinity of about 100 EC at

Morgan will have to be found by new interventions over and above within-valley actions such as revegetation.

A new joint program of salt interception works, costing an estimated \$60 million, will commence immediately to deliver at least 46 EC, and potentially up to 61 EC, over the first seven years. The partner Governments have agreed that joint salt interception schemes must be economic and technically certain, and all things being equal, the most economic schemes should proceed first.

The new program provides for a State (if it chooses) to contribute to joint works to offset 'legacy of history' and provide SDEs to offset the downstream impacts of future developments in that state. The State can also choose to implement actions within its borders to offset the 'legacy of history' or provide SDEs, if it considers such actions will be more cost effective for the State than contributing to joint works.

3.8.3 Cost sharing and benefit allocation for joint works

The Commission will review in the first 12 months of this Strategy, the scale of the program required, and the cost sharing and benefit allocation arrangements. Of the minimum 46 EC reduction in average salinity at Morgan, 31 EC will be allocated as 'legacy of history' offsets, and 15 EC as SDEs; however, it is highly likely that more credits will be needed to cover both the 'legacy of history' and new development.

The partner Governments have agreed to the following cost sharing and benefit allocation principles for the new joint works:

- each State will have equal access to a limited number of SDEs but will be accountable for offsetting the effects of future developments;



Salt harvesting and salt interception works

Matt Kendall

- partner Governments will have equitable access to the works, first right of refusal and credits generated will be allocated according to contribution to costs;
- the Commonwealth's credits will be re-allocated to the State entries on the Commission Registers, in proportion to the 'legacy of history' affecting each State; and
- each State is to keep its contribution to the Commission Registers in balance or in surplus.

These principles allocate salinity credits in an equitable manner that acknowledges the historic and geographical differences between the States. Salinity credits arising from the Commonwealth's contribution will be allocated to resolve State differences. In addition, the Commonwealth may allocate credits to the Commission A Register to offset actions to provide environmental and social benefits (e.g. wetland flushing).

3.8.4 Investigating, constructing and operating joint works

River Murray Water, as the operational arm of the Murray-Darling Basin Commission, coordinates the partner Governments in developing the investigation and construction programs, and the subsequent operation of joint works.

The Commission's high-level inter-jurisdictional working group on salt interception will interpret the principles for undertaking the new joint works program, for the purposes of recommending to Council within 12 months the final number of EC credits to be delivered, along with cost sharing and benefit allocation arrangements.

Beyond the seven-year program, it is envisaged that additional investigation and construction of salt interception works will be required, along with other mitigation options, to deliver the additional EC credits necessary to maintain the Morgan target. Planning for this subsequent program will be in place before completion of the initial program.

3.9 Ensuring Basin-wide accountability: monitoring, evaluating and reporting

3.9.1 Salinity credits and debits

An important feature of the Basin salinity target at Morgan is that it is supported by a system of salinity credits and debits. Setting end-of-valley targets and establishing their contribution to the Basin salinity target provides the basis for Basin-wide application of Commission credits and debits. It generates a consistent currency

through which trade-offs and Basin-wide accountability can be accommodated, and by convention the currency is EC units (a measure of salinity concentration) at Morgan.

3.9.2 Valley Report Cards

In addition to advising of works and measures that may have a significant effect at Morgan, each State has agreed to establish Report Cards for annual reporting arrangements on each of their tributary valleys. The design and layout of the Valley Report Cards will be a State prerogative, and will include details of predicted impacts of proposed actions (as detailed in Section 3.5.4) and actual implementation to date:

- assessed baseline conditions (as at 1 January 2000) for end-of-valley salinity, salt load and flow regimes;
- expected 'legacy of history' impacts on end-of-valley salinity, salt load and flow for 2015, 2050 and 2100;
- agreed end-of-valley salinity and salt load targets; and
- assessed effects of significant in-valley actions undertaken to date, including effects of catchment management plans on end-of-valley salinity, salt load and flow conditions for the current year, and at 2015, 2050 and 2100.

On an annual basis each State will prepare a consolidated Report Card for all valleys within the State for reporting to the Commission.

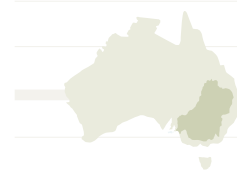
3.9.3 Administering Commission Registers

The system of salinity credits and debits for achieving the Morgan target will be managed through the Commission A Register (for tracking SDEs) and the Commission B Register (for actions to address the 'legacy of history').

