



Review of the Murrumbidgee River Corridor Management Plan 1998



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Traditional Custodian Acknowledgment

We acknowledge the Ngunnawal people as Canberra's first inhabitants and Traditional Custodians. We recognise the special relationship and connection that Ngunnawal people have with this Country.

Prior to the displacement of Ngunnawal people from their land, they were a thriving people whose life and culture were connected unequivocally to this land in a way that only they understand and know and is core to their physical and spiritual being. The segregation of the Ngunnawal people from Culture and Country has had long-lasting, profound, and ongoing health and well-being effects on their life, cultural practices, families, and continuation of their law/lore. We acknowledge the historic interruption of the Ngunnawal people of Canberra and their surrounding regions. We recognise the significant contribution the Ngunnawal people have played in caring for Country. For time immemorial they have maintained a tangible and intangible cultural, social, environmental, spiritual, and economic connection to these lands and waters.

Ngunnawal Language Acknowledgement

Yuma

Dhawura nguna ngurumbangu gunangu Ngunnawal.
Nginggada dindi dhawura Ngunnawalbun yindjumaralidjinyin.
Mura bidji mulanggaridjindjula.
Naraganawaliyiri yarabindjula.

This country is Ngunnawal (ancestral/spiritual) homeland.
We all always respect elders, male and female, as well as Ngunnawal country itself.
They always keep the pathways of their ancestors alive.
They walk together as one.

Photographs

Front Cover: View of the Murrumbidgee River from Shepherds Lookout

Back Cover: Murrumbidgee River at Red Rocks Gorge

Except where otherwise acknowledged, all photographs are by Brian Prince.

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1. The Murrumbidgee River Corridor Management Plan 1998

The current management plan for the Murrumbidgee River Corridor (MRC) was developed in 1998 to meet the requirement of the *Land (Planning and Environment) Act 1991* that management plans be prepared for land identified as Public Land under the ACT's Territory Plan.

The 1998 plan identified its purpose as “to develop a clear management direction for the Corridor and particularly in terms of management systems and policies”. The plan was structured into two main sections, the first of which provided information on the nature of the Corridor, the planning context and existing statutory responsibilities. The second section of the plan identified management objectives, strategies and guidelines, and proposals for future investigations and follow-up management planning for specific issues.

Importantly, the 1998 plan covered not just the public land overlay reserves but also the river corridor zoning, hills ridges and buffer zones and mountains and bushlands as well as leased land. These complex zoning and tenure arrangements remain and will require careful consideration in any new plan.

Key areas of focus in the plan included the maintenance of water quality and integrity of aquatic and riparian ecosystems; the protection of discrete nature conservation areas; management of the Lanyon and Lambrigg historic precincts; investigation and conservation of cultural resources; and the maintenance and enhancement of recreational opportunities. The plan recognised the role of rural lessees in the management of parts of the Corridor and incorporated management guidelines for resource protection and arrangements for the leasehold management of grazing areas, concessions and utilities.

The plan stated that, within 12 months of its release, an Implementation Plan would be prepared in consultation with peak community groups. This Implementation Plan was completed in 2000.

1.1 Objectives of the plan

The 1998 plan identified objectives for management of the Corridor at several levels. The overall management objectives were:

1. to conserve the endemic aquatic, riparian and riverine ecosystems
2. to provide for recreational activities appropriate to rural and natural river setting
3. to conserve natural landforms and the valley's scenery
4. to conserve and enhance habitat links through the regional landscape
5. to maintain water quality
6. to provide formal and informal educational opportunities
7. to conserve the cultural heritage landscapes, areas and sites
8. to maintain a corridor of open rural and natural land on the western edge of Canberra, and to give clear definition to the transition from the urban landscape to the rugged forested landscape of the mountainous skyline to the west of the city
9. to provide educational and Interpretative opportunities associated with water issues relevant to the Corridor.

Specific management objectives were outlined in each section of the plan. Individual sections identified management practices and actions to be undertaken to achieve these objectives, and management issues that required further research. The final section of the plan comprised a summary table of management programs and priorities for the Murrumbidgee River Corridor which listed 41 projects, their priority and likely duration. The Implementation Plan developed in 2000 identified activities to be undertaken within each of the projects listed in the plan.

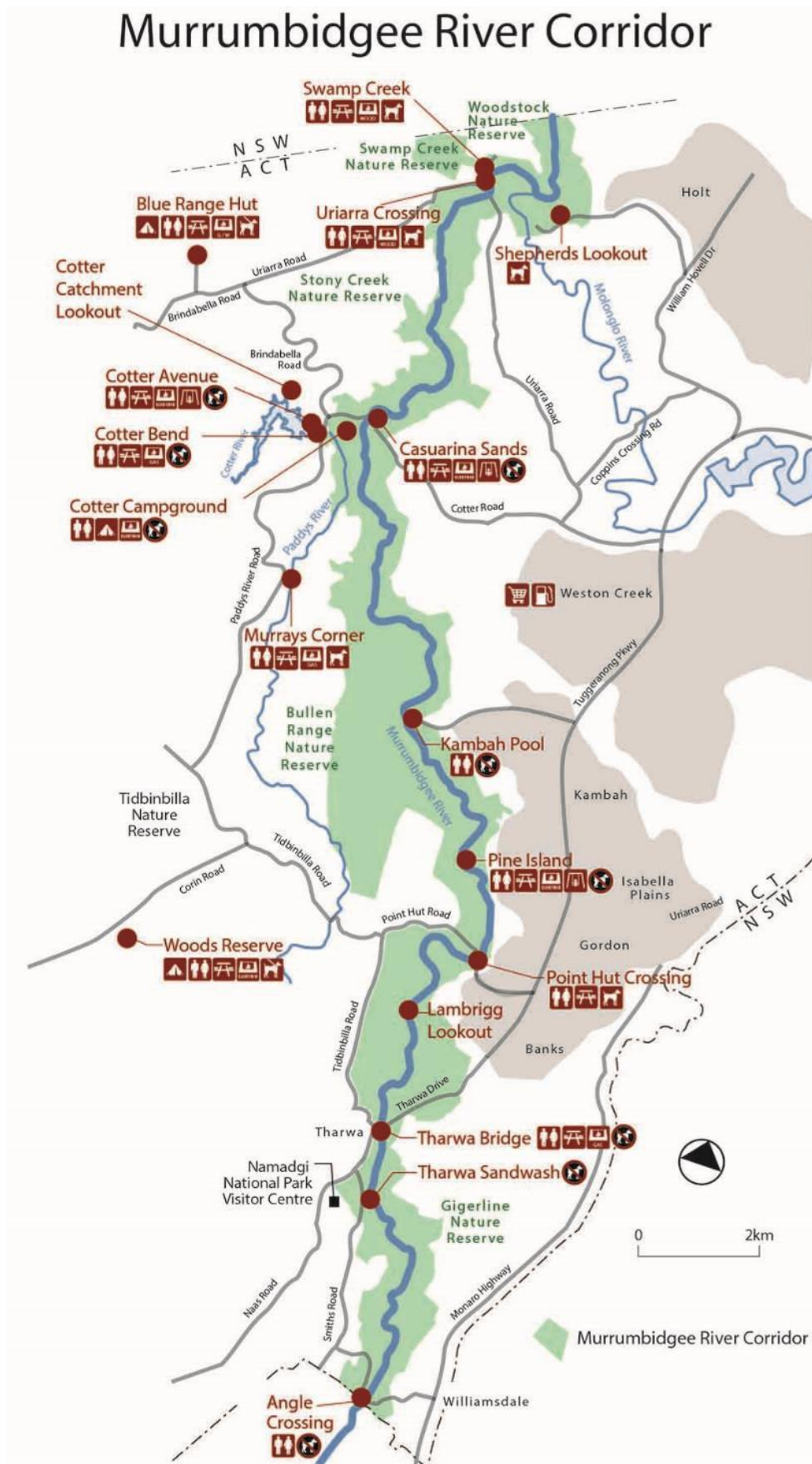


Figure 1: Map of the Murrumbidgee River Corridor showing the location of visitor facilities and allowable activities

2. Reviewing the 1998 Management Plan

The focus of this review is to: (1) determine the effectiveness of the implementation of the 1998 plan in achieving its objectives, in particular the overall management objectives for the MRC; and (2) assess the adequacy of the 1998 Management Plan as the primary planning document for the MRC.

