

To meet the scientific challenges, the MDFRC needs to have a balanced research portfolio. To this end, the Science Plan comprises descriptions of seven program areas designed to meet these science challenges. The programs are based on the notion that aquatic ecosystems are a mosaic of interconnected patches. Each patch transforms organic matter through a variety of metabolic processes and interacts with other patches through the exchange of material and organisms. Each program addresses one broad aspect, namely: primary production, decomposition, nitrogen cycling, carbon movement, biotic connectivity, invertebrate habitat and fish ecology.

Research Portfolio

Researchers have been working on the ecology of rivers, floodplains and wetlands since 1986. Some of our more recent studies include:

- Nutrient dynamics in rivers, water storages and wetlands.
- Acidification events following drying in inland wetlands and the distribution of acid sulfate soils in wetlands of the Murray-Darling Basin.
- Impact of stock grazing on floodplain soil health.
- Effects of salinisation on the ecology of wetlands including biogeochemical cycling of nutrients, and shifts in bacterial, plant and animal communities in these wetlands.
- Understanding the ways that flow affects primary production (algae, aquatic macrophytes and riparian vegetation), heterotrophic production (decomposition) and consumption of the resultant organic material function in lowland rivers.
- Effects of environmental flows on native fish recruitment in lowland rivers.
- Determining the exchange of material, energy and nutrients between lowland rivers and their floodplains.
- Modelling Carbon export from forested floodplain and wetlands predicting the likelihood of blackwater events downstream.
- Understanding the impacts of drying on biogeochemical cycling and microbial community structure in sediments.

- Development of scientifically rigorous monitoring programs for the key MDBA's "The Living Murray" Significant Ecological Asset wetlands.
- Lindsay Island Fish Larvae, where the effects of three different flow regimes on larval fish was examined and conceptual models developed.
- Online guide to the identification and ecology of Australian Freshwater Invertebrates.
- Impacts of managed flows on fish spawning and recruitment.
- Review of QA and QC in the Sustainable Rivers Audit (macroinvertebrate and fish themes).
- Development of a willow removal monitoring program.
- Linking sediment dynamics, riparian vegetation and aquatic ecology in the Ovens River.
- The Campaspe Flow Manipulation Project which was a large scale research project designed to determine the effectiveness of the translucent dam approach to environmental flow allocations.
- Carried out reviews and analyses of water quality data for Lakes Hume, Mulwala and Wyangala.
- Undertaking large scale biological monitoring for Murray Irrigation Limited, which encompasses rivers and streams within the Murray Irrigation area.
- Development of monitoring programs for the environmental watering of Barmah Forest, Lindsay and Wallpolla Islands and Tuppal and Bullatale Creeks as part of the former Murray-Darling Basin Commission's *Living Murray Initiative*.

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23 Years of Research in the Murray-Darling Basin



The MDFRC is an unincorporated joint venture between CSIRO, La Trobe University and the Murray-Darling Basin Authority.

Additional investment is provided by the Australian Government through the Department of the Environment, Water, Heritage and the Arts

History

The Murray-Darling Freshwater Research Centre (MDFRC) has been established for 23 years in the Albury-Wodonga region and in Mildura for 13 years.

The MDFRC is a multi-disciplinary research centre with capacity across three broad areas: Biology, Ecology and Nutrient Cycles.

The MDFRC undertakes research on a diverse range of freshwater ecological issues including: environmental flows in rivers and wetlands, the effects of salinity; wetland acidification (biogeochemistry/soil chemistry), rehabilitation, microbial, fish, wetland and invertebrate ecology.

MDFRC employs over 65 scientific and support staff at two regional laboratories strategically located along the River Murray, at Wodonga and Mildura.

Dr David Mitchell was the inaugural Director of MDFRC from 1986 to 1993, followed by Dr Terry Hillman from 1993 to 2001. Since 2002, the MDFRC has been under the directorship of Dr Ben Gawne. Three Officers-in-Charge have managed the Lower Basin Laboratory in Mildura – Dr Ben Gawne from 1996 to 2002, Dr Shaun Meredith from 2002 to 2006 and Dr Todd Wallace since September 2006.

The MDFRC Strategic Plan 2008-2013 was published in September 2008 and is available on the MDFRC website. Version 2 is currently being edited.

Vision

MDFRC's Vision Statement is: *Healthy and productive aquatic ecosystems in the Murray-Darling Basin.*

Mission

In targeting this vision, the overarching mission of the MDFRC is the generation, synthesis and communication of freshwater ecological science fundamental to the protection and enhancement of the natural assets of the Murray-Darling Basin, while supporting sustainable use of the Basin.

Expertise

MDFRC maintains within its structure:

- An established NATA (National Association of Testing Authorities) accredited chemical laboratory.
- An invertebrate taxonomy voucher collection housing approximately 20,000 invertebrate species.
- An interactive guide and resources for the identification and ecology of Australian freshwater invertebrates (Bug Guide - located on the MDFRC website).
- A microbiological laboratory (equipped for the enumeration and identification of bacteria using both traditional and molecular techniques) in aquatic ecosystems and waste treatment plants.
- A diverse portfolio of field sampling equipment to enable collection of a broad range of physico-chemical and ecological samples.

We are widely recognised for our ability and commitment to the provision of independent knowledge to underpin the management of our freshwater resources.

These laboratories enable MDFRC to maintain an active research presence throughout the Murray-Darling Basin and to undertake comparative research across the summer and winter rainfall systems.

The Centre has expertise in:

- Assessing and monitoring environmental flow requirements for Australian inland rivers.
- Designing and implementing long-term biological and chemical monitoring programs for rivers, wetlands and reservoirs.
- The taxonomy and identification of aquatic macro- and microinvertebrates routinely used in monitoring programs.
- Collation and interpretation of biological and water quality monitoring data.
- Assessing habitat requirements for aquatic organisms.
- Assessing water quality in freshwater ecosystems, including nutrient dynamics.
- Fish biology and ecology.

- The management of nuisance algal blooms, and algal physiology.
- Microbial ecology (including the enumeration and identification of bacteria) in aquatic ecosystems and waste treatment plants.
- Routine analysis of water quality parameters (including nutrients, carbon, metals, *E. coli* and total coliforms).

Communication and Education

The MDFRC is committed to the synthesis and communication of knowledge to the community and natural resource managers in order to support sustainable management of aquatic resources.

Thirty one PhD students from seven Universities have undertaken their doctoral research through MDFRC, with an additional 31 Honours or Masters students having studied at MDFRC.

Over 530 year 11 students across the Murray-Darling Basin have participated in the *Rotary Murray-Darling School of Freshwater Research* held in Albury-Wodonga, and an additional 360 year 9 students have taken part in the *Health of the River System Youth Forum* held in Mildura.

In addition, MDFRC has placed 50 practical and industry placements, and 57 summer scholarship students since 1986.

A Communication and Knowledge Management Strategy has recently been prepared.

Science Plan

Staff have been developing a Science Plan over the past few years, and is a document that provides a framework for the ongoing research activities of the MDFRC, outlining the major challenges faced by managers, the knowledge we believe the MDFRC needs to generate to help managers meet these challenges and a strategy for the development of that knowledge.