

Classifying tropical rivers: A new tool for management

River classification as a tool

Not all rivers are the same – some flow all the time, some have regular floods while some are dry for most of the time. Understanding these differences can have profound implications for how we decide to use and manage rivers, and consequently their value for production, cultural and environmental purposes.



Photo courtesy of Jorg Hacker/Airborne Research Australia

One of the key factors that makes a river unique is its flow regime (see box). Rivers with different flow regimes will also be ecologically different.

For example a river that regularly dries out will contain plants and animals adapted to periods of no water.

Flow regime

The pattern of timing and magnitude of water delivery down the stream channel. The flow regime is recognised as a key driver of river ecology.

River classification is a process by which we group rivers with similar features – in this case flow regime.

Classification systems can be used to guide decisions about the management of river flow.

For example river managers may seek to protect unique flow regime types or distinctive parts of the flow regime such as seasonal drying.

Classification schemes are also important in developing generalisations about how natural rivers respond to phenomena such as climate changes or to inform natural resource management options.

This new classification provides policy makers and managers with knowledge that can support ecologically sustainable management and restoration of freshwater ecosystems in northern Australia.

What was done?

TRaCK researchers Brad Pusey and Mark Kennard (Australian Rivers Institute, Griffith University) classified the nation's rivers and streams according to variation in key, ecologically relevant, characteristics of the flow regime.



Project leader Brad Pusey in the field. Photo: Michael Douglas.

120 descriptors of ecologically relevant characteristics of river flow were derived from river discharge data. This data came from 830 stream gauges across Australia that had 15-30 years of records.

The classification is the first continental-scale classification of its type for Australia.



Perenniality/ intermittency

Perennial streams always have water flowing in them, intermittent streams have periods when they dry out.

Predictability

In the tropics many streams flood and dry every year at around the same time in a predictable manner.

Timing

The months of the year in which floods tend to occur can be significant for the breeding cycles of aquatic animals.

What makes streams different or similar?

There was a clear distinction between the flow regimes of rivers in northern and southern Australia. Six of the twelve flow regimes identified in Australia were found in northern Australia (from the Kimberley region to the Wet Tropics – Figure 1).

The distinctive characteristics of flow regimes were:

- perenniality/intermittency
- predictability
- timing of major floods

These characteristics are shown in Figure 2 which includes typical patterns of river flows over years, seasons and individual flood events.