The 1998 Management Plan, the 2000 Implementation Plan and the 41 management programs and priorities ('projects') identified in the management plan have been reviewed in consultation with the ACT Parks and Conservation Service (PCS), the Conservation Research and Evaluation (CRE) Branch and other Environment, Planning and Sustainable Development Directorate (EPSDD) staff.

Activities carried out in the management of the MRC since the 1998 plan was established have been reviewed and an assessment made of how these activities have contributed to meeting the plan's overall management objectives. Where internal EPSDD consultation has suggested issues requiring consideration in the development of a new plan for the MRC, these are listed at the end of the review of activities against each objective.

An assessment of the plan as the primary planning document for the MRC has also been undertaken, utilising the tool described by Hockings et al. (2008) as a component of assessing the management effectiveness of natural World Heritage sites.

Reviewing the 1998 Management Plan presented some significant challenges, primarily due to the age of the plan, the significant changes that have taken place in the legislative and policy environment since it came into force, and the absence of a systematic, integrated approach for ongoing monitoring and evaluation of management effectiveness. EPSDD is currently in the process of establishing an integrated planning framework that will include a more systematic approach to management planning, monitoring and outcome-based evaluation of management effectiveness.

2.1 Summary assessment of the Management Plan 1998

Strengths

The plan included:

- an outline of the planning and management context of the Corridor
- overarching objectives for management
- objectives for heritage values, visitor use, interpretation and education, resource protection, authorised activities, management systems, land management and planning coordination
- management objectives, policies or actions for specific values, activities or reserves
- a summary table of management programs and priorities
- location maps for each nature reserve and recreation area (special purpose reserve).

Limitations

The plan provided only limited information on:

- biodiversity and other natural values
- Aboriginal and historic cultural heritage
- Aboriginal engagement and caring for Country, including cultural flows
- potential threats to reserve values and management approaches and actions to protect the values – climate change is not considered
- community engagement
- management zoning.

Importantly, there have been significant changes in the legislative and policy environment since the 1998 plan was established, as well as considerable new or enhanced information on values and current and emerging threats, in particular climate change. Canberra's growth over the past 23 years and into the future has placed, and will continue to place, increased pressure on the Corridor and its environmental and social values.

2.2 Changes in the legislative and policy environment since 1998

2.2.1 Legislation

Key legislation relevant to conservation introduced during the life of the 1998 plan includes:

- *Fisheries Act 2000*—governs the sustainable management of fishing in the ACT and promotes the protection and conservation of native fish species and their habitats to ensure high quality and sustainable recreational fishing.
- *Heritage Act 2004*—provides for the recognition, registration and conservation of places and objects of natural and cultural significance and establishes statutory protection for all Aboriginal places and objects within the ACT.
- *Human Rights Act 2004*—acknowledges that Aboriginal and Torres Strait Islander peoples hold distinct cultural rights and must not be denied the right to maintain, protect and develop their culture. The Act also recognizes their material and economic relationships with the land, waters and other resources.
- *Planning and Development Act 2007*—governs land use in the ACT and establishes the Territory Plan, provides for the identification of public land and its reservation for defined purposes and outlines requirements for environmental impact assessment. Schedule 3 of the Act defines management objectives for each category of public land reserve.
 - Nature Reserve: (1) to conserve the natural environment; and (2) to provide for public use of the area for recreation, education and research
 - Special Purpose Reserve: to provide for public use of the area for recreation, education and research.

The Act requires the preparation of public land management plans. If the land is wilderness area, national park, nature reserve, catchment area or a special purpose reserve managed under the *Nature Conservation Act 2014*, then the management plan is prepared under that Act.

- *Water Act 2007* (Commonwealth)—promotes the use and management of Murray-Darling Basin water to optimise economic, social and environmental outcomes, ensure environmentally sustainable levels of extraction for water resources, and protect, restore and provide for the ecological values and ecosystem services of the Basin.
- *Territory Plan 2008*—sets out objectives for the River Corridor Zone NUZ4:
 - a) Conserve the ecological and cultural values of the ACT's major river corridors.
 - b) Protect stream flow, water quality and flood plains from adverse impacts.
 - c) Ensure that the type and intensity of development is sustainable.
 - d) Provide opportunities for a range of ecologically sensitive water and land based recreational activities.
 - e) Ensure compatibility between land uses, water uses and the general character of the rivers.
 - f) Provide opportunities for appropriate environmental education and scientific research activities.
 - g) Prevent development that would significantly increase fire hazard.
- *Nature Conservation Act 2014*—protects native plants and animals in the ACT and provides management authority for conservation lands and the legal underpinning of nature conservation policy, management and action across the Territory. The Act prescribes a process for the development of reserve management plans and includes requirements that: implementation reports

should be sent to the Minister every five years; reserve management plans should be reviewed every ten years; the Conservator may assign an International Union for the Conservation of Nature (IUCN) category to a reserve; and the reserve must be managed in accordance with the IUCN objectives for the relevant category of reserve. Section 169 defines a reserve.

2.2.2 Policy

Key conservation strategies introduced during the life of the 1998 plan include:

- *ACT Nature Conservation Strategy 2013–23*—takes a landscape scale approach to conservation and aims to *strengthen the key foundational elements—connectivity, resilience, community capacities—of a long-term approach to build the adaptive capacity of natural ecosystems and people to a changing climate*. The strategy identifies the Murrumbidgee River Corridor as a focal landscape for the restoration of native vegetation.
- *ACT Water Strategy 2014–44: Striking the Balance*—provides long term strategic guidance to manage the Territory’s water resources and is focused on the achievement of three outcomes: healthy catchments and waterbodies; a sustainable water supply used efficiently; and a community that values and enjoys clean, healthy catchments (ACT Government 2014).
- *ACT Native Grassland Conservation Strategy and Action Plans 2017*—builds on achievements under the 2005 Lowland Grassland Conservation Strategy, providing a Territory-wide approach within a regional context to the conservation and management of native grasslands. The Strategy includes montane and rocky native grasslands and, recognising past protection success, shifts focus to best-practice conservation management and enhancing native grasslands condition in light of a changing climate (ACT Government 2017).
- *ACT Aquatic and Riparian Conservation Strategy and Action Plans 2018*—provides guidance for the conservation and management of aquatic and riparian ecosystems. The Strategy addresses current and future issues, such as a changing climate, focuses on best practice conservation in an adaptive management framework and includes Action Plans for threatened species.
- *ACT Climate Change Strategy 2019–2025*—sets out the steps the community, business and Government will take to reduce emissions by 50–60% (below 1990 levels) by 2025 and establish a pathway for achieving net zero emissions by 2045.
- *ACT Native Woodland Conservation Strategy and Action Plans 2019*—builds on the achievements of the 2004 Lowland Woodland Conservation Strategy and aims to protect, maintain and improve the ACT’s woodlands in collaboration with other agencies and organisations. The Strategy identifies how the ACT Government intends to manage threats, safeguard threatened species, enhance woodland structural complexity, undertake monitoring and research, and enhance resilience, ecosystem function and connectivity of lowland and subalpine woodlands.