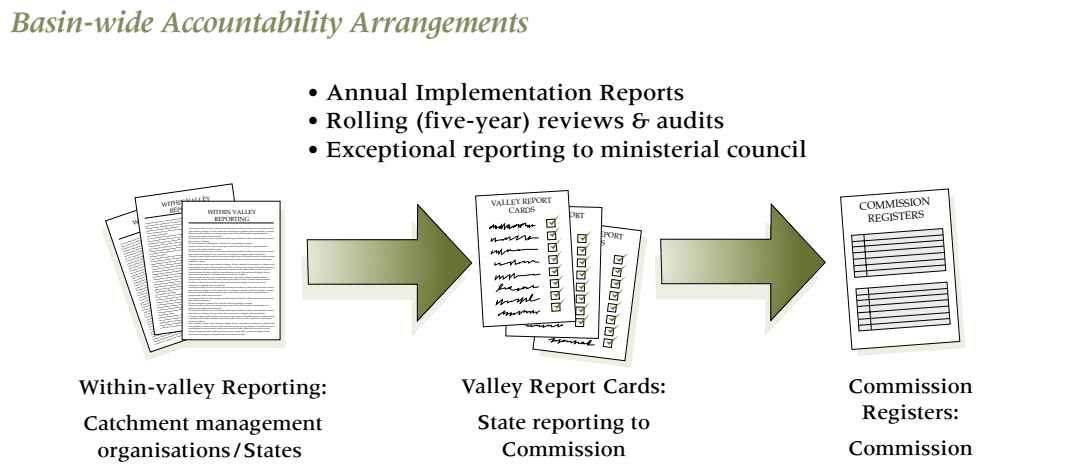
The Commission Registers will keep account of all actions undertaken within the Basin after agreed baseline dates that will cause a significant increase or decrease in average salinity at Morgan. The agreed dates are:

- 1 January 1988 for accountability for future actions by NSW, Victoria and South Australia;
- 1 January 2000 for accountability for future actions by Queensland; and;
- 1 January 2000 for responsibility to address the 'legacy of history' effects by partner Governments.

The States have agreed to establish tributary Report Cards for annual reporting of predicted impacts of proposed within-valley actions. Each State will prepare for the Commission a consolidated Report Card covering all tributaries within the State.



The Commission will establish two Registers to account for credits and debits of all actions that affect EC at Morgan. States in deficit on the Registers will be answerable to Council.



The effect of actions will be assessed with models using an agreed climatic/hydrologic sequence (otherwise known as the 'benchmark period'). The benchmark period is from July 1975 to June 2000. An action will be considered as significant and included in the Commission Registers if it is assessed to cause a change in average EC at Morgan of 0.1 EC or higher within 30 years.

Under this Strategy, the current *S&D Strategy* Register will be translated directly into the Commission A Register. The units of the Commission A Register will be Equivalent EC at Morgan, which recognises the economic impact on the shared rivers, and is a continuation of current practice.

The Commission B Register is being established to track 'legacy of history' impacts and to assess the effects of actions to address it, for example revegetation. The effects of these actions are less certain, and are often more time-lagged, than actions qualifying for the Commission A Register. In some cases these actions may result in short-term salinity costs, while providing longer-term salinity benefits.

The Commission Registers will operate in harmony using the common currency of Equivalent EC at Morgan. The States will keep the total of the Commission A Register as well as the cumulative total of both Commission Registers in balance, or in surplus.

In the early years of this Strategy there is not expected to be any trade between the Registers.

3.9.4 Reporting to Council

This Strategy will incorporate transparent accountability arrangements whereby progress towards targets will be monitored and reported to Council annually. This follows the same principles as for the Cap on diversions.

Each year, States will collate data on all actions undertaken or proposed, and will report these against the agreed end-of-valley targets and against the Commission A and B Registers.

Basin monitoring and reporting arrangements required for this Strategy will be consistent with NAP and other catchment and state-of-environment reporting needs. Synchronisation of these reporting requirements is a priority in the early years of Strategy implementation.

