THE EPHEMERAL RIVERS OF THE NAMIB
by Peter Jacobson

One of the most fascinating scenes I have witnessed was a flood that came out of the mountainous Kuiseb catchment and into the desert. The leading edge of the flood was nearly a meter high and looked more like lava than water as it rolled rapidly down the channel. The water was loaded with sediments and organic material, including seeds, sticks, logs, grasses, and animals of various shapes and sizes. The water itself contained high amounts of nutrients and dissolved organic carbon. All of this material was carried downstream and deposited within the desert reach of the Kuiseb River.

During the next two years I will be studying the ephemeral rivers of the Namib as I pursue my doctoral degree at the Virginia Polytechnic Institute and State University. During this time I will be conducting my field studies from a base on the Kuiseb River at the Desert Ecological Research Unit of Namibia, under the guidance of Mary Seely. The Namib’s rivers, such as the Kuiseb, originate in the inland escarpment of western Namibia and drain westward towards the Atlantic. In total there are thirteen major rivers draining the northwestern corner of Namibia, with catchments ranging in size from less than 5,000 km$^2$ to more than 40,000 km$^2$. In every case these rivers form linear oases in their lower reaches as they enter the Namib. Associated with these riparian corridors is a wealth of biodiversity that would otherwise not be found under such a harsh climatic regime.

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The central question of my work addresses the importance of flooding in structuring and maintaining these ecosystems. Flooding occurs in these rivers in response to strong convective storms occurring inland during the summer rainy season. Although there is wide variation in flooding frequency between the rivers, they are all ephemeral, flowing for only short periods each year, if at all! The Kuiseb River is the main focus of my work and provides a good example of an ephemeral
river's hydrological regime. On average, over the past thirty years, the Kuiseb flowed 22 days a year at Gobabeb, although that figure ranges from 0 to 101 days. From 1979 to 1984 there was no flooding at all on the river, associated with a drier climatic phase in southern Africa. This variability is characteristic of ephemeral rivers and reflects the inherent climatic variability of arid regions.

Although ephemeral river systems drain more than thirty percent of the Earth’s surface and support much of the biodiversity found within arid regions, they have been little studied. Aquatic ecologists tend to ignore ephemeral rivers which lack of a permanent aquatic phase, thus limiting the development of an aquatic fauna or flora. At the same time, terrestrial ecologists tend to focus on the terrestrial biota in these riparian systems, ignoring the significance of the occasional flood. Thus, ephemeral rivers have largely been the domain of geomorphologists, seeking to understand the relationships between climate and fluvial landforms.

Of particular interest is the relationship between the hydrological regime and the biotic communities within the desert reaches of these rivers. Flooding undoubtedly plays an important role in establishment and growth of the riparian vegetation. What