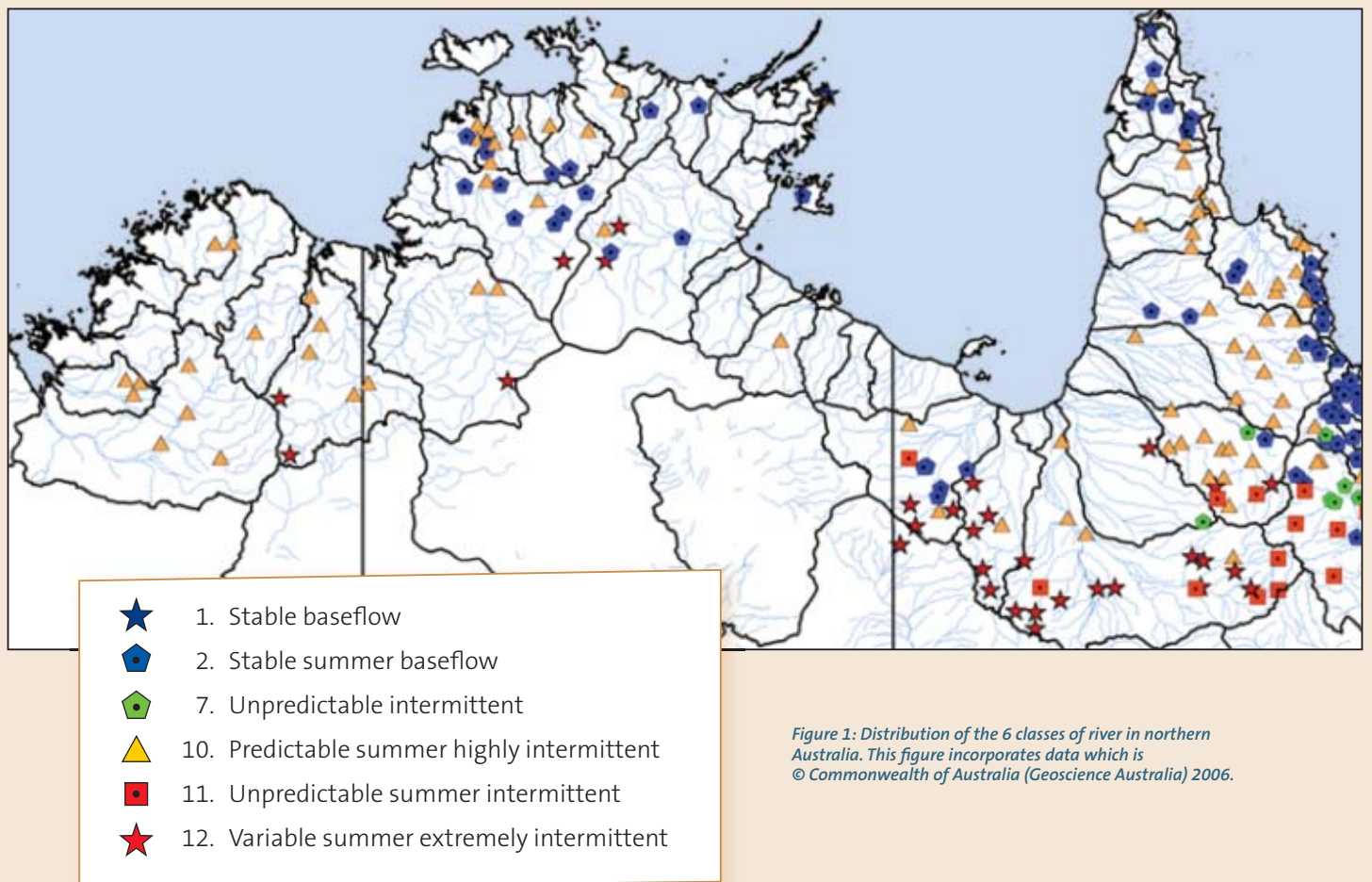


Figure 1: Distribution of the 6 classes of river in northern Australia. This figure incorporates data which is © Commonwealth of Australia (Geoscience Australia) 2006.

What is a typical tropical stream?

The types of streams found in northern Australia reflect the strong influence of the northern monsoon and associated cyclonic activity.

Most tropical streams are within two flow classes:

Predictable summer highly intermittent

This was the most common stream class in northern Australia. Streams in this class stop flowing 100-200 days/year. Timing is predictable with rivers flowing in summer (wet season) and drying in winter. Examples can be found in the Fitzroy (and nearly all other Kimberley rivers) as well as the Flinders River in the Gulf region and the Mitchell River of Cape York.

Streams with stable summer baseflow

Streams with stable baseflows keep flowing during the dry season. Constant river flows come because of groundwater inputs during the dry season. Examples are found in the Daly and Roper Rivers in the NT.



The Flinders River, Qld – an example of a predictable summer highly intermittent stream in a TRaCK focus catchment. Photo: Catherine Leigh.



The Daly River, NT – an example of a stream with stable summer baseflow in a TRaCK focus catchment. Photo: Danielle Warfe.

