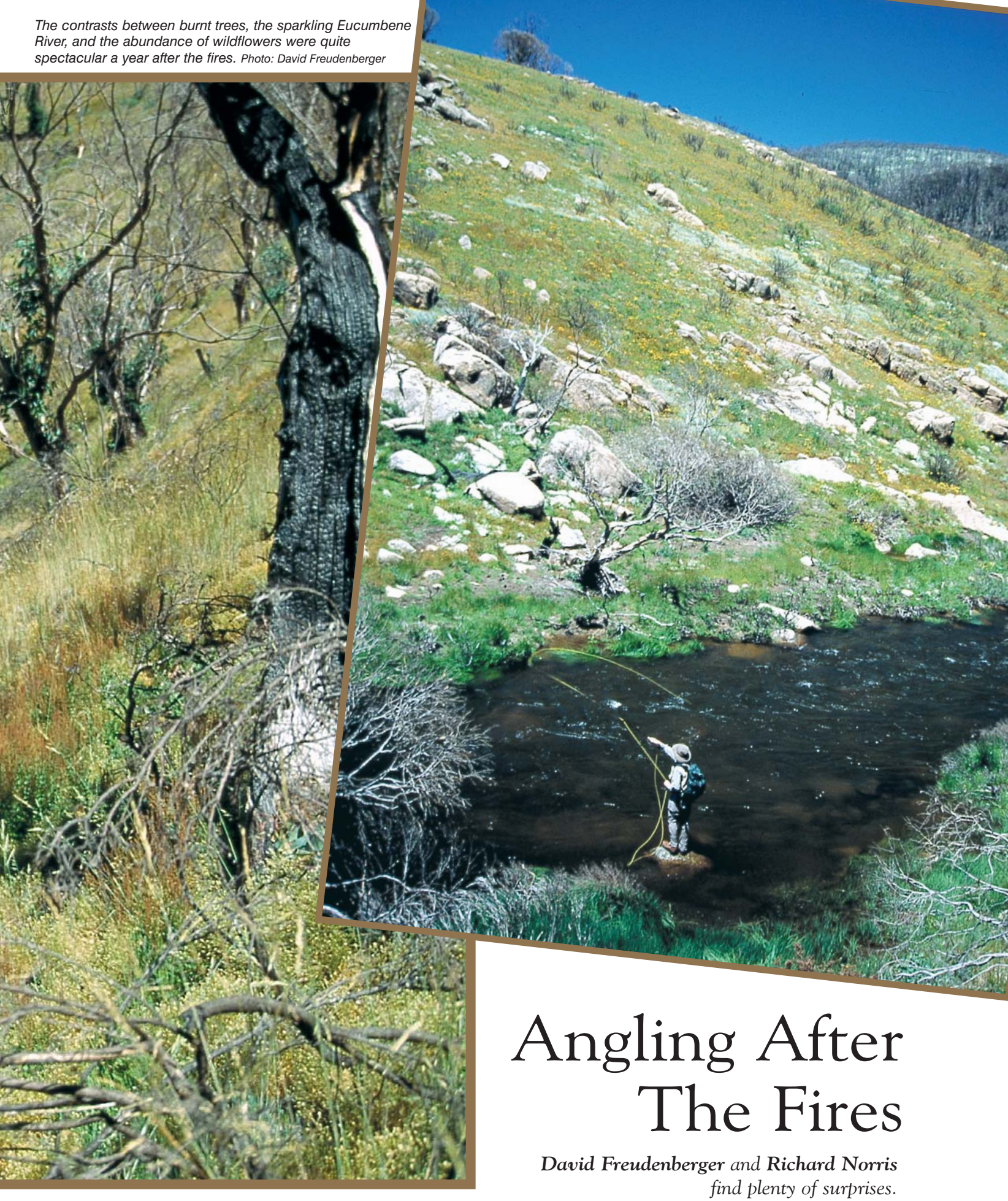
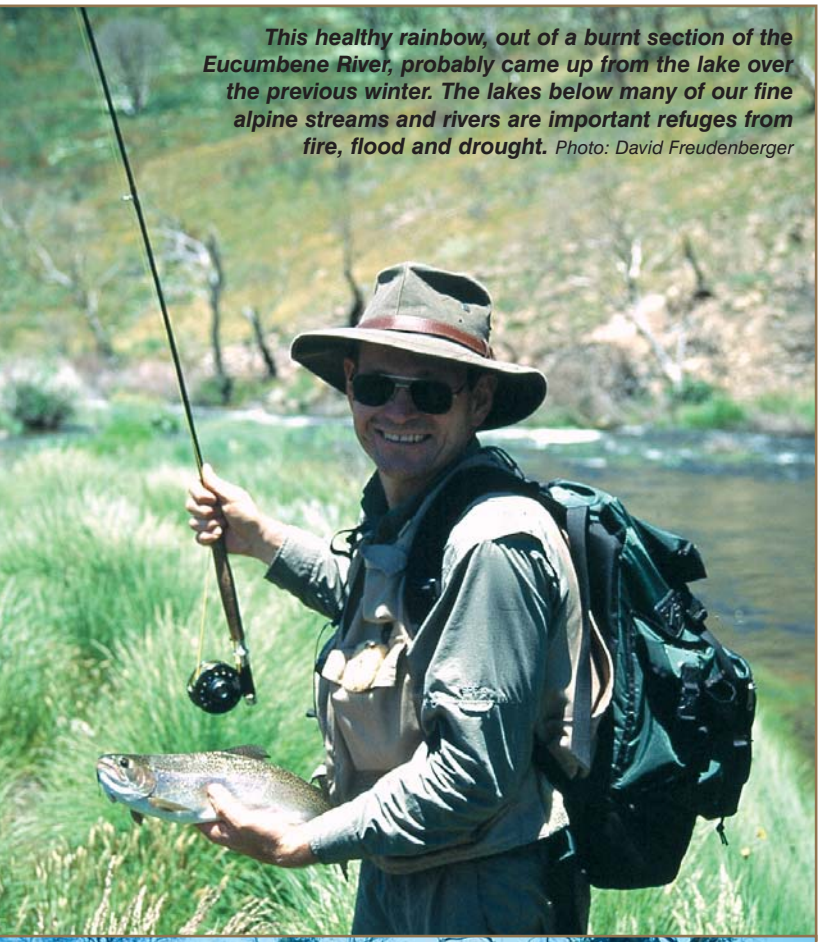
Some trees have survived but others died and will eventually fall, providing important in-stream habitat and assisting in pool formation.
Photo: David Freudenberger