It will be critical for any new plan for the MRC to incorporate directions and actions from these strategies and for appropriate mechanisms to be established for evaluating management effectiveness in achieving desired outcomes for relevant ecosystems and other values within the Corridor.



Murrumbidgee River at Uriarra Crossing

3. Review against objectives

3.1 Objective 1: to conserve the endemic aquatic, riparian and riverine ecosystems

3.1.1 Review

Research and monitoring

Threatened aquatic species in the MRC and their current conservation status are:

- Macquarie Perch (*Macquarie australasica*) (endangered)—found in the cooler, upper reaches of the Murray–Darling river system in Victoria, New South Wales and the ACT, although the species was historically more widely distributed. In the ACT, natural populations of Macquarie Perch now occur only the Murrumbidgee, lower Paddys and Cotter rivers.
- Murray Cod (*Maccullochella peelii*) (vulnerable under *Environment Protection and Biodiversity Conservation Act 1999*, special protection status in the ACT under the *Nature Conservation Act 2014*)—endemic to the Murray–Darling Basin, this species has suffered significant population decline over the past 50 years. The Murrumbidgee River population is identified as an important population in the National Recovery Plan for the Murray Cod.
- Silver Perch (*Bidyanus bidyanus*) (endangered)—endemic to the Murray–Darling Basin and was formerly widespread through the Basin, including in the Murrumbidgee River as far upstream as Cooma. Silver Perch have not been recorded in the ACT Government’s Murrumbidgee River monitoring since 1988, although there were reports of the species around Casuarina Sands in 2002 (ACT Government 2018a).
- Trout Cod (*Maccullochella macquariensis*) (endangered)—endemic to the southern Murray–Darling river system, this species has suffered major declines in range and abundance with only a single ‘natural’ remnant population remaining, in a section of the Murray River. While Trout Cod formerly occurred along the length of the Murrumbidgee River in the ACT, no naturally occurring populations survive today. The species now occurs in the Murrumbidgee and Cotter rivers as a result of reintroductions under a national recovery program.
- Murray River Crayfish (*Euastacus armatus*) (vulnerable)—found in the southern Murray–Darling Basin to around 700 metres above sea level. In the ACT is the species known from the Murrumbidgee and lower Cotter rivers.

The threatened species listed above, except for Murray Crayfish, are monitored under the ACT Government’s Murrumbidgee River Fish Monitoring Program, which is conducted biennially by EPSDD CRE to monitor fish populations and inform management of the river and threatened, pest and recreational fish species. The program has evolved over time to monitor habitat as well as fish. Several earlier catch methods have been phased out and fish monitoring is now entirely based on boat based electro-fishing.

Monitoring of Murray River Crayfish populations is challenging. The species is hard to detect, enclosed traps are not used for monitoring as they present a by-catch risk to species such as turtle and platypus, and lift nets like those used by recreational fishers are inefficient. A 2013 report on methods to survey and improve the Murray River Crayfish population, funded by the Murray–Darling Basin Authority, concluded that current data were not adequate to formulate management prescriptions (Ryan et al. 2013). EPSDD CRE has consequently ceased surveys for Murray Cray and future research on the species will be management focused, using approaches such as capture/mark/recapture and genetic analysis.

Adaptive management for conservation of ecosystems requires research and monitoring to be integrated with on-ground action. A Conservation Effectiveness Management Program (CEMP) is being established by EPSDD for lowland native grasslands, upland grasslands, lowland woodlands, upland woodlands, lowland forests, upland forests, bogs and fens and riparian/aquatic ecosystems. Its purpose is to create a coordinated, systematic and robust biodiversity monitoring program to detect changes in ecosystem condition within reserves, evaluate the effectiveness of management actions in achieving conservation outcomes, and provide evidence to support management decisions.



Genetic sampling of Murray Cod (*Maccullochella peelii*) to assess populations (Mark Jekabsons)



Measuring Murray River Crayfish (*Euastacus armatus*) (Mark Jekabsons)

A Condition Assessment & Monitoring Plan recently developed under the CEMP by Malam *et al.* (in preparation) for aquatic and riparian ecosystems will assess their condition using monitoring data aligned with indicators and corresponding metrics. Ecological indicators include water flow and quality, stream channel geomorphology, native flora and fauna, riparian vegetation and riparian zone connectivity. Ecosystem threat indicators include inappropriate flow and fire regimes, invasive plants, introduced fish and terrestrial species, and erosion and sedimentation.

Aquatic habitat enhancement

Key threats to native aquatic species include river regulation and water extraction, barriers to fish passage, introduced species and disease, habitat modification, reduction in water quality, historical overfishing, sedimentation and climate change (ACT Government 2018a).

Initiatives to enhance habitat for Murray Cod and other native fish species have included research to identify barriers to fish passage (Lucas *et al.* 2019), the installation of fishways at Casuarina Sands and Cotter River weir, and construction of instream rock deflectors and engineered log jams at several locations near Tharwa. Monitoring results show increased river channel depth past the instream structures and improved habitat in the area. Trout Cod breeding has been detected and the numbers of Murray Cod have significantly increased (Upper Murrumbidgee Demonstration Reach n.d.).



Sedimentation downstream of Tharwa Bridge (Mark Jekabsons)



Engineered Log Jam downstream of Tharwa (Mark Jekabsons)

Environmental Flows

The ACT Environmental Flow Guidelines are an instrument under the *Water Resources Act 2007* that set out the flow requirements needed to maintain aquatic ecosystems. The Guidelines apply to all rivers, streams, lakes and ponds in the ACT. The 2013 Guidelines have been reviewed and revised using the most up to date scientific information available, and establish environmental flows for each ecosystem type, and for specific reaches within the water supply catchments. Ecological objectives for the ACT reaches of the Murrumbidgee River are to: maintain healthy aquatic ecosystems in terms of biota; enhance native fish community, including Murray Cod and Murray River Crayfish; prevent degradation of riverine habitat through sediment deposition; maintain extent of riparian vegetation; and maintain diversity and increase abundance of waterbirds. Flow requirements for the Murrumbidgee are to maintain 80th percentile monthly flow November to May and 90th percentile monthly flow June to October inclusive, with a minimum flow of 50ML/day protected January to March. Tantangara Dam environmental flow releases may not be abstracted within the ACT (ACT Government 2018b).

Recreational fishing

The Murray Cod Native Species Conservation Plan (ACT Government 2017) provides for the protection and appropriate management of the Murray Cod through management objectives and actions intended to maintain the sustainable recreational fishing of Murray Cod and conserve wild populations in the ACT.

Management of recreational fishing in the Murrumbidgee River Corridor has included production of an information pamphlet which is regularly reviewed against community and legislative needs. The *Fisheries Act 2000* was reviewed and updated in 2021. Opera house traps have been banned in all ACT waters and extra habitat protections introduced. A free program to replace opera house traps with wildlife-friendly nets is currently underway (ACT Government 2021a). Additional proposed amendments include the exclusion of angling between Angle Crossing and the Gudgenby River confluence, a section of no-take for Murray Cod below Uriarra Crossing and a reduction in the Golden Perch bag limit for the Murrumbidgee River to two.