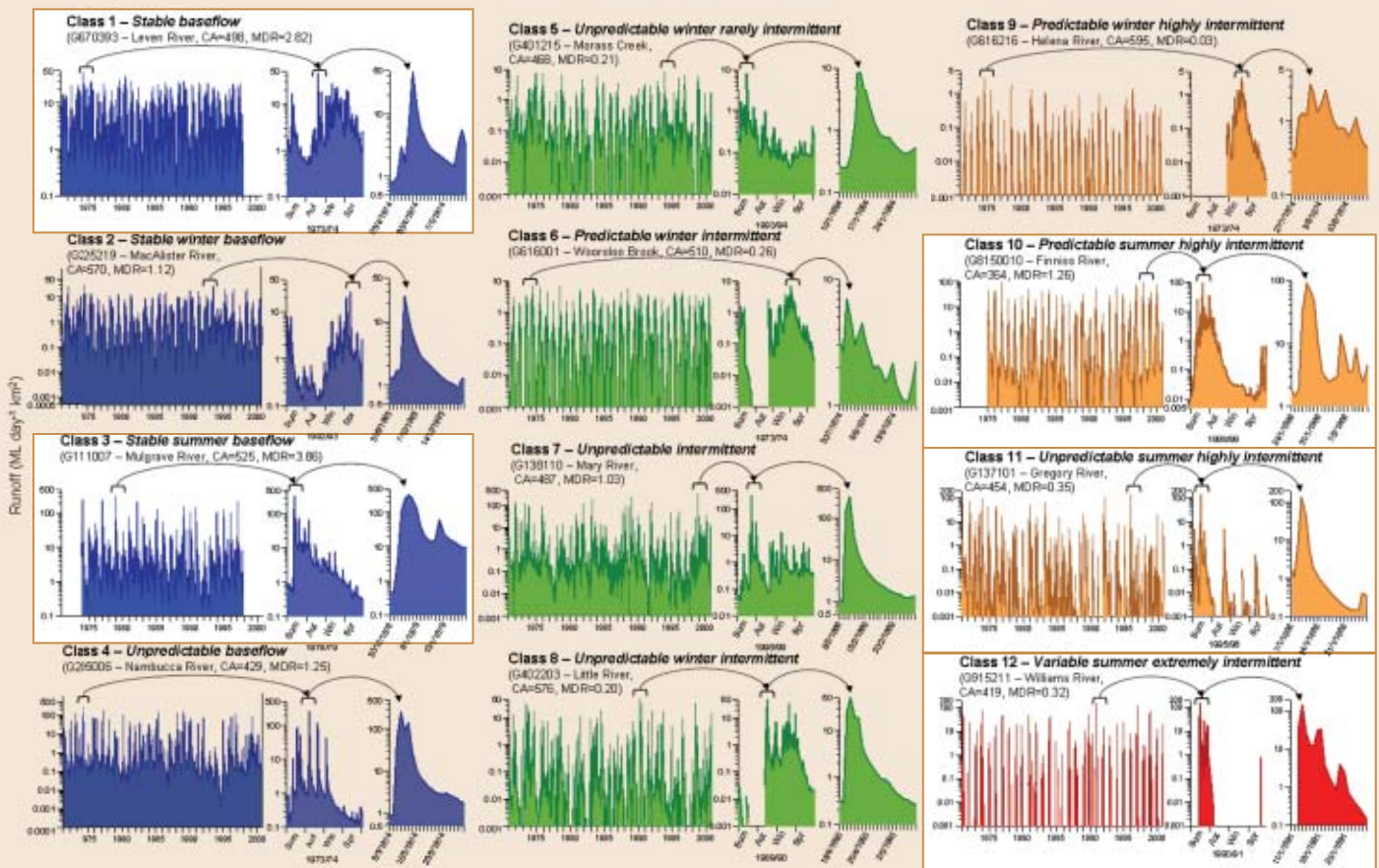


Figure 2: Examples of the 12 different flow regime types present in Australia. Classes found in northern Australia are highlighted.



Use of the classification

1. Transferring knowledge about one catchment to others

There is limited data available about northern rivers. The classification can be used by river managers such as government agencies and regional NRM organisations to assess the transferability of knowledge from one catchment to another.

Insights about how rivers function or respond to changes in management are more likely to be transferable between rivers in the same class. For example, environmental water requirements assessed for one river system may not be transferable to rivers from a different class.

TRaCK researchers will also be using the classification to help extrapolate and integrate results from their focus catchments (Fitzroy, Daly, Flinders and Mitchell) to other catchments across the north.

2. Incorporation in river analysis software

Methodological insights gathered through the research have already been incorporated in the River Analysis Package software: <http://www.toolkit.net.au/Tools/RAP>

This software assists river and water resource managers to undertake condition assessments, environmental flow planning and river restoration design.

3. Assessment and prediction

The classification should allow researchers to develop meaningful generalisations about the interaction between hydrology and ecology in Australia. This is valuable as hydrology data is generally more common than ecological data. It also provides a benchmark against which the response of biological communities to hydrological alteration can be assessed.

It is also possible that the classification can be used to predict patterns in biodiversity and community function but this remains to be tested.

Where to go for more information?

Full details and the final report for this research may be found at <http://lwa.gov.au/products/pn22591>

The data file upon which the classification was based is also available at this address.

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