

Environmental water needs for the Mitchell River



Northern Australia
Environmental
Resources
Hub

National Environmental Science Programme

World class research to support sustainable development in northern Australia

Project update, November 2019

Ben Stewart-Koster and Stuart Bunn, Griffith University

This research is supporting water planning and floodplain management in the Mitchell River catchment through increasing our understanding of the links between river flows, flooding, aquatic ecosystem productivity, fish habitat quality and fish movement between habitats.

What's new?

- We completed our final wet season field trip in May 2019, delayed from March due to Cyclone Owen. The focus of this trip was to collect samples to help us understand how floodplain inundation connects river channel, distributary and floodplain wetland ecosystems.
- We are finalising a manuscript on the relationship between river flows and floodplain inundation in the Mitchell River catchment. It appears that floodplain inundation is strongly dependent on river flows, with around 50% of the variation in inundation correlated with river discharge. Our results show that river discharge is likely to play a greater role in floodplain inundation than was previously understood.
- We have analysed the ratio of two strontium (Sr) isotopes in the otoliths (ear bones) of every fish captured during our field sampling. As a fish lays down layers of calcium carbonate in its otolith, it also captures the Sr isotope signature of the water it was living in at the time. The Sr isotope ratios of the waters in the Mitchell River catchment show distinct variation between regions, allowing us to use a fish's otolith to trace its movement along the river and between river channel and floodplain over the course of its lifetime.
- We have been collaborating with Professor Edward Boone of Virginia Commonwealth University to develop a probabilistic model that predicts where multiple species of fish have lived at every stage of their life. The next step will be to include fish biology in the model to increase the accuracy of its predictions.
- We are using isotopes of carbon, nitrogen and sulfur to understand food webs and to trace where fish are feeding. Fish may travel to different parts of the catchment (as shown by

Sr isotopes) but they may not feed there. Sulfur concentrations, in particular, are proving useful to trace whether fish are feeding in river channels, floodplain waterholes or distributary creeks.

- We have begun our analyses of the essential fatty acids extracted from fish tissue. This will show us if there are differences in the quality of fish food between river channels and floodplain waterholes.
- We used 20 years of remotely sensed data to generate maps showing the spatial extent of floodplain inundation and its relationship with river discharge. We are also using satellite imagery to locate 'hotspots' of aquatic plant productivity on the floodplain that are likely to be important fish habitat.
- We have continued to receive valuable advice on potential sampling sites and support with travel and access logistics from the Kowanyama Aboriginal Land and Natural Resource Management Office.

What's next?

- We are engaging with Traditional Owners throughout the catchment.
- We plan to drill down further into which habitats fish are gaining high and low quality food from by using compound-specific stable isotope analysis on our fatty acid samples.



This project focuses on the Mitchell River catchment.



Ten Mile Swamp, photo Ben Stewart-Koster.

- We will investigate how local environmental factors, such as shading, influence algal primary production in the hotspots to better understand how potential changes in river flows and floodplain inundation will affect food quality for fish.
- We plan to develop an online portal to hold all of the data and other information on the Mitchell River catchment generated by this project. This 'catchment story' of the Mitchell will use conceptual models and animation to illustrate the data in way that is accessible to stakeholders, community members and the public.
- Invasive spotted tilapia (*Tilapia mariae*) were found in the upper Walsh River, a tributary of the Mitchell River, in late 2017. We have received NESP emerging priorities funding to use tilapia otoliths to map their current distribution and to trace where they came from.



Cast-netting in the Mitchell River catchment, photo Ben Stewart-Koster.

The incursion of spotted tilapia into the Walsh River is the first time they have been found west of the Great Dividing Range.

Project summary

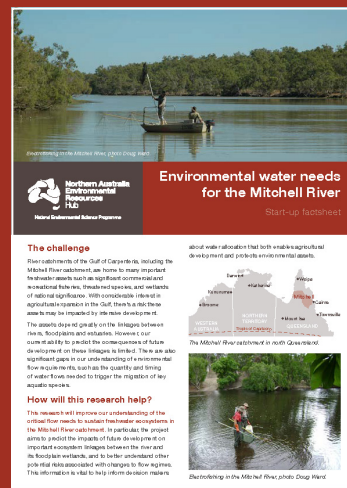
This research is improving our understanding of the water flows needed to sustain freshwater ecosystems in the Mitchell River catchment. In particular, the project has increased our understanding of the linkages between river flows, rainfall and floodplain inundation, and how this influences the productivity of aquatic ecosystems and the quality of fish habitat. This will help water planners to understand how water allocation to future agricultural development within the catchment might impact aquatic ecosystem health and productivity.

Further information

Contact project leader, Ben Stewart-Koster at b.stewart-koster@griffith.edu.au.

The project page can be found on the [Hub website](#), along with the [project start-up factsheet](#).

This project is due for completion in December 2020.



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nespnorthern.edu.au

nesp.northern@cdu.edu.au



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