Riparian vegetation

Riparian vegetation plays a vital role in maintaining aquatic habitats through protecting the stream from surrounding land uses, preventing erosion and sedimentation, providing nutrients and habitat components from fallen logs and other debris, and shading water and reducing temperatures (ACT Government 2018a).



River She-oak (*Casuarina cunninghamiana*) at Uriarra East



Black Cypress Pine (*Callitris endlicheri*) at Pine Island

A 2009 survey of vegetation and habitat in key riparian zones of the MRC (Johnston et al. 2009) found that riparian and valley slope vegetation communities in the Corridor were in moderate to low condition, having been significantly impacted by land management practices and the 2003 bushfires. The riparian zone was found to have a very high cover and abundance of weed species and to be a major conduit for the

downstream spread of weeds. African Lovegrass (*Eragrostis curvula*) and Blackberry (*Rubus fruticosus* species aggregate) were found to be having a significant impact on native biodiversity. Recommendations included protection and enhancement of remnant vegetation, ongoing vegetation survey and monitoring, investment in weed management and structured re-establishment of native vegetation.

Riparian vegetation has been shown to have disproportionately large benefits for landscape-scale conservation of woodland birds, particularly where urbanisation and agriculture have led to widespread habitat removal (Bennett 2014). More than 230 species of birds have been recorded in the Corridor, including several threatened species—Brown Treecreeper (*Climacteris picumnus victoriae*), Hooded Robin (*Melanodryas cucullata cucullata*), Little Eagle (*Hieraaetus morphnoides*), Painted Honeyeater (*Grantiella picta*), Regent Honeyeater (*Anthochaera phrygia*), Scarlet Robin (*Petroica boodang*), Varied Sittella (*Daphoenositta chrysoptera*) and White-winged Triller (*Lalage tricolor*).

The MRC is a major connecting corridor across a fragmented landscape for birds and may provide important refuge habitats in dry periods. The Corridor is also an important migration route for species of honeyeater, which move through the region each autumn (Davey 1986, Taws 1999). Surveys targeting autumn post-breeding migration of honeyeaters were conducted along the Corridor in 1985 (Davey 1986), 1997 (Taws 1999) and again in 2004, post the 2003 bushfires (Taws 2004).

Woodland and grassland ecosystems

Detailed vegetation mapping of the Murrumbidgee Valley was completed in 2018 and data have been uploaded to ACTMAPi. These data are helping to develop an understanding of dieback and biodiversity refugia and have informed development of the Bushfire Operations Plan, as well as the revised Woodlands and Grasslands Conservation Strategies (ACT Government 2019).

The critically endangered ecological communities Yellow Box–Blakely's Red Gum Grassy Woodland and Natural Temperate Grassland both occur in the MRC. Threatened plants recorded in the Corridor include Austral Toadflax (*Thesium australe*), Murrumbidgee Bossiaea (*Bossiaea grayi*), Pale Pomaderris (*Pomaderris pallida*) and Tuggeranong Lignum (*Muehlenbeckia tuggeranong*).

The MRC provides important habitat for the vulnerable Pink-tailed Worm-lizard (*Aprasia parapulchella*). Management is guided by the recovery plan for the species (Osborne and Jones 1995) and habitat requirements are taken in consideration in implementing management actions, for example in revegetation programs no planting is undertaken on north-west facing rocky areas, particularly if Corkscrew Grass (*Austrostipa scabra*) or Kangaroo Grass (*Themeda triandra*) is present. African Lovegrass infestations in high-quality habitat areas are controlled by spraying.



Painted Honeyeater (*Grantiella picta*) (Geoffrey Dabb)



Pink-tailed Worm-lizard (*Aprasia parapulchella*) (EPSDD)

Weeds and Pests

Weed and pest management is conducted in the MRC under the ACT Pest Animal Management Strategy 2012–2022 and Pest Animal Management Plans, in cooperation with adjoining lessees and land managers. Priorities for pest animal control include wild dogs, pigs, deer and rabbits. Rabbits have been reduced from up to 200/km² to <5/km² in all areas and monitoring is ongoing. Fox and wild dog control is primarily undertaken by managers of rural lease lands.

In accordance with the Nature Conservation Strategy, pest plant management plans have been developed for critical weed species. An Invasive Weeds Operations Plan is prepared each year to set out priority species and areas. Major weeds targeted for control in the MRC are Blackberry (*Rubus fruticosus* species aggregate), Willow (*Salix* spp.), Serrated Tussock (*Nassella trichotoma*), African Lovegrass (*Eragrostis curvula*) and Box Elder (*Acer negundo*).



African Lovegrass (*Eragrostis curvula*) (Lois Padgham)



Blackberry (*Rubus fruticosus* species aggregate)

Removal of pine wildings (*Pinus radiata*) is continuing in Gigerline, Bullen Range and Stoney Creek nature reserves and Pine Island, Kambah Pool and Uriarra recreation areas. Liaison is ongoing with PCS Fire, Forests and Roads on removal of wildings in adjoining areas.

Feral fish in the Murrumbidgee are Common Carp (*Cyprinus carpio*), Goldfish (*Carassius auratus*), Eastern Gambusia (*Gambusia holbrooki*), Oriental Weatherloach (*Misgurnus anguillicaudatus*) and Redfin Perch (*Perca fluviatilis*). Trout have also been historically introduced as an angling species, but no longer occur in the ACT section of the Murrumbidgee. All these introduced species have an adverse impact on native fish.

Carp have major negative impact on biodiversity, water quality and the amenity value of freshwater rivers and lakes. They have contributed to decline of native fish populations in many areas and now make up to 80 to 90 per cent of fish biomass in the Murray-Darling Basin. The Australian Government is investigating a long-term biological control plan using *Cyprinid herpesvirus 3* (carp virus) (Australian Government 2021). Should this program proceed, the Murrumbidgee will be a key area for carp control efforts in the ACT.

FeralFishScan is a community website and app for collecting evidence of feral fish in Australian waterways. The Upper Murrumbidgee homepage for FeralFishScan provides information on how to identify feral fish; control programs in the Upper Murrumbidgee catchment; and how data is helping to map feral fish hotspots, identify breeding sites, and control feral fish (FeralFishScan n.d.).

Fire

The catastrophic Canberra bushfires of 2003 had a significant impact on the environment to the west of the city and almost the entire area of the MRC was affected by fire. Extensive stands of Black Cypress Pine (*Callitris endlicheri*) were killed and in places replaced by eucalyptus woodland, although the species has since re-established in many areas. Mature She-oak were also heavily impacted and several years after the event had not recovered. The impact of the fires and other factors, such as changes in flow regimes and more frequent drought conditions, has resulted in a 'downhill successional migration' pattern where

riparian, flood plain and lower slope communities are being replaced by more drought tolerant eucalypt assemblages from higher up the gradient (Johnston et al. 2009).

Fire management in the MRC is undertaken in accordance with the ACT Bushfire Management Plan, Regional Fire Management Plans, annual Bushfire Operational Plans and Ecological Guidelines for Fire, Fuel and Access Management Operations. Fire management activities in the Corridor include modification of grassland fire fuel loads by slashing, grazing of selected grasslands with domestic stock, maintenance of fire trails, hazard reduction, ecological and cultural burns, and staff engagement in fire suppression. Under the Ecological Guidelines for Fire, Fuel and Access Management Operations (ACT Government 2019), Black Cypress Pine and riparian vegetation are excluded from management burns wherever possible.