The contrasts between burnt trees, the sparkling Eucumbene River, and the abundance of wildflowers were quite spectacular a year after the fires. Photo: David Freudenberger

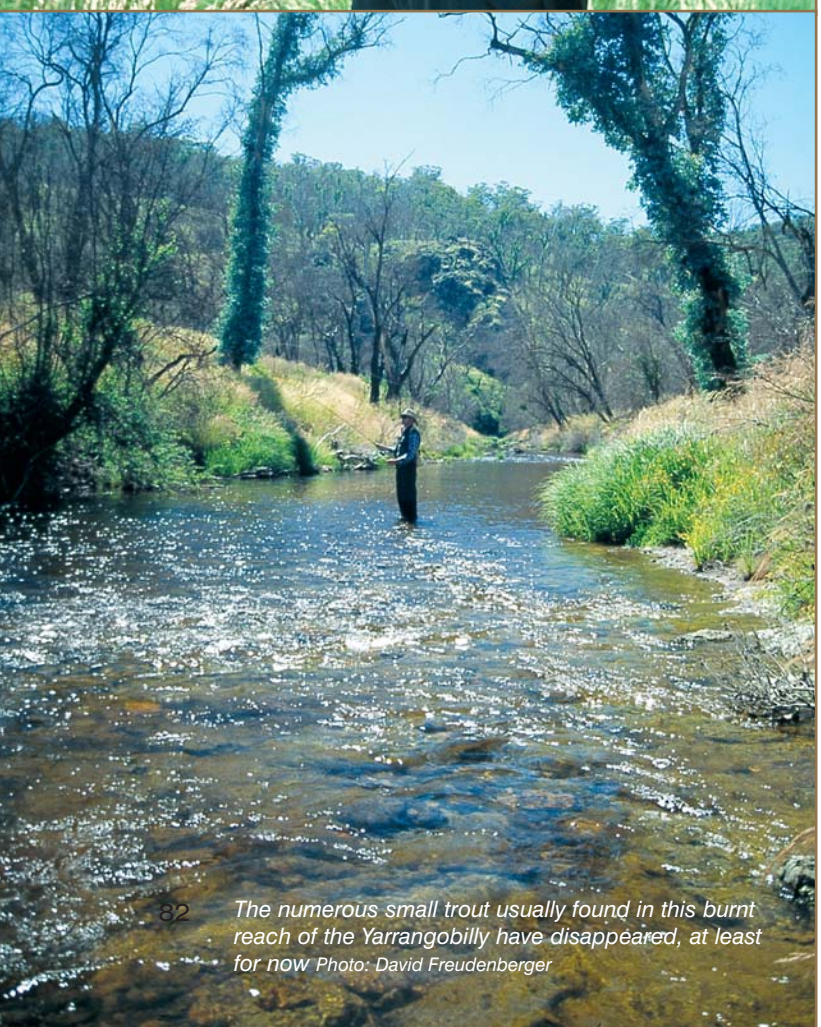


Angling After The Fires

David Freudenberger *and* ***Richard Norris*** *find plenty of surprises.*



This healthy rainbow, out of a burnt section of the Eucumbene River, probably came up from the lake over the previous winter. The lakes below many of our fine alpine streams and rivers are important refuges from fire, flood and drought. *Photo: David Freudenberger*



The numerous small trout usually found in this burnt reach of the Yarrangobilly have disappeared, at least for now *Photo: David Freudenberger*

On the 8th of January 2003, lightning storms ignited at least 140 separate fires, from alpine ranges in north-east Victoria to the Brindabella Range in the ACT. Over the next month 1.7 million hectares of alpine country were affected by fires. They swept through many of the headwaters and valleys of premier mountain trout streams and rivers including the Thredbo, Eucumbene, Tumut, Tooma and Mitta Mitta Rivers. The immediate post-fire conditions were bleak: range after range blackened and cooked. Flying over the Brindabellas, it was hard to see how any terrestrial or water life could have survived; some trees were so severely burnt and twisted by gale force winds that they had collapsed onto the ground. Runoff from thunderstorms in February and March dumped large loads of sediments and ash into many runs and pools of normally gin-clear and stony alpine streams. There were fish kills in some reaches.

But a closer examination of rivers such as the Thredbo and Eucumbene offered some immediate hope. Nowhere was the fire uniformly severe along an entire length of a stream or river. Sections of the upper Eucumbene north of the Snowy Mountains Highway were hardly burnt. The lower Eucumbene through the gorge and down to the mouth weren't burnt at all and fished fairly well post-fire, considering the drought. Similarly, sections of the Thredbo and Mitta Mitta Rivers escaped, while other sections were burnt to a crisp leaving nothing but charcoal and ash.

