The SDL adjustment assessment framework for supply measures

Australian Government

MURRAY–DARLING BASIN AUTHORITY

Acknowledgement of the Traditional Owners

The Murray–Darling Basin Authority acknowledges and pays respect to the Traditional Owners, and their Nations, of the Murray–Darling Basin, who have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. We understand the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the Basin.

The approach of Traditional Owners to caring for the natural landscape, including water, can be expressed in the words of Darren Perry (Chair of the Murray Lower Darling Rivers Indigenous Nations).

> *'The environment that Aboriginal people know as Country has not been allowed to have a voice in contemporary Australia. Aboriginal First Nations have been listening to Country for many thousands of years and can speak for Country so that others can know what Country needs. Through the Murray Lower Darling Rivers Indigenous Nations and the Northern Basin Aboriginal Nations the voice of Country can be heard by all'.*

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Cover image: Aerial view of Chowilla floodplain in November 2014.
Courtesy Callie Nikolai, DEWNR

SUMMARY

The Basin Plan requires the recovery of 2,750 GL of water for the environment. It also provides governments with an opportunity to find more efficient ways to achieve the Basin Plan's objectives; for example, ways that deliver the Plan's environmental outcomes using less environmental water

Healthy environment and more water for productive industries

The state governments are working with communities and stakeholders to develop such projects, known as 'supply measures'

States have already submitted 27 projects

The MDBA has developed an assessment framework as designed by Basin governments. In mid-2016, MDBA will use this to assess all projects and calculate the new recovery target

The framework has been trialled and thoroughly reviewed by independent experts and all Basin governments...it was found to be scientifically-rigorous and suitable to use for the adjustment

The MDBA tested the assessment framework on the first seven projects. The results indicate that the method works to deliver an offset while still achieving equivalent environmental outcomes (at least 200 GL for the first seven measures tested)

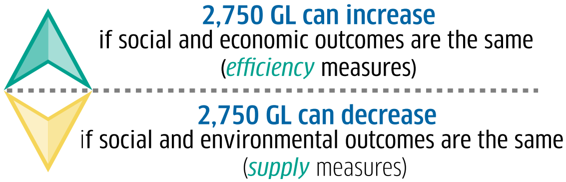
As state governments bring forward more supply measures the volume of water recovery is expected to further reduce. The new recovery volume calculated by MDBA will be combined with additional 'efficiency' savings (see p. 17) to amend the Basin Plan's Sustainable Diversion Limits. These will begin on 1 July, 2019.

The size of the supply contribution depends upon the scope and quality of projects

Independent stocktake of 36 prospective projects suggests a plausible offset of over ***500 GL***

To achieve a sustainable balance between water for industry, agriculture and the environment, the Murray–Darling Basin Plan placed limits on the average amount of surface water that can be taken from the Basin's rivers. This 'Sustainable Diversion Limit' (SDL) is 10,873 GL per year (on average) for the Basin as a whole. To get to this SDL by 2019, 2,750 GL of water will be recovered for the environment by the Australian Government.

However, to optimise the outcomes achieved by the Basin Plan, state and Commonwealth governments included an SDL adjustment mechanism (SDLAM), to make sure all water is used efficiently, and to its full effect. For example, if ways can be found to achieve the Basin Plan's environmental outcomes with less water (actions known as 'supply measures') the volume of water recovery could be reduced. Similarly, if further investment can make water delivery systems for irrigation even more efficient (actions known as efficiency measures) more water could be recovered for the environment. The third type of SDLAM investment is for constraints measures, to make environmental water delivery more effective in the future (p. 19). The MDBA will help Basin governments to explore potential supply measures and in 2016 adjust the SDL up or down to reflect the net effect of the combined 'package of supply and efficiency measures'.



The 2,750 GL water recovery volume was carefully chosen by the MDBA to balance environmental, economic and social considerations. Therefore, governments agreed these same considerations would determine how much less water needed to be recovered after investing in supply measures. Governments also agreed that MDBA would perform this calculation using the 'SDL adjustment assessment framework' – a model-based framework that includes an independently-developed, science-based and peer-reviewed test for environmental equivalence. This document explains the framework and how the equivalence test is applied. It also provides more information on some of the supply measures being explored through the SDLAM. A separate CSIRO document explains the equivalence test in more detail (see 'more information' at the back of this document).

The Australian Government's position

The Australian Government has committed to implementing the Basin Plan and recovering water for the environment in a way that minimises the impacts on communities.

As of 30 June 2015 over $5 billion has been invested, recovering 71% of the 2,750 GL target. Just under half of this investment has been spent on purchasing water licenses with the rest going to more efficient infrastructure projects. The Australian Government is now prioritising remaining investments towards more efficient infrastructure to bridge the remaining gap between current water use and the adjusted SDL. After the water recovery target is reached, continued investment in 'additional efficiency measures' could provide up to a further 450 GL for the environment.

Supply measure projects (see snapshot p. 3) are mostly about:

- building or changing water management structures so environmental water can be delivered more effectively – achieving more with less
- improving the way rivers are managed to get the most out of the water we have.

Supply measures can mean equivalent environmental outcomes can be achieved with less than 2,750 GL of water (the saved water is then available for consumption by communities).

Additional efficiency measure projects (see snapshot p. 17) include:

- on-farm efficiencies (such as improved irrigation methods)
- reducing evaporation and seepage (eg. piping or lining water delivery channels).

The additional efficiency measures can mean more than 2,750 GL of water is recovered for the environment without changing the volume of water available for communities – having no impact on social and economic outcomes.

SUPPLY MEASURE SNAPSHOT

Supply measures are new ways to manage the Basin's rivers to more efficiently achieve outcomes for the environment. They can be:

- new river operating rules that make environmental water delivery more effective – like new rules to manage the water released from Hume Dam to get better environmental outcomes downstream (image A)
- smarter ways to use dams, locks and weirs to reduce evaporation losses over summer
- building innovative water management structures that deliver water to environmental assets more efficiently (images B & C).