Working with other landholders and community groups

Around one quarter of the public land in the MRC is under lease and collaboration with leaseholders is important to achieving conservation objectives for the Corridor. Land Management Agreements under the *Planning and Development Act 2007* between the lessee and the Conservator of Flora and Fauna, incorporating activities to meet conservation objectives, are developed when rural leases are transferred or renewed.

Licences for grazing are issued by the Planning and Land Authority under the *Planning and Development Act 2007* for some areas of public unleased land, subject to the written agreement of the Conservator of Flora and Fauna. Grazing licences may be issued for areas of nature reserve or special purpose reserve where the grazing is considered beneficial to the achievement of conservation objectives, such as managing vegetation structure to maintain or improve habitat for threatened species. Where such licences are granted over an area of reserve in the MRC, grazing and its effects are monitored by PCS and licence conditions may be varied when required.

The Upper Murrumbidgee Demonstration Reach (UMDR) was established in 2009 on a 100 km section of the Upper Murrumbidgee River between Bredbo (NSW) and Casuarina Sands (ACT). The program is a collaborative partnership between the ACT Government, Bush Heritage Australia, Kosciuszko 2 Coast, Murray-Darling Basin Authority, South East Local Land Services, NSW Department of Primary Industries, University of Canberra, Icon Water and local communities.

The UMDR program demonstrates techniques that landholders and community groups can use to rehabilitate and protect aquatic and riparian habitat. In addition to engineered log jams, work has included 56,800 native plants planted, 85 km of willows controlled, 89 km of river fenced to exclude stock, fish passage through Casuarina Sands, two carp trapping trials, two gross sediment studies to guide sand slug rehabilitation works, field days and community events (Upper Murrumbidgee Demonstration Reach n.d.).



Upper Murrumbidgee Demonstration Reach sign at Pine Island Recreation Area

3.1.2 Issues for consideration in a new plan

- Incorporation of management directions and actions from conservation strategies
- Review of long-term aquatic monitoring program
- Continuing activities to improve aquatic habitat and manage exotic species
- Continuing revegetation and rehabilitation
- Planning for the restoration of the former plantation estate
- Assessment of the adequacy of wildlife corridors and habitat connectivity under a changing climate
- Working with plantation managers to control the impact of pines outside plantations
- Flora and fauna surveys to inform management
- Continuing weed and pest control programs
- Invasion of deer and their impact on regenerating vegetation
- Review of land tenure and zoning within the river corridor; rural leases, reserve boundaries etc.
- Ensuring that leases are managed consistent with management plans and conservation strategies
- Effectiveness of Land Management Agreements
- Maintenance requirements of structures (dams)
- Western Edge development planning and assessment processes and impact mitigation
- Ginninderry development in the northern section of the river corridor.

3.2 Objective 2: to provide for recreational activities appropriate to rural and natural river settings

3.2.1 Review

The ACT Parks and Conservation Service provides for appropriate recreational activities in multiple locations along the MRC, which is one of Canberra's most popular places for nature-based recreation. Activities include bushwalking, camping, picnicking, wildlife observation and birdwatching, as well as water-based pursuits such as swimming, fishing and canoeing. The area includes five nature reserves and eight special purpose reserves, with seven recreation areas. Most of the MRC recreation areas are open 24 hours a day, 365 days a year, although Pine Island and Kambah Pool are closed to vehicles at night.



Walking on the Murrumbidgee Discovery Track in Bullen Range Nature Reserve



Red Rocks Gorge from the Murrumbidgee Discovery Track, between Kambah Pool and Pine Island

The 27-kilometre Murrumbidgee Discovery Track extends along the riverside from Point Hut Crossing in the south through to Pine Island, Kambah Pool and Casuarina Sands to the north. Mountain biking is generally not permitted on walking trails but is allowed on sections of the riverside trail from Kambah Pool to Point Hut Crossing. There has been significant investment in maintaining and enhancing this trail, particularly following the impacts of the 2003 fires on infrastructure in the Corridor.

Horse riding is permitted on the Bicentennial National Trail. Dogs are generally excluded from the MRC and are permitted only at Uriarra picnic areas, Shepherds Lookout and the Dog Exercise Area at Point Hut. Monitoring of dog access to recreation areas is ongoing, and fines may be issued for non-compliance.



Kayaking at Casuarina Sands (PCS)



Enjoying the view at Shepherds Lookout

Recreation areas are well serviced with mown areas, playgrounds, picnic tables, and free electric or wood-fired barbecues. PCS staff maintain these areas to a high standard and significant improvements have been made over the life of the current plan, including upgrades to walking tracks and trails, upgrade of recreational facilities at Casuarina Sands and Casuarina Sands North, and upgrade of Cotter Campground. Shade sails were installed over the Pine Island and Cotter Avenue playgrounds in 2020. Regular inspection of playground equipment is carried out by PCS staff and/or City Services and maintenance is conducted as required.

In 2016, a policy was introduced to restrict camping at the Cotter Campground to a maximum of 14 consecutive nights, and a minimum of 28 nights between occupancies, to prevent the campground being used for temporary residence.



Playground at Cotter Avenue



Electric BBQs and picnic tables at Casuarina Sands

Over the life of the current plan, management access has been rationalised and eroding tracks closed and rehabilitated. A management trail has been constructed from Point Hut to Bullen Range Nature Reserve. There have been upgrades to walking tracks and ongoing maintenance of roads, walking tracks and interpretive signs. Several initiatives are underway to set the strategic direction for nature-based tourism in the ACT, including development of a Nature-based Tourism Strategy for the Territory and a Landscape Classification System (LCS) for PCS-managed reserves. The LCS clarifies sites, areas or linear features according to scores against physical, social and management criteria. Zones within the PCS estate will be consistently categorised using the LCS and relevant urban and rural zoning, providing a framework to

inform ongoing management decisions relating to visitor experience while producing spatial representation of current and future visitor experiences and opportunities.

The 1998 plan established recreation management classes, ranging from 'natural' to 'developed', for areas within the Corridor, and indicators and standards for maintaining appropriate conditions and sites and areas within each class. It is anticipated that these management classes will be superseded by the Landscape Classification System.

3.2.2 Issues for consideration in a new plan

- Strategic directions from the Nature-based Tourism Strategy and the LCS
- Urban expansion adjacent to the Corridor
- Matching recreation areas and facilities to increasing population and changing demographics
- Canberra Mountain Bike report, particularly proposed trail to link Stromlo Forest with the Cotter recreation areas
- User group conflicts, including issues with newer technologies such as drones and e-bikes
- Dog areas
- Management of group activities, events and commercial operations such as climbing, canoeing etc.
- Campground management and opportunities
- Fishing management arrangements and the protection of native species for sustainable angling.

3.3 Objective 3: to conserve natural landforms and the valley's scenery

3.3.1 Review

Progressive vegetation regeneration and rehabilitation has been a key focus of activity in the MRC since the 1980s and is important in achieving several the 1998 plan's objectives, including conservation of natural landforms and the Murrumbidgee valley's scenery.

A forward tree planting program was begun in the Corridor in 1986, with 180,000 trees planted, mainly in the Tuggeranong area. Between 1991 and 2000, 36 km of riparian zone was withdrawn from lease and fenced. During 1992 and 1993, 2,800 trees were planted in the Lanyon-Tharwa reach.