Damage & Regeneration

So it was hard to know what the 2003/04 trout season would offer across the high country of Victoria and NSW. The first surprise was the extraordinary carpet of wildflowers that sprang up in December under the charred snow gums and between burnt tussocks of snow grass. The good cover of winter snow and steady spring rains turned hill and after hill into a flowing wave of yellows, whites and greens. There were stunning contrasts between the blackened trees, just starting to regenerate, and lush and colourful understorey, though it was at times challenging to enjoy this spectacle as hoards of little black bush flies created clouds around any viewer's head. A fly veil was a necessity during the worst of the plague in December and January.

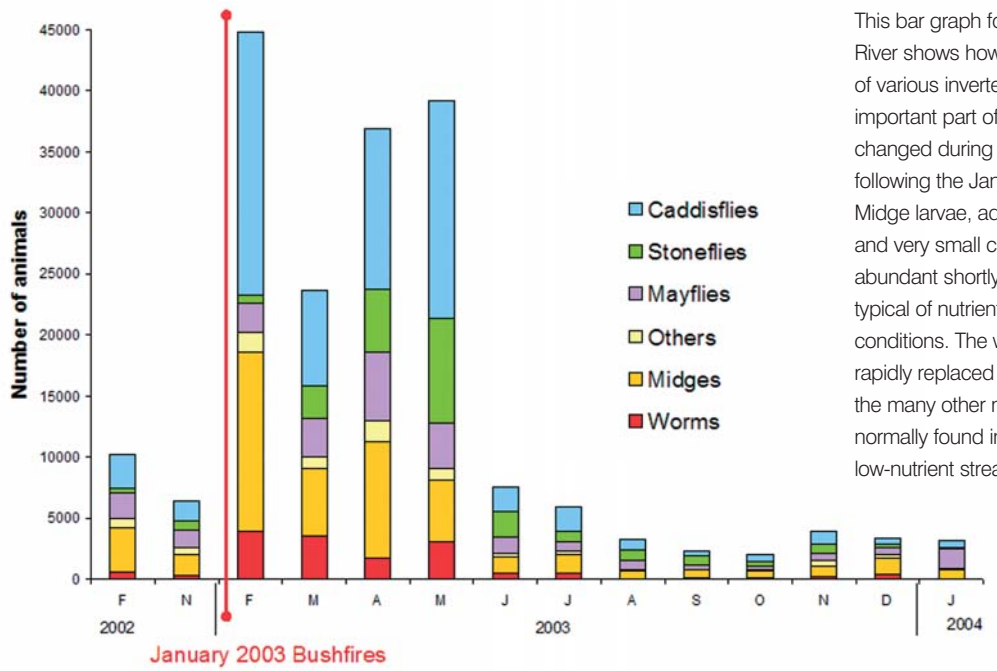
As usual with any of these streams and rivers, trout fishing was a mixed bag. Some lovely fish came out of pools and runs of the well burnt mid sections of the Eucumbene River. However, the large head of small fish normally found on the

Yarrangobilly south of the Snowy Highway were absent. Many of the Yarrangobilly's pools were still filled with gravel washed down from the crumbling slopes. The trout may be gone this summer, but the gravel should provide good spawning beds for years to come. Similarly, there were some good fish in the Mitta Mitta, but juvenile trout were rarely seen in runs and tails of pools where they were consistently found in the past.

The biggest impacts on these alpine systems are the first few rain-storms post-fire. With little or no canopy, ground cover and especially streamside vegetation to soften the impact of rain and slow or catch run-off, torrents of debris and fine sediment washed into creeks and down into our favourite rivers. Juvenile trout would have been particularly vulnerable to the poor water quality after these early storms.

Most of our alpine streams and rivers, like the landscapes from which they spring, are remarkably resilient. These high-energy systems can rapidly flush themselves clean. The depth of blackened debris at the mouth of the Eucumbene River is metres deep in places and stretches for hundreds of metres out into the lake. As long as we don't grossly interfere with these rivers by damming them and reducing the flows, they bounce back from the occasional disturbance caused by a fire. In contrast, high-energy flows down the Cotter River in the Brindabellas are blocked by Corin and Bendora Dams. Deep black sumps of ash and sediments are still caught in the backwaters of the Cotter River below the dams, whereas many of the free flowing rivers were pretty well scoured clean by 2004.

