

Environmental flows and ecological assets

Flow-ecology relationships for biodiversity and ecosystem processes

Knowledge to manage river flows

There appears to be increasing interest in developing the water resources of northern Australia. However taking water out of rivers changes their flow regime (how much water flows through the system and when). Changing flow regimes may have negative effects on ecological assets such as biodiversity.

Water managed and “allocated” to rivers is commonly known as “environmental flows”. The critical step in determining appropriate environmental flows is predicting how particular changes in river flows might affect important ecological assets. However, the ecological impacts of changes in flow regimes are poorly understood for most tropical river ecosystems.

This project will investigate the relationships between flow and several specific assets of tropical rivers. The assets being studied are fish, habitat, food webs (who eats who) and ecosystem processes such as primary productivity (plant growth) and stream metabolism (production and breakdown of organic matter i.e. carbon). It will build on work already done in the Daly (NT) as part of the “Daly River Fish and Environmental Flows Project”.

The “flow-on effects” of changes to river flows

Rivers are made up of different habitats, such as woodpiles, rocky bars and pools. The types of habitat present influence how productive the river is (how much plant growth occurs), how much food there is for fish, and how many fish are present and where. The flow regime affects the quality and quantity of habitat and food resources available in rivers.

The project team will therefore:

- define the habitat requirements of fish and determine how fish habitat varies with changes to the flow regime;
- determine seasonal movement patterns of fish and invertebrates (aquatic insects, crayfish, etc) and identify potential flow “cues” which may trigger this movement;
- define the habitat requirements of aquatic plants such as algae, and determine how flow alteration might affect plant growth; and
- develop models relating the distribution of aquatic plants, habitats, fish and invertebrates to flows, to assess how changes to the flow regime might affect habitat availability and biodiversity.



Photo: Danielle Warfe

To do this, the team will be recording the number and types of fish at different locations along the river. At each location they will also measure a range of habitat characteristics such as channel width, water velocity and depth, and the presence of woody debris.

Researchers will also select a number of sites which they will visit numerous times over the wet and dry seasons to get a picture of how food webs change between seasons.

How will different fish respond?

As well as having the appropriate habitat, the fundamental biological characteristics or ecological



requirements of a fish species (called “ecological traits”) will also determine how it responds to changes in flow regime. Will it adapt or die?

Ecological traits include such things as the body size and shape of an animal, its behaviour, its life history requirements (e.g. migration and reproduction) and feeding requirements.

Researchers will be using the information collected in this project together with a broad range of information sources to describe the ecological traits of northern fish species.

Using different sources of knowledge

If considered appropriate by the Traditional Owners for the study locations, the project team will work with the Indigenous values project team to assist Indigenous people in recording and transferring of traditional knowledge related to fish within, and where appropriate, beyond local language groups.

By pulling together all that we know about the ecological requirements for fish species and their food and habitat resources, the team will be able to identify what elements are critically related to flow. The team will also attempt to determine how “flexible” the ecological requirements of different fish are.

Who is on the team?

The project is lead by Professor Peter Davies from the University of Western Australia. He is working with a range of researchers with different technical expertise from Charles Darwin University (Darwin), NT Fisheries Research Branch, Griffith University (Brisbane), Monash University (Melbourne) and the Australian National University (Canberra).

Where is the research happening?



This project will be undertaken predominantly in the Daly River NT). Some activities will occur in the Mitchell River (Qld) and the Fitzroy River (WA) catchments. Field research will be undertaken over both the wet and dry seasons although predominantly in the dry.



Photo: Danielle Warfe

How will this research help?

The research will provide river managers with an improved understanding of relationships between flow, habitat, food resources, fish diversity and ecosystem processes. The project will also develop models and tools which evaluate the environmental consequences of flow alteration. Decision-makers, water planners and managers will then be in a better position to undertake the protection and maintenance of important ecological assets.

Indigenous people will be contracted to work on the project, and training will be provided to local field assistants in survey and other research techniques. Cultural advisers will be engaged to provide Indigenous knowledge and to ensure it is properly integrated into the research.

Team contacts

For more information on this project contact:

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How can you be involved?

There are opportunities for Aboriginal people to participate in this project. Aboriginal field assistants will be provided with training in fish sampling and recording methodologies in order to work on the fish surveys. There are also opportunities to be involved in recording Indigenous ecological knowledge related to fish.



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