In the decade to 2018, 300,000 native trees were planted in the Corridor, including 30,000 in Gigerline Nature Reserve, as part of planting one million trees across the Territory to help rebuild a resilient ecosystem and assist the ACT in tackling the challenge of climate change under the ACT's 2007 climate change strategy *Weathering the Change* (ACT Government 2007).



Trees planted under the One Million Trees program at the Gudgenby River confluence in Gigerline Nature Reserve



Parkcarers of Southern Murrumbidgee volunteers take a break from planting trees in the Corridor (Paul Room)

Under the ACT Woodlands Restoration Program (2011–2018) 60,000 hectares of the largest remaining box-gum grassy woodland landscape in Australia have been restored and connected in areas including the MRC and linkages between Kama Nature Reserve and the Stony Creek tributary.

The volunteer group Parkcarers of Southern Murrumbidgee has been working from Point Hut Crossing to Pine Island since 1992 in activities including planting, seed collection, weeding and erosion control.

PCS is continuing revegetation in the Corridor with a current focus on small strategic areas, such as erodible banks on the outside of river bends, using species including River She-oak (*Casuarina cunninghamiana*), Yellow Box (*Eucalyptus melliodora*), Apple Box (*Eucalyptus bridgesiana*) and Ribbon Gum (*Eucalyptus viminalis*). Some plantings require protection from damage due to antler rubbing by feral deer. Seed collection by rangers, volunteers, and contractors for revegetation is ongoing. In some recreation areas such as the Cotter, planting of exotic deciduous trees is being undertaken to maintain social and visual amenity when existing exotic trees are reaching the limit of their life.

To ensure that impacts on the scenic values of the Corridor are minimised, environmental assessments have been undertaken for all major works and operations in accordance with *Planning and Development Act 2007* and National Capital Authority Works Approval processes. Development applications have been approved for activities such as construction of engineered log jams to enhance aquatic habitat, and the extension of the Bullen Fire Trail. Operational management arrangements are implemented with utility providers to minimise any adverse effects on Corridor values from utilities installations.

3.3.2 Issues for consideration in a new plan

- Review conservation values in the light of current information, for example recent vegetation mapping
- Review grazing lease holdings, boundaries and provisions as conservation values identified
- Potential for reservation of additional areas
- Identification of additional rehabilitation priorities and development of a planting strategy
- Potential for fauna reintroductions
- Liaison with lessees on soil conservation and vegetation management
- Formalising utility operational procedures and management arrangements—Codes of Practice
- Assessment report on the scenic values of the Corridor, including geological features such as gorges
- Visual impact on the Corridor of the proposed Western Edge development.

3.4 Objective 4: to conserve and enhance habitat links through the regional landscape

3.4.1 Review

Fine scale modelling of fauna habitat and connectivity values in the ACT region, including the MRC, was undertaken by Barret and Love (2012) based on CSIRO research (Doerr et al. 2010). Habitat connectivity mapping has been incorporated into ACTMAPi and is informing on-ground woodland revegetation. Connectivity mapping data has also been integrated into the ACT Environmental Offsets Calculator.

The One Million Trees program discussed under Objective 3 (above) was finalised in the MRC in 2018 and focussed on key Vegetation Restoration Areas identified in the National Capital Plan. Many areas planted, such as in Black Joes Creek, through the Jeggaline (Lanyon) Lease, and between Bullen Range Nature Reserve and Tharwa, have contributed significantly to enhancing connectivity.

As noted under Objective 3 (above) the ACT Woodlands Restoration Program (2011–2018) restored and connected areas of box–gum grassy woodland in the Murrumbidgee River Corridor and in areas linking the Kama Nature Reserve with the Stony Creek tributary.

3.4.2 Issues for consideration in a new plan

- Connectivity strategy for the MRC in a changing climate
- Potential for reservation of additional areas and/or revegetation to enhance connectivity
- Continuing to improve in-stream connectivity for native aquatic species.

3.5 Objective 5: to maintain water quality

3.5.1 Review

The extensive rehabilitation and revegetation work conducted in the MRC under the Natural Heritage Trust, the ACT Woodlands Restoration Program, the One Million Trees Program and by Parkcarers (see Objective 3, above) has been critical to maintaining water quality in the Murrumbidgee River. Other work undertaken to achieve this objective includes fencing and revegetation of river banks, general exclusion of stock from the riparian zone, and rock placement to exclude vehicles from the river.

Maintenance work undertaken on fire trails to reduce the risk of erosion has included rehabilitation and rock armouring of Tuggeranong Creek fire trail crossing and extensive rehabilitation of the Woodstock Nature Reserve fire trail.

The Upper Murrumbidgee Actions for Clean Water Plan (NSW Government 2012) identified priority erosion hotspots which continue to pose a risk to water quality. Between 2012 and 2018 there were several sites that had a decreased risk rating due to on ground land management efforts, such as filling erosion gullies with rock, fencing off areas from grazing and conducting rehabilitation (Icon Water 2019).

Control of rabbits has been important in reducing erosion in the MRC. Rabbit haemorrhagic disease virus (Calicivirus) has been effective in reducing rabbit numbers. As noted in Objective 1, PCS advises that rabbit densities have been reduced from up to 200/km² to <5/km² in all areas. (D Roso, pers. comm. 2021)



Stabilising a gully in Bullen Range Nature Reserve (PCS)



Installation of boulders to prevent vehicular access to the river at Angle Crossing (PCS)

Upper Murrumbidgee Waterwatch engages community volunteers in monitoring the condition of the upper Murrumbidgee catchment and produces an annual Catchment Health Indicator Program (CHIP) Report, which informs policy, on ground catchment management and State of the Environment reporting by the Commissioner for Sustainability and the Environment. The 2020 CHIP Report for the Murrumbidgee River (O'Reilly et al. 2021) showed the following results for water quality, water bug diversity and abundance, and riparian condition for reaches of the river between Michelago Creek and Ginninderra Creek (Table 1).

Table 1: 2020 Catchment Health Indicator Program Report results for the Murrumbidgee River.

Reach	Water Quality	Water Bug	Riparian Condition
Michelago Creek confluence to Tharwa Sandwash	Excellent	Good	Fair
Tharwa Sandwash to Point Hut Crossing	Excellent	Good	Poor
Point Hut Crossing to Kambah Pool	Good	Fair	Fair
Kambah Pool to Uriarra Crossing	Good	Good	Poor
Molonglo River to Ginninderra Creek	Good	Degraded	Poor

Elevated nitrate levels have been recorded in the reach of the Murrumbidgee River between the confluences of the Molonglo River and Ginninderra Creek. The higher nitrate levels are considered by

O'Reilly et al. (2021) to be due to discharges of treated sewage effluent from the Lower Molonglo Water Quality Control Centre (LMWQCC). The LMWQCC operates under an Environmental Authorisation issued by the ACT Environmental Protection Authority, which specifies the concentrations and loads of total phosphorus, total nitrogen, ammonia, chlorine salts, suspended solids and thermotolerant coliform bacteria of the treated effluent to be discharged to the Molonglo River (Icon Water 2021a). The quality requirements for water discharged from the LMWQCC were set to ensure that objectives under the Territory Plan for uses of the Molonglo and Murrumbidgee Rivers can be achieved.

The ACT Guidelines for Recreational Water Quality provide a framework for the management of recreational water sites within the ACT. The guidelines apply to water bodies in the ACT, including the Murrumbidgee River, where primary contact recreational activities are permitted, and address risks to human health from blue-green algae (cyanobacteria) and microbial pathogens.