Dams are a mixed blessing. The fine-conditioned trout caught this summer in the Eucumbene and Mitta Mitta probably ran up from Eucumbene and Dartmouth Dams over last winter and spring. All of the alpine rivers are dammed except the Ovens in northern Victoria, but the lakes behind these dams are refuges from the inevitable drought and fires like we had last summer.



This bar graph for the Thredbo River shows how the numbers of various invertebrates, an important part of trout diet, changed during the year following the January 2003 fires. Midge larvae, aquatic worms and very small caddisflies were abundant shortly after the fire, typical of nutrient-rich conditions. The worms were rapidly replaced by mayflies and the many other nymph species normally found in clear flowing, low-nutrient streams.

The Positives

There is no doubt the fires will have a lasting, but probably positive effect on conditions for trout. The most intense fires have killed trees, particularly the mountain ash that only regenerates from seeds. But dead trees slowly fall into streams and rivers, adding valuable structure to in-stream habitat for nymphs that feed upon algae that rapidly colonise woody debris and other hard surfaces. Of course these nymphs are then the basis for a lot of fun called flyfishing for well-fed trout.

The initial flow of ash and sediments into our alpine streams altered the trout's food supply. Rather than the

The diversity of nymphs typically found in a clear flowing stream. Photo: F. Coffa

Shortly after the first storms swept ash-laden debris into the nearest creek, an abundance of worms and midge larvae replaced the normal diversity of mayfly, stonefly and caddis. Photo: F. Coffa

As alpine streams and rivers were flushed of their post-fire sediment loads, worms became less abundant and foraging nymphs like mayflies reappeared. Photo: F. Coffa

normal mix of mayflies, stoneflies and caddis grazing across well scoured rocks, midges (chironomids) and worms thrived in the nutrient rich black goo found in most streams for the first few months post fire. But nothing stays the same in any ecosystem. Soaking autumn rains and lots of snow-melt washed the nutrients out. The midges and worms lost their banquet, but the mayflies and other clear stream nymphs are coming back with vigour. There's a lot more sunlight with less overhanging vegetation, and sun and warmth drives the food chain, with the trout as the top predator. Less green vegetation, which intercepts, uses and transpires water, means greater in-stream flows of water for the next few years. Later, regenerating trees and shrubs will fully green-up and transpire a lot more water, leaving less 'surplus' for the nearest creek.

Fire is a good lesson on why biodiversity is so important. Most streams, forests or grasslands are dominated by an abundance of just a few species and lots of relatively rare species. But after a disturbance, be it a fire, drought, or flood, many of these 'rare' species become temporarily abundant as they exploit post fire or flood conditions. The midges and worms, usually pretty rare in clear fast running streams, quickly built up to very high abundances after the fire. They in turn provided a ready food supply for the omnivorous trout. If our streams didn't have this diversity of many different kinds of creatures, the food supply for trout would disappear at times after fire, drought or during floods. Biodiversity buffers the normal climatic variation of our alpine systems, fire included.

Nothing is uniform or continuous about a trout stream. They keep drawing us up and around the next bend. The dawn of another day can bring on a new hatch, or a breeze can spring up to shift some beetles or grasshoppers. The fires that swept across our alpine ranges were just as variable.

Fire continues to shape the character, diversity and beauty of our alpine ranges and their streams. The highly adaptable North American rainbow trout and European brown trout have made themselves at home in these dynamic streams that are never quite the same from one fishing visit to the next. Fire is just one more surprise to be encountered and accepted as part of the adventure called trout fishing.

David Freudenberger is a keen fly fisherman and a scientist with CSIRO, Canberra; Richard Norris is a scientist with the Cooperative Research Centre for Freshwater Ecology at the University of Canberra.