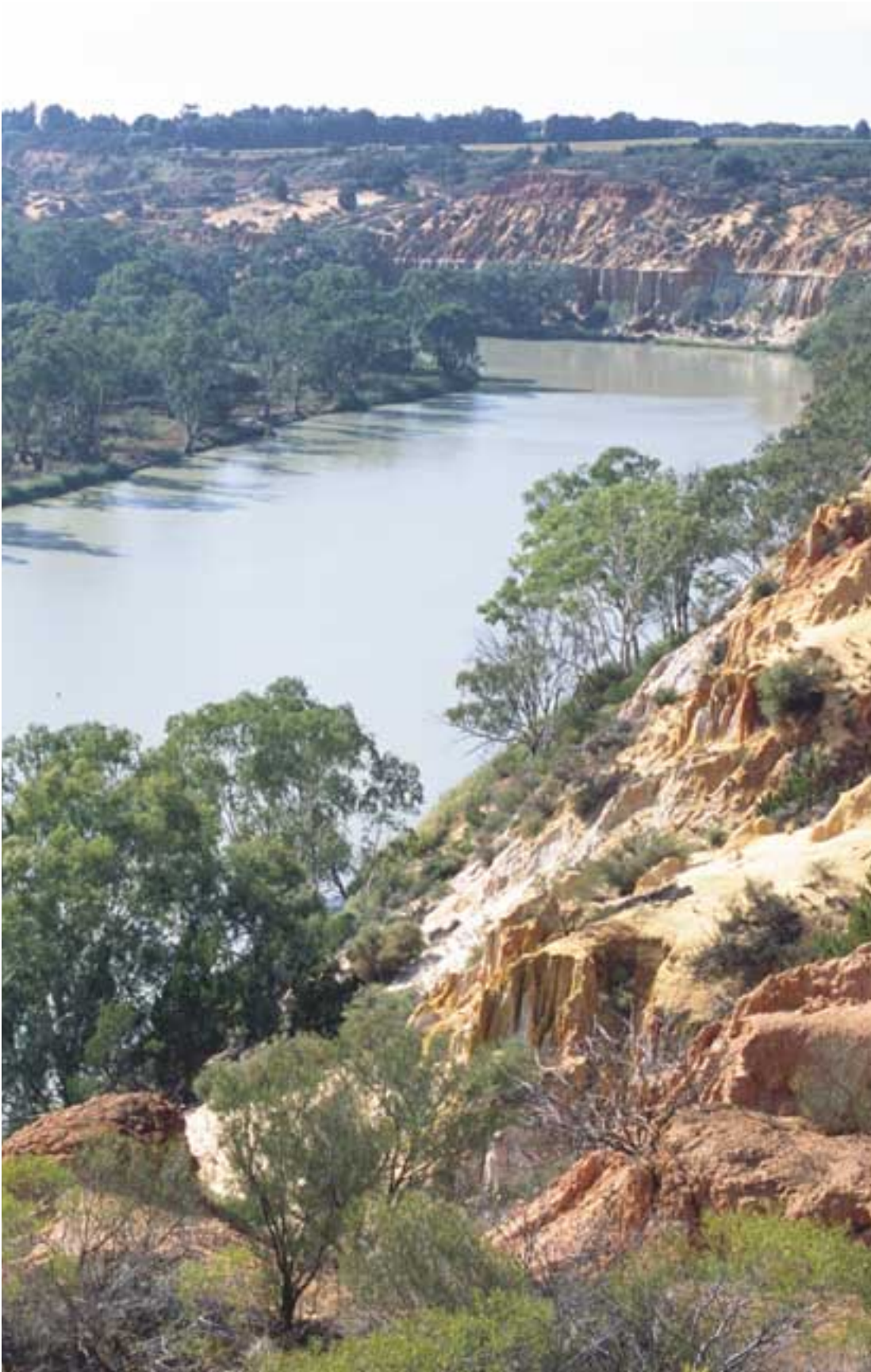
Reporting to the Commission and Council by the States will consist of:

- an annual report detailing progress with implementation of works and measures and a progressive estimate of salinity effects (at end-of-valley and/or Morgan as appropriate) of those works and measures actually implemented to date; and
- a rolling five-year review and audit for each valley and Commission Register entry, of the assessed effect on river salinity (at end-of-valley and/or Morgan as appropriate) due to actions implemented to date, as well as an update of the expected change in the future flow, salt load and salinity regime due to 'legacy of history' (and any other emerging effects such as climate change).

3.9.5 Accountability under Schedule C

If a State is found to be in deficit on the Commission A Register, it will be deemed to be in breach of the terms of Schedule C to the Agreement. The States will be directly answerable to Council for any breaches of the Commission A Register.

Should the total of the Commission A and B Registers for a State go into deficit, Council will receive an exception report from the Commission, with a proposed course of action to correct the situation.



River Murray

Peter Solness/Network Photographers





NSW Agriculture (DLWC)

Piezometer for measuring groundwater level



NSW Agriculture (Allan Grogan)

Community tree planting