The ACT Government monitors the environmental status of Canberra's lakes, ponds and rivers and advises changes in water quality conditions. River swimming locations are monitored for blue-green algae and monitored weekly for faecal indicator bacteria throughout the summer swimming season (October to April). General water quality parameters are also monitored in the lakes, rivers and ponds to pick up long-term trends (ACT Government 2021b).

While most of the drinking water for Canberra and Queanbeyan is sourced from the Cotter and Googong dams, some water is drawn directly from the Murrumbidgee River at Angle Crossing and transferred by pipeline to Googong Dam via Burra Creek and the Queanbeyan River. Water can also be extracted at Cotter Pump Station (Casuarina Sands) for treatment at Stromlo Treatment Plant. Icon Water undertakes an extensive sampling and analysis program to monitor water quality in its storage reservoirs and the Murrumbidgee River (Icon Water 2021b).

Wastewater is strictly managed in all PCS reserves in the Corridor. Where provided, toilets have closed septic systems that are regularly monitored for compliance by Icon Water. Chemical use in the Corridor for management purposes is carefully controlled, with all pesticides, herbicides and other chemicals used in accordance with manufacturer's directions, codes of practice and relevant guidelines.

3.5.2 Issues for consideration in a new plan

- Continuing strategic revegetation of the riparian zone
- Rehabilitation and restoration of ground cover
- Ongoing stock grazing management
- Inclusion of ground cover thresholds in LMAs, particularly for sloped areas
- Any requirements for additional exclusion fencing
- Possible requirement for more soil conservation work
- Analysis of sources of sediment and other pollution coming into the system, including from PCS-managed land, and identification of ways to reduce that pollution
- Importance of urban development pollution control ponds
- Working with other agencies and jurisdictions to maintain water quality in the Murrumbidgee.



Murrumbidgee River upstream of Uriarra Crossing

3.6 Objective 6: to provide formal and informal educational opportunities; and Objective 9: to provide educational and interpretative opportunities associated with water issues relevant to the Corridor.

3.6.1 Review

Currently there is no formal interpretation program operating in the MRC and interpretation activities by PCS staff tend to be conducted on an ad hoc, opportunistic basis by individual rangers. PCS ensures that there is an increased ranger presence in the Corridor's recreation areas during busy periods to keep up with routine management tasks, monitor activities and facilities, and provide information and assistance to visitors.

The ACT Government Murrumbidgee River Corridor Map and Guide provides comprehensive information on the Corridor and its values, recreation areas, facilities and activities, and is regularly revised. Educational opportunities are provided through mechanisms including signage, brochures, the EPSDD/PCS website and direct interaction with PCS rangers. Information on the MRC and its recreation areas is provided on the EPSDD website.

There are more than 700 signs installed throughout the MRC to inform and assist visitors, including 179 information panels, 34 major reserve entry signs, 52 minor reserve entry signs, 240 walk markers, 37 equestrian signs, 65 warning signs, 30 road signs and 67 totems. Vehicle and pedestrian traffic counters are deployed in key areas in the MRC and are used to give an indication of visitor usage and monitor trends.

Information on recreational fishing in the ACT has been provided in various documents following the introduction of the *Fisheries Act 2000*. The current ACT Government brochure *Recreational Fishing in the ACT* (ACT Government 2020) is regularly reviewed against community and legislative needs and is translated into several languages other than English. This information is helping to increase community awareness of sustainable fishing practices. The brochure is available at some fishing stores, from PCS rangers and online.



Welcome sign at Casuarina Sands



Information sign at Cotter Bend

3.6.2 Issues for consideration in a new plan

- Interpretation strategy
- Ranger guided interpretation program
- Surveys of visitors—including visitor satisfaction and angling usage
- Review and update of signage, brochures and web-based information
- Provision of more detailed information on the resources and values of the Corridor.

3.7 Objective 7: to conserve the cultural heritage landscapes, areas and sites

3.7.1 Review

The ACT Heritage Register has more than 370 Aboriginal heritage sites and several historic European heritage places located in the MRC. Aboriginal heritage sites are predominantly stone artefact scatters or isolated stone artefacts, but also include four rock shelters and nine scarred trees.

The 1998 plan identified several cultural resources to be evaluated for their significance in accordance with relevant legislation. All these evaluations have been progressed. Places listed in the ACT Heritage Register under the *Heritage Act 2004* during the life of the plan include:

Aboriginal sites on trails in Uriarra Forest	Lambrigg Precinct and Farrer Graves
Cotter Caves and surrounds	Lanyon
Cotter Pumping Station and associated housing	Pine Island Homestead and Surrounds
Cuppacumbalong Homestead Precinct	Tharwa Bridge
Cuppacumbalong (De Salis) Cemetery	Tuggeranong Boundary Marker
Greenhills Ruin	

The 1998 plan also identified several precincts as priorities for the preparation of precinct (conservation) plans. Conservation plans have been developed during the life of the plan for Lanyon (Marshall et al. 2010) and Tharwa Bridge (Philip Leeson Architects 2009). Lanyon Homestead is now the managed by ACT Heritage Places, a sub-unit of the ACT Government-owned Cultural Facilities Corporation. Conservation plans are yet to be developed for Lambrigg, Gudgenby confluence–Tharwa Sandwash Aboriginal sites, Aboriginal sites in the Uriarra Crossing–Swamp Creek area, and scarred trees.

Conservation work at Cotter Caves has included removal of graffiti and the installation of secure, bat-friendly barriers to exclude unauthorised access.



Tuggeranong Boundary Marker



Bat friendly barrier,
Cotter Caves (PCS)



Quartz flake, Gudgenby River
confluence

In 2018, the ACT Heritage Council considered a nomination of the MRC to the ACT Heritage Register. The Council decided not to provisionally register the MRC on the grounds that the place only has natural heritage significance of a kind that is protected under the *Nature Conservation Act 2014*, any cultural heritage significance was already captured by existing registrations or nominations, and the nomination under assessment did not include any other cultural heritage significance.

3.7.2 Issues for consideration in a new plan

- Aboriginal engagement in caring for Country
- Aboriginal access to cultural resources

- Heritage surveys and recording of casual finds
- Cultural sites conservation program, works priorities and precinct plans
- Conservation plans for heritage places
- Review of Cotter Caves Conservation Plan
- Interpretation of heritage places.