A. Hume Dam. Photo: Adam Sluggett, MDBA


B. Pumping water into wetlands at Hattah Lakes. Photo: Ben Dyer, MDBA


C. An environmental regulator to control the flow of water at Koondrook forest. Photo: Damian McRae, CEWO

SUPPLY MEASURE PROJECTS SUBMITTED

An initial, preliminary list of supply measure projects* being considered by Basin governments have been nominated for the southern Basin only and includes:

1. Chowilla floodplain The Living Murray (TLM) proposal
2. Riverine recovery project
3. South-east flows restoration project
4. Belsar Yungera floodplain management project
5. Burra Creek floodplain management proposal
6. Gunbower Forest TLM proposal
7. Gunbower National Park floodplain management project
8. Guttrum and Benwell State Forests floodplain enhancement project
9. Hattah Lakes north floodplain management project
10. Hattah Lakes TLM proposal
11. Lindsay Island (Stage 1) TLM proposal
12. Lindsay Island (Stage 2) floodplain management project
13. Mulcra Island TLM proposal
14. Nyah floodplain management project
15. Vinifera floodplain management project
16. Wallpolla Island floodplain management project
17. Flexible rates of fall in river levels downstream of Hume Dam
18. Hume Dam airspace management and pre-release rules
19. Barmah–Millewa forest environmental water allocation
20. Alternative supply systems for effluent creeks – Murrumbidgee River
21. Computer-aided river management (CARM) Murrumbidgee
22. Improved flow management works at the Murrumbidgee River – Yanco Creek offtake
23. Nimmie Caira infrastructure modifications
24. River Murray weir modification (locks 8 and 9)
25. Snowy Hydro licence amendments to call environmental water
26. Koondrook–Perricoota Forest flood enhancement TLM proposal
27. Murray & Murrumbidgee Valley National Parks water management works.

Stressed Koondrook Forest during drought in 2009. Photo: David Kleinert

*Supply measures could be nominated across the Basin; however, Queensland and New South Wales have not identified any prospective projects in the Basin's north.

Mimicking a flood to benefit the floodplain environment

Supply measures can generally provide benefits at one of two scales:

- a whole length of a river – like the proposed rule change for the operation of Hume Dam
- a small area or river reach – reducing evaporation losses or delivering local environmental outcomes in more efficient ways. These latter are called 'environmental works' (shown in images B & C on page 3).

Flow regulation and removing water from rivers for consumptive use have caused many floodplains and wetlands in the Basin to become 'disconnected'. That is, these ecosystems now receive less water, less often than they need it, which has led to serious decline in the health of many native plants and animals that depend on the river.

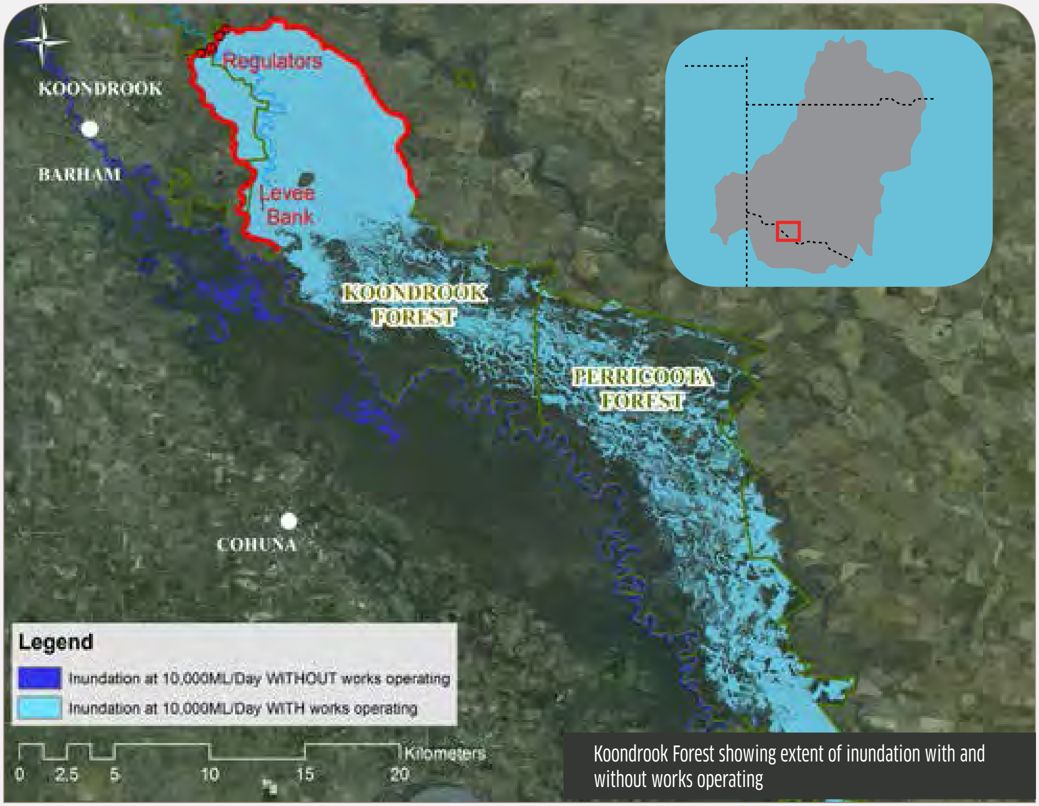
To protect and restore these ecosystems, the Basin Plan seeks to use some of the water recovered by the Australian Government to reconnect these areas, using 'managed overbank flows'. This is where environmental water is used to raise the river level high enough to allow water to flow into wetlands and out into the floodplain.

Another way to provide water to parts of the floodplain involves building environmental works. Using structures like environmental regulators and levee banks, water can be directed to the floodplain without having to raise the river level. This typically uses less environmental water than a managed overbank flow. Several successful environmental works projects have already been constructed in the Basin and will be assessed as supply measures. Several more projects have also been proposed by state governments (see previous page). When implemented, the projects have the potential to not only help to lower the water recovery target, but also keep many small areas of floodplains in a healthier condition.

Koondrook Forest receiving an environmental flow. Photo: Damian McRae, CEWO

Environmental works in the Koondrook–Perricoota Forest

Environmental regulators, levees and additional channels constructed in the Koondrook-Perricoota Forests (near Barham, in New South Wales) are an example of environmental works. Built as part of a joint government program (The Living Murray initiative), they were designed to give water managers the ability to mimic a natural flood. By closing the regulator, water can be held on the floodplain for a few weeks. Mimicking a flood in this way every few years triggers plants to flower and reproduce and improves the health of river red gum forests.



Koondrook Forest showing extent of inundation with and without works operating

Reconnecting wetlands allows fish and crustaceans to flourish and become the food supply for large flocks of breeding waterbirds. After the event, the water returns to the river to contribute to more environmental outcomes downstream.

Environmental works provide greater watering efficiency – managers can achieve equivalent environmental outcomes using less water, and they also benefit more than just the environment. Experiences from The Living Murray initiative show that works create positive outcomes throughout the whole community – as people come together to better understand their local environment, the Indigenous culture and how they all fit into a large and complex river basin.

VALUING THE CONTRIBUTION OF SUPPLY MEASURE PROJECTS

To implement the Basin Plan in 2019, the contribution of supply measures needs to be determined (before they are fully implemented). For this reason the Sustainable Diversion Limit Adjustment Mechanism, outlined in Chapter 7 and Schedule 6 of the Basin Plan, provides a model-based method for calculating the new water recovery target in mid-2016.

The MDBA and Basin governments have been working together to combine this method with the MDBA's river-modelling platform to provide a SDL adjustment assessment framework. The five key components of the assessment framework are summarised opposite and detailed in pages 9–14.

The model-based assessment framework allows a simulation of supply measures (and lower volumes of water recovery) to be compared to the Basin Plan simulation (with 2,750 GL of water recovery). Three tests are applied during the comparison to ensure the benefits of the Basin Plan are protected: preserving the current level of water security enjoyed by towns and water license holders and ensuring important environmental outcomes are maintained (like reconnecting wetlands and rivers more regularly and transporting salt out to the sea). The three tests consider:

- reliability of supply – the supply measures can't have a detrimental impact on the reliability of supply to water users
- limits of change – three categories of environmental 'safety nets' are applied – to preserve some environmental outcomes, but allowing for trade-offs to occur in some others, so long as they are not unreasonably large
- environmental equivalence – overall environmental outcomes in the southern Murray–Darling Basin must be maintained.

The assessment framework will be applied by the MDBA in mid-2016 to assess the contribution of the package of supply measures. The smallest water recovery volume found to pass all three tests will be adopted as the new water recovery target.

The framework components are:

1. **Computer (hydrologic) models**

A model simulation of the Basin Plan – the outcomes from 2,750 GL water recovery – forms the 'benchmark' for comparison against a supply measure package simulation (including any resultant lowering of 2,750 GL water recovery).

2. **Hydrologic indicator sites**

A number of environmental sites are well understood by scientists. These have helped to understand the relationship between river flows and the health of fish, birds and vegetation in a river reach. The framework uses the simulated river flow at these 'indicator' sites as the environmental safety nets, and as inputs to the 'environmental equivalence test'.

3. **Ecological elements**

A CSIRO-led team of river scientists selected 12 categories of fish, waterbirds and vegetation ('ecological elements') – with known responses to river flows – to be assessed at each indicator site. These relationships allow simulated flows to provide an indication (and score) of long-term ecological health.

4. **Ecological equivalence scoring**

Health indicator scores are combined across all ecological elements to compare their equivalence to the benchmark simulation. This method was peer-reviewed and deemed scientifically robust.

5. **Assessment methodology**

In mid-June 2016 the package of supply measures will be simulated using water recovery volumes potentially less than 2,750 GL. The smallest recovery volume to pass all three tests will be used to adjust the Basin Plan's SDLs.

Ensuring reliability of supply:

The MDBA has been very careful in making sure that nothing in the Basin Plan impacts on water user reliability. In the same way, the package of supply measures cannot have negative impacts on the reliability of water for licence holders. As state water management agencies are the experts in this domain, the MDBA has worked closely with them to develop and adopt a range of indicators for the reliability assessment. These indicators, which include how water is shared between each state, will be used by state government experts to ensure water users' reliability is not affected by the new supply measures or changes made to the SDLs.

Mulwala irrigation water supply channel near Deniliquin, NSW. Photo: Brayden Dykes, MDBA

1 Computer (hydrologic) models

Hydrologic models are used in most developed nations to manage water resources. Over many decades Basin governments have developed these models to mirror all the parts of a river system, and how they interact. This allows managers to answer questions like: how much water flows into dams and rivers and what is the optimal way to share this water? Models can then allow governments to simulate and test the different management options available, without needing to put them into practice.

To develop the Basin Plan, Basin governments provided the MDBA with twenty-two tried and tested hydrologic models. These were connected to represent the entire Murray–Darling Basin. The SDL adjustment framework will apply this same modelling 'platform' to simulate:

- the Basin Plan with 2,750 GL of water being used towards the Basin Plan's environmental objectives (benchmark model)
- the Basin Plan improved by supply measures (SDL-adjusted model) – this model will also be used to test different water recovery volumes.

Information drawn from these simulations will help MDBA to test: (1) if the reliability of water supply has been impacted; and (2) if the limits of change have been satisfied. Simulated flows at each hydrologic indicator site (see below) will also be used as inputs to the third test – environmental equivalence.

2 Hydrologic indicator sites

In developing the Basin Plan, the MDBA needed to work out how much water was required to sustain a healthy river system, including its wetlands and floodplains. In a river basin covering over one million square kilometres this proved to be challenging. A lot is known about some areas (like the Ramsar wetlands) and relatively little about others. For this reason, we focussed on acquiring the best available science at 24 hydrologic indicator sites (HIS, see p. 10) across the Basin. At these sites, local information and years of scientific research helped to determine the environmental water needs of many different ecological communities important for fish, plants and waterbirds.

For example, to provide breeding opportunities for a range of native aquatic species near the South Australian border, it was identified that a bank-full flow of 20,000 ML per day was desirable. This should occur over 60 days in 70% of years.

Just over one hundred of these 'site-specific flow indicators' (SFIs) were determined – representing many different types of water-dependent ecosystems. They were used to calculate how much water was needed to reinstate the flow regime of ecologically-important parts of the river (see opposite page).

For the most part, achievement of SFIs was used as a measure of the environmental outcomes achieved by a model simulation. However, they are not suitable for more detailed assessments – such as comparing the benefits provided by environmental works with those achieved by natural overbank flow events. For this reason, the method needed to adopt more refined ecological indicators to assess whether supply measures deliver 'equivalent environmental outcomes'.

The Hydrologic Indicator Sites and assessment reaches applied in the southern Basin's SDLAM

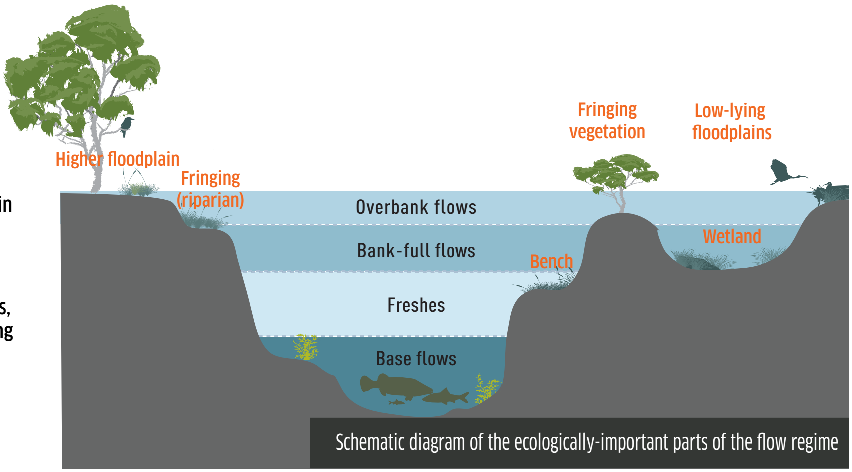
Hydrologic indicator sites in the southern Murray-Darling Basin

Types of site-specific flow indicators (SFI's) used to inform the Basin Plan's SDL:

Bank-full/overbank – less frequent larger flows that fill the channel or spill; important for the health of floodplain plants & animals and often stimulate fish spawning and bird breeding

Freshes – relatively short duration, small-to-medium flows that water benches and may flow into anabranches, but otherwise do not 'break banks'; important for fringing plants, nutrient cycling and fish movement

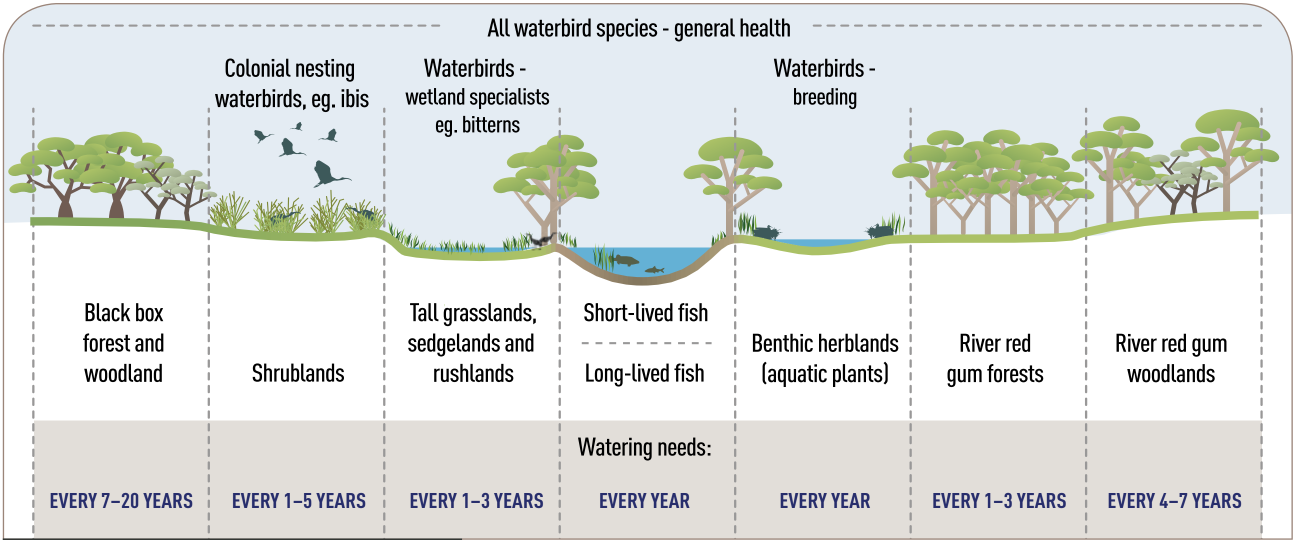
Base flows – persist long-term or seasonal; important refuge and home-sites for aquatic plants and animals (esp. in dry periods)



Schematic diagram of the ecologically-important parts of the flow regime

3 Ecological elements

Twelve 'ecological elements' are used by the method to capture flow-related environmental outcomes. These ecological elements are found across the southern Murray–Darling Basin and each has distinct flow needs: their health is known to be affected by changes in flow (wet and dry conditions). Four elements relate to waterbirds, six to vegetation and another two to fish.



The twelve ecological elements as part of the landscape

Flow regimes: High flows after heavy rain are often captured by dams for summer irrigation. This has had a profound influence on the flow pattern (regime) of rivers, and has generally made them far less variable than they were naturally. This prevents important lifecycle processes – which evolved over thousands of years of natural floods and droughts – from occurring. Therefore, to keep the river ecosystem healthy, the Basin Plan seeks to use the recovered water to reinstate the important components of the natural flow regime. This includes: base flows, freshes, bank-full and overbank flow events (see graphic on previous page).

Some types of supply measures (like environmental works) can also provide a more natural flow regime. But compared to a managed bank-full or overbank event, they can do this more often, during droughts, and using less water in the long term. This means some areas can be kept in a better condition and they can become more resilient to other impacts. Hence optimising the outcomes of the Basin Plan will comprise supply measures that restore a more natural flow regime, including through the use of environmental works.

Requirements of the environmental equivalence test:

To make sure the Basin Plan's environmental outcomes (benchmark model) are equal to those provided by supply measures (supply model) an 'environmental equivalence' test is needed.

The Basin Plan requires the environmental equivalence test to be:

- science-based (uses the best available science to describe relationships between flow and ecology)
- fit-for-purpose (be applied in a modelling framework and completed within the SDLAM time-frames)
- independently reviewed
- able to test all different types of supply measures.

A CSIRO–led team of experts independently developed the test to be consistent with the requirements of Schedule 6 in the Basin Plan (see 3 opposite). The scoring method provides a measure of health for each element over the 114 year modelling period; and combines all environmental outcomes into a regional score (see 4 below).

4 Ecological elements scoring method

The scoring method uses published literature and expert knowledge to determine a *flow–response relationship* for each ecological element; providing a basis for comparing the ecological outcomes of different model scenarios. Each relationship links the cycle of wetting and drying to the long-term health of an ecological element. This considers the types of flows needed for specific life stage processes and the time between flow events suitable to support growth, reproduction, dispersal and migration.

Within the assessment framework the modelled sequence of site-specific flow indicators (representing an annual cycle of wetting and drying) is combined with each relationship to derive a 'score' for each element. These scores are then combined into a region scale environmental outcomes score. For a supply model to pass the test, it must have a region score greater than or equal to the benchmark region score.

How scoring works (using short-lived, small-bodied fish as an example):

There is a lot of scientific information about the way that short-lived, small-bodied fish (like rainbow fish and olive perchlet) respond to both wet and dry conditions. Living around four to eight years, they are opportunistic, breed rapidly and improve in both health and population size when there are suitable conditions. The response relationship for short-lived, small-bodied fish varies from scores of 0.3 (poor health) to 0.9 when conditions are favourable. For example, a 'low' score will occur when the habitat conditions in a year are poor (eg. a continuing dry period). Scores will rapidly increase as conditions improve (eg. higher flows and inundation of the wetland after significant rainfall). These 'health scores' are calculated in each year, and for each site-specific flow indicator. Scores for each year of the 114-year model simulation are averaged, and combined across all ecological elements and flow indicators into a reach score. These are then averaged into a region score – the scale at which the test is applied.

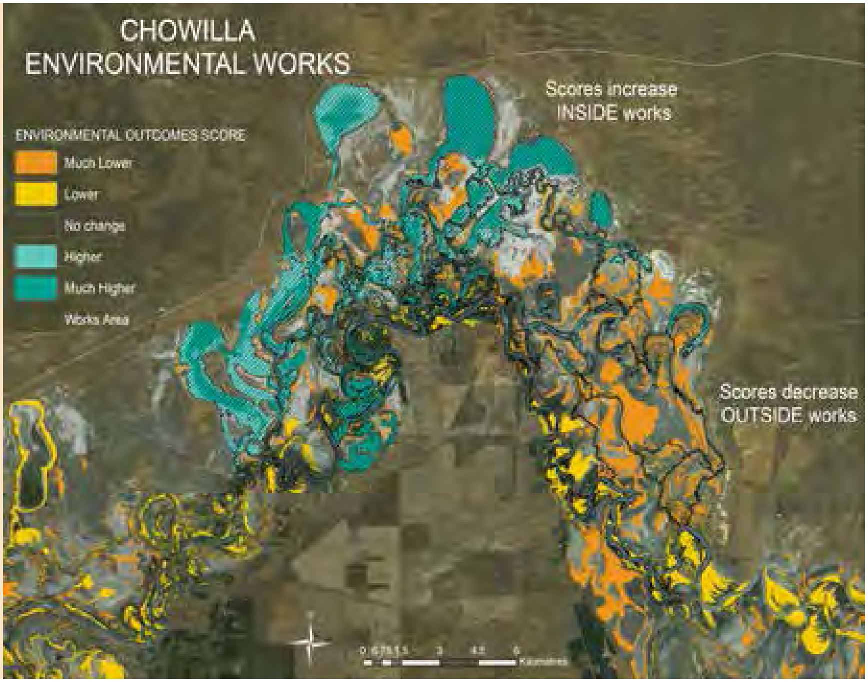
To pass the environmental equivalence test, the region score achieved by the supply measure package simulation must be better than, or equivalent to, the benchmark region score. Exactly the same steps are applied to score each scenario; however, in areas where supply measures improve the wetting and drying regime, region scores will generally increase. This indicates less water is required to achieve the benchmark environmental outcomes. If the reliability and limits-of-change tests also pass, a smaller recovery volume is then tested, and this repeats (see opposite).

A note about trade-offs

Environmental works (like on the Chowilla Floodplain) can provide significant benefits, but only for a small portion of a river reach (for Chowilla it's around 5%).

In the assessment framework, the higher scores inside the works area can reduce water recovery; but less recovery also means less water for managed overbank flows. This means the score will reduce in the areas outside of works (as illustrated).

The ecological elements method allows these types of trade-offs to be made in a scientifically robust way; and so long as the region score remains equal to, or better than, the benchmark score, environmental equivalence is maintained.



As long as the improved environmental outcomes from supply measures match the lessened benefit to the environment from reduced water recovery, then an equivalent ecological elements score at the region scale is possible. This, of course, is also only as long as the Basin Plan's limits of change are also satisfied; and that supply for consumption is not affected.

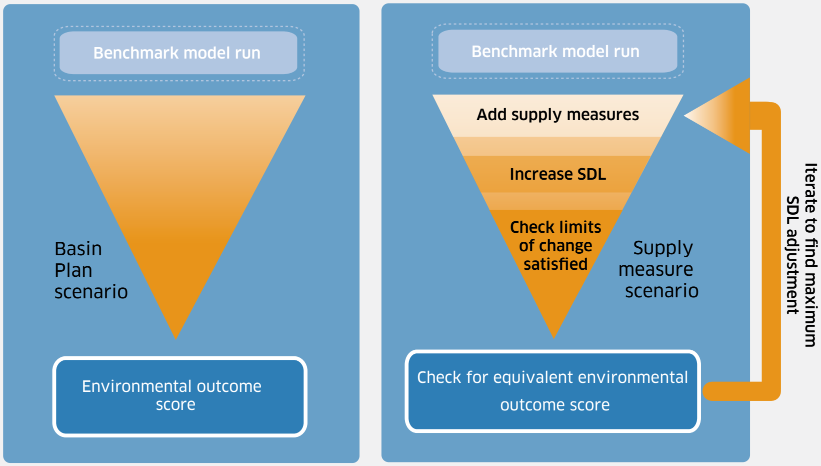
5 Assessment methodology

The MDBA must determine the smallest water recovery volume that passes all three tests. After simulating the Basin Plan's 2,750 GL recovery volume and determining the benchmark environmental outcomes score, the MDBA will add the package of supply measures to the model and progressively test smaller and smaller water recovery volumes.

For each simulation of the supply measures, three tests are applied:

- Were the environmental safeguards (limits of change) satisfied?
- Were no impacts on critical human water needs or reliability detected? (see p. 8)
- Was the regional environmental outcome score equal to or higher than the benchmark scenario?

If the answer to all these questions was 'yes', an even smaller recovery volume will be simulated. This cycle continues until the smallest recovery volume is found.



Trial implementation of the method

To develop the five assessment framework components outlined on the previous pages, the MDBA worked closely with the CSIRO ecological elements project team, Basin governments, many independent experts and a team of eminent scientists over a two year period.

In the second half of 2014 the first version of the framework was complete, and ready to be tested on a range of different supply measures.

This testing phase made sure the framework:

- was consistent with the requirements of the Basin Plan
- could assess different types of supply measures
- could calculate an SDL adjustment (or lower water recovery) volume.

With the assistance of Basin governments, seven supply measures were chosen for the trial, including The Living Murray environmental works:

- Gunbower Forest: where an environmental regulator and levees along Gunbower Creek can divert environmental water into the forest (~5,500 ha)
- Koondrook-Perricoota Forests: where channels, regulators and levees can draw environmental water from Torrumbarry Weir pool to water large parts of the forest (~16,500 ha)
- Hattah Lakes: where pumps can divert environmental water from the River Murray into Chalka Creek; and regulators and levees then control watering of the Lakes (~6,000 ha)
- Riverland-Chowilla floodplain, where watering can occur of around 8,000 ha across three works sites, including:
  - Mulcra Island: raising the Lock 8 water level allows water to enter Potterwalkagee Creek, where a regulator can hold water on the floodplain
  - Lindsay Island: the Lock 7 water level can be raised which allows low and base flows to go down the Lindsay River
  - Chowilla Creek: raising the Lock 6 water level permits diversion of environmental water into Chowilla Creek, where a regulator can hold water on the floodplain
- Hume Dam operational rule change: this supply measure adjusts the 'airspace' management arrangements at Hume Dam – which could reduce the regulating effect of the dam. This may allow a natural flow regime downstream and water to enter the Barmah-Millewa Forest more regularly during the spring.

Progress

The trial is now complete. Both CSIRO and an Independent Review Panel of eminent scientists advised that they consider the method to be science-based and fit-for-purpose:

> *'The method as described and implemented is considered scientifically rigorous, compliant with Schedule 6 of the Basin Plan, has an appropriate balance between sensitivity and uncertainty and is fit-for-purpose for determining the SDL adjustment of supply measures.' CSIRO.*

Based on this and all the tests done so far, the assessment framework is considered suitable and will be used to determine the final SDL adjustment from supply measures, subject to any minor refinements needed to robustly assess proposals.

> *From the trial, we learned that seven projects can potentially deliver an adjustment of at least 200 GL.*

Much work remains to be done – the independent stocktake of adjustment measures suggested a plausible offset associated with 36 *prospective* projects. It is difficult to predict the final adjustment until all projects are assessed through the framework. We have learned from the trial that there are interdependencies between the supply measures. As the stocktake has found, the offset is dependent upon the submission of a number of quality proposals by Basin states.

SDL ADJUSTMENT: WHO DOES WHAT?

Adjusting the SDLs

Using the assessment framework outlined in the Basin Plan, the MDBA will assess a package of supply measures proposed by Basin governments. The volume by which water recovery can reduce is known as the 'supply contribution'.

At the same time, the savings from additional efficiency measures will be determined. This is called the 'efficiency contribution'. The net change resulting from the combined supply and efficiency contributions will be used by MDBA to adjust the SDLs – but this is limited to a maximum of 5% of the Basin-wide SDL of 10,873 GL (544 GL).

Before proposing the adjustments to the Federal Water Minister, the MDBA will have a public consultation period. More material will be provided to help people understand the technical details of the assessment method and the final result.

Managing environmental water portfolios

Water acquired by the Australian Government is managed by the Commonwealth Environmental Water Office.

This water, and other environmental water, will be used to restore and protect water-dependent ecosystems in the Basin . This is coordinated by the Environmental Watering Plan (Chapter 8 of the Basin Plan).

Developing SDLAM projects

Basin governments are responsible for developing supply, constraint and efficiency measure projects and collectively agreeing on a package of measures for further investment.

A thorough review process will consider the costs, benefits and address the risks to third parties and the environment.

The Basin Officials Committee will submit the package of supply and efficiency measures to MDBA for assessment before 30 June 2016.

The environmental equivalence test

A CSIRO-led project team, including independent experts and scientists from Griffith University, the Australian National University and the Murray–Darling Freshwater Research Centre helped to develop the test for environmental equivalence.

This test is part of the SDLAM assessment framework which will be used by MDBA to adjust the SDLs in mid-2016.

The MDBA will assess the final agreed package of supply measures in 2016 to determine their ability to get equivalent environmental outcomes with less water.

The assessment framework includes a science-based, independently reviewed environmental equivalence test developed by CSIRO.

INFRASTRUCTURE INVESTMENT SNAPSHOT

On-farm and private irrigation network efficiency projects mean that more water is available for the environment, but not at the expense of agricultural production. Considerable government funding is driving these sorts of projects, which give the participants a more sustainable future. When on-farm irrigation systems and meter accuracy are improved, 'leaky' pipes and channels lined, and irrigation services and infrastructure upgraded, billions of litres of water can be saved.

Examples of programs funding these upgrades include the $575 million Australian Government's On-Farm Irrigation Efficiency Program (part of the Sustainable Rural Water Use and Infrastructure Program). This is assisting irrigators in the New South Wales Murray, Victorian Murray, South Australian Murray, Campaspe, Murrumbidgee, Goulburn, Broken, Loddon and the Lower Darling (south of Menindee Lakes) river catchments. The $750 million Private Irrigation Infrastructure Operators Program is assisting this sector in New South Wales.

Investment in water saving projects is beneficial and shows that the government is committed to a prosperous irrigation future.

In exchange for increased productivity for the farmer, these programs generally require the transfer of a portion of the water savings (in the form of permanent water licences) to the government. This water is then available to be used for environmental health purposes.

These types of projects are likely to be a part of the efficiency measure program. The environmental water recovery would be known as the efficiency contribution to the SDL adjustment mechanism.

See the Basin Plan Annual Report 2013–14 and other resource links at the back of this report for more information.

Left: Lateral irrigation system funded by the Aust. Govt. water recovery program (Russell James, MDBA). Right: MDBA Chair Neil Andrew checks drip irrigation system

'It is not the quantity of water applied to a crop, it is the quantity of intelligence applied which determines the result – there is more due to intelligence than water in every case..' ALFRED DEAKIN 1890

Computerised irrigation system allowing more efficient delivery of water and nutrients. Photos: Arthur Mostead

Addressing constraints

In developing the Basin Plan the MDBA identified a number of constraints that were preventing the full benefits of environmental water from being achieved. This can include physical aspects such as low-lying bridges; but can also include operational aspects, such as river management rules designed to limit the frequency of high flow events.

This issue is not a new one, and by working with landholders along low-lying sections of the River Murray between Hume Dam and Lake Mulwala, win-win solutions have already been implemented. Basin governments therefore requested that MDBA develop a Constraints Management Strategy to investigate 'constraints measures' as part of the SDLAM – to identify solutions from a whole-of-basin perspective and to ensure constraint investments achieve the best possible outcome for landholders and the environment.

For more details, see the back of this document for the website url.

A section of the River Murray known as the Barmah Choke, where flows are currently restricted. Photo: Arthur Mostead

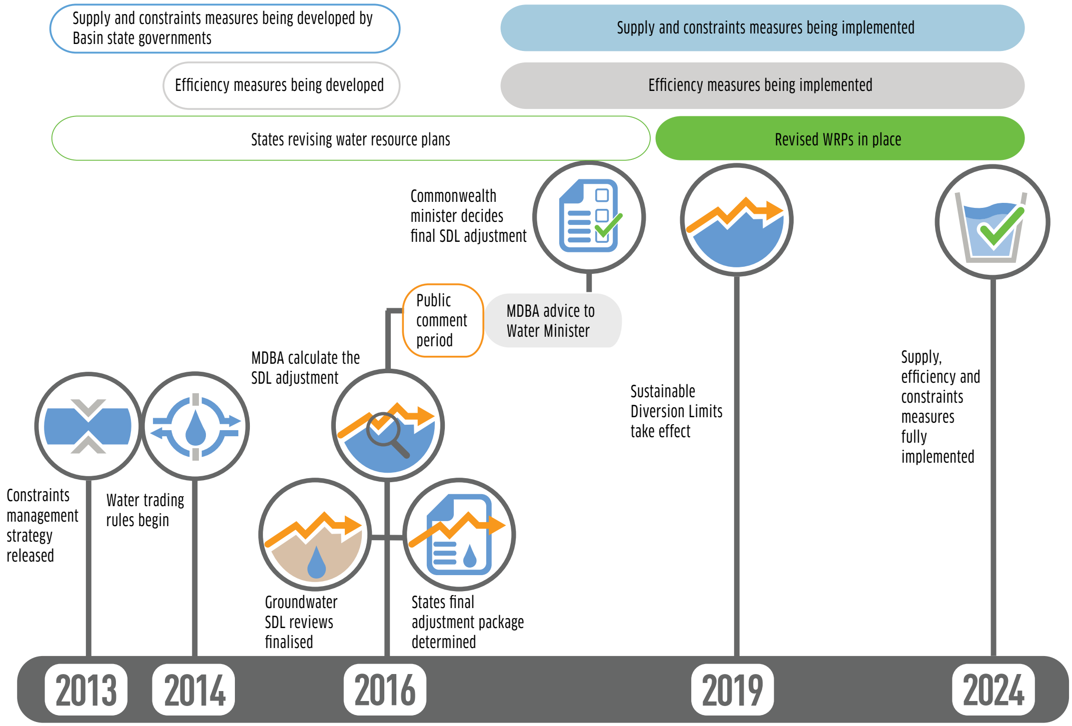
Still to do

Each supply measure has its own unique complexities, so it is possible that further refinements to the assessment framework may be identified. If so, we will work with Basin governments to ensure the measure is accurately and robustly assessed.

The trial has helped the Basin states and the MDBA to understand the projects that are likely to have the most potential – and this directs future effort, including the potential from some simple operational rule changes which can have system-wide benefits.

The independent stocktake suggests that a plausible offset of over 500 GL is achievable. This is dependent upon the submission of a quality package of measures. Basin states are continuing to develop business cases for projects and this work is well under way. The final package of supply measures to be included in the SDL adjustment mechanism is to be agreed by jurisdictions in June 2016. The MDBA (using the SDL adjustment assessment framework described here) will then advise the Water Minister of the SDL adjustment resulting from that package.

The figure below shows the continuing process towards full implementation of the Basin Plan.



QUICK RECAP: BASIN PLAN

The Basin Plan (2012) is the first plan that emphasises managing the Basin as one river system; but it builds on many decades of water management. It sets a limit on consumption (by 2019) and sets out ways by which to recover and improve the health of ecosystems that have been in decline for several decades. A particular stimulus for this national plan was the long 'millennium drought' (2000–09) which significantly affected not only the Basin's environment, but also people's livelihoods and wellbeing and our country's economy. This drought (which was by no means the first nor will be the last) highlighted that existing water use was not sustainable in the long term.

The Basin Plan is not trying to return the Basin's floodplain and riverine ecosystems to a pre-European settlement state. Rather, we are trying to find a better balance between the way people use the water and keeping some agreed important (water-dependent) wildlife and their habitats viable into the future. To achieve this, more water must remain available in the river system; and it must be used efficiently and effectively.

The additional amount of water that we need to return for environmental health purposes is 2,750 GL per year on average. This is to be recovered across the whole Basin river system. This amount was carefully calculated to balance environmental outcomes with social and economic ones; and based on the best information at the time (2012).

To date, 71% of the required Basin-wide water recovery has been achieved. That means we are already a good way towards a more sustainable level of water resource use.

The Plan acknowledges that there is potential to find engineering (and other) solutions which might mean we could do more with less water. The SDL adjustment framework allows us to consider the effects of these types of solutions on outcomes for the Basin's environment.

Protecting and restoring the Basin's key water-dependent ecosystems means:

- connecting some parts of rivers, where possible, with their floodplains. Along with the water comes nutrients, seeds, fish spawn etc. It allows plants to regenerate, bugs, frogs, turtles, fish and waterbirds to breed and feed, and this supports wider food webs and also tourism, recreation and Aboriginal cultural practices
- connecting some rivers to the sea. This flushes salt, improves water quality, allows fish migration, improves in-river habitats and keeps the Coorong viable, among other things
- providing water regularly to plants and animals so they have healthy populations that are more resistant to threats (like droughts, land use change and disease).

This can't be done just by a volume of water. It means careful management (and cooperation between water and land managers) because the water must be delivered or available at the right places and seasons, and for long enough.

For example, a late spring water 'pulse' down a river might naturally have followed seasonal high rainfall—this is known to be a catalyst for golden perch breeding. Colonial waterbirds gather and breed in large numbers when certain wetlands are inundated for sufficient time—which promotes food sources and plant growth (which forms nest sites for some species). Today, the natural flow pattern has been altered by dams and from water being taken from rivers for consumptive uses, such as irrigated agriculture.

The Basin Plan is looking for ways to reinstate some of these natural flow events. This will not return the river systems of the Basin back to their natural state, but will allow low-lying flood plains and wetlands to be maintained.

Aerial image of Renmark and the River Murray. Photo: Michael Bell

More information

Joint governments (2014) The sustainable diversion limit adjustment mechanism
www.environment.gov.au/water/publications/mdb/sustainable-diversion-limit-adjustment-mechanism

Sustainable diversion limit adjustment proposals
www.mdba.gov.au/what-we-do/water-planning/sdl/proposals

Department of the Environment (Aus Gov) – progress of water recovery
www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/progress-water-recovery

Commonwealth Environmental Water Office
http://www.environment.gov.au/water/cewo

CSIRO summary of the environmental equivalence scoring method
http://www.mdba.gov.au/sites/default/files/pubs/CSIRO-summary-of-the-scoring-method.pdf

Assessing environmental water requirements of the Hydrologic Indicator Sites
http://www.mdba.gov.au/what-we-do/basin-plan/development/bp-science

Basin Plan annual report 2013–14
http://www.mdba.gov.au/what-we-do/mon-eval-reporting/bp-annual-report

Basin Plan water trading rules
http://www.mdba.gov.au/what-we-do/managing-rivers/water-trade/trading-rules

Basin Plan environmental watering plan
http://www.mdba.gov.au/media-pubs/publications/environmental-watering-plan

Basin Plan environmental watering priorities for 2015–16
http://www.mdba.gov.au/media-pubs/publications/basin-annual-environmental-watering-priorities-2015-16

Basin-wide environmental watering strategy
www.mdba.gov.au/media-pubs/publications/basin-wide-environmental-watering-strategy

Constraints management strategy
http://www.mdba.gov.au/media-pubs/publications/constraints-management-strategy

NSW Department of Primary Industries, Office of Water
http://www.water.nsw.gov.au

Victorian Department of Environment, Land, Water and Planning
http://delwp.vic.gov.au/

South Australian Department of Environment, Water and Natural Resources
http://www.environment.sa.gov.au/managing-natural-resources/river-murray/murray-darling-basin-plan

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Cover image: Environmental water entering the Chowilla floodplain, November 2014. Photo: Callie Nickolai, Department of Environment, Water and Natural Resources, South Australia.

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The Murray–Darling Basin is one of the largest river systems in the world, but also one of the driest.

Home to more than two million people (including 18% of Australia's Aboriginal people) this 14% of mainland Australia accounts for around half of our irrigated agricultural production.

The Basin plays an important role in supporting biodiversity. It includes 16 internationally significant wetland sites, and supports over 60 species of fish and 98 species of waterbirds. It also contains Australia's largest river red gum forest.

The Basin Plan is about addressing significant environmental decline that has been brought about by over-use of the Basin's water resource, combined with recurrent drought.

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