3.8 Objective 8: to maintain a corridor of open rural and natural land on the western edge of Canberra, and to give clear definition to the transition from the urban landscape to the rugged forested landscape of the mountainous skyline to the west of the city

3.8.1 Review

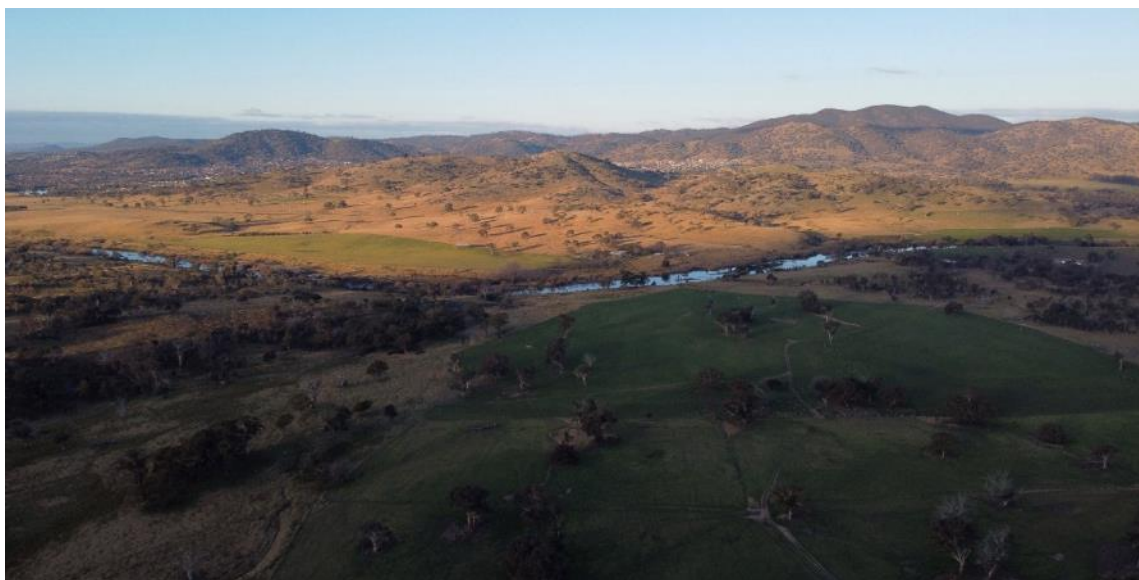
Maintenance of rural leases and grazing in some areas of the Corridor, together with protection of natural areas in nature reserves and the rehabilitation and revegetation of degraded sections of the landscape, combine to maintain a corridor of open rural and natural land on the western edge of Canberra and give definition to the transition from the city to the forested hills and mountains to the west.

The Territory Plan Map and Written Statement were varied in 2001 to make the Public Land Overlays and the 13B Area Specific Policy in the River Corridors policy consistent with lease boundaries, new fences and updated surveyed lines. Key changes in this Variation were recommended by the Conservator of Flora and Fauna to make the public land categories in the Territory Plan consistent with management objectives. The purpose was to stop stock access to rivers to prevent increased erosion of the bank edge, destruction of the riparian vegetation, and consequent degradation of the river edge and the associated vegetation (ACT Government 1998). The 13B policy provided for commercial and community recreation and tourist activities directly related to the use of the river.

The current Territory Plan sets out objectives for the River Corridor Zone NUZ4 and stipulates types of development that are prohibited or require various levels of assessment and approval.

3.8.2 Issues for consideration in a new plan

- Review of boundaries and fencing alignments
- Redundant fencing in nature reserves and on boundaries
- Visual impact of the proposed Western Edge development.



Murrumbidgee River Corridor at Lambrigg, with the southern-most suburbs of Canberra in the distance

4. Discussion and conclusion

4.1 Meeting the objectives of the 1998 plan

As described in earlier sections of this review, there have been considerable achievements in meeting the objectives of the 1998 Murrumbidgee River Corridor Management Plan. Ongoing monitoring programs for fish and threatened aquatic species have provided an understanding of changes in populations and management interventions such as the removal of willows along the river and the installation of fishways and engineered log jams have improved aquatic habitat.

Revegetation of extensive areas throughout the Corridor has reduced erosion and the inflow of sediment to the river, helping to maintain water quality and further improve aquatic habitat. Revegetation has also improved habitat and enhanced habitat links for terrestrial fauna, including woodland birds, and helped to conserve scenic values and natural landforms. Ongoing weed and pest control programs have limited the impact of weed and pest species on the Corridor's natural ecosystems and will continue to be a critical component of management into the future.

While there have been achievements in the conservation of aquatic and riparian ecosystems and other natural values of the Corridor, the effectiveness of management will continue to be constrained by activities on adjacent lands and upstream, beyond the ACT border. Continuing to maintain and improve the MRC's natural values will require ongoing collaboration with other agencies, including in other jurisdictions, owners and managers of adjacent lands, and the broader community. Addressing issues such as climate change, which did not receive attention in the 1998 plan, will also be critical to future management effectiveness.

Recreational activities have been well provided for and significant improvements have been made to recreational infrastructure. The recreation areas along the river are popular with Canberra residents and visitors and receive high visitor numbers, particularly in the warmer months. Pressure on the Corridor from visitors and their recreational activities will continue to increase and future planning and management will need to address issues such as the carrying capacity of the environment, the adequacy of visitor infrastructure, and potential conflicts between user groups.

The provision of educational opportunities has been generally constrained to passive media such as signage and brochures, with some limited interpretation conducted by PCS rangers on an opportunistic basis. Future management of the Corridor would benefit from the development and implementation of an interpretation and education strategy, which explores alternative or additional approaches to interpretation, including new technologies and the potential benefits of a ranger-led interpretation program.

While activities have been undertaken to support the conservation of cultural heritage, such as development of conservation plans for some heritage places and the installation of barriers to restrict public access to Cotter Caves, conservation planning previously identified as a priority for some key precincts and features has not been progressed and there has been little focus on Aboriginal engagement in heritage management or caring for Country more generally. Effective future management will require a greater focus on these issues.

As noted in Section 2, one of the challenges in reviewing the achievements of the 1998 plan is the current absence of a systematic, integrated approach for ongoing monitoring and evaluation of management effectiveness for ACT reserves. EPSDD is currently in the process of reviewing its land management planning system, in order to establish an integrated planning framework that provides for a more systematic approach to management planning, monitoring and outcome-based evaluation of management effectiveness, and assists EPSDD in meeting reporting obligations under the *Nature Conservation Act 2014*.

4.2 Adequacy of the 1998 plan as the primary planning document for the MRC

An assessment of the adequacy of 1998 Management Plan for the Murrumbidgee River Corridor as the primary planning document for the MRC, utilising the tool described by Hockings et al. (2008), found it to be a plan of generally fair quality, good in some areas, that PCS staff have found useful in guiding the management of the Corridor.

Future planning for the MRC will benefit from more clearly identifying desired outcomes, values and management issues; addressing the need for monitoring, review and adjustment; involving local and Indigenous communities in its development and setting directions; and incorporating a logically linked, cascading series of management objectives, policies and actions. A new management plan should be explicitly underpinned by an adaptive management approach and integrated with a framework for monitoring and the evaluation of management effectiveness.

4.3 Recommendations

Given the age of the current plan and the significant changes that have occurred in the information base, the legislative and policy environment, and the environmental, social and economic circumstances of the region, it is recommended that a new plan for the Corridor be developed as soon as practicable.

Recommendations arising from this assessment are that a new plan should:

- clearly articulate a vision and goals for the future of the Murrumbidgee River Corridor
- be based on current, up-to-date information
- be outcome rather than issues driven
- consider legislative and policy changes since the 1998 plan was developed
- consider any significant national/regional/sectoral plans that influence management of the reserve, such as the Murray-Darling Basin Plan and ACT conservation strategies
- identify values
- articulate management issues
- include a cascading series of management objectives, policies and actions, linked to values, management issues and desired outcomes for the Corridor
- address adaptive management, monitoring and evaluation, including the role of the Conservation Effectiveness Monitoring Program (CEMP)
- involve the Aboriginal and local communities in its development and setting directions for the Corridor
- identify the interests of Aboriginal and local communities and take these into account in decision-making
- identify the needs and interests of other stakeholders and take these into account in decision-making
- include a consolidated table of actions to be undertaken to achieve the objectives
- require an Implementation Plan to be developed, which includes indicators for measuring success, and provision for regular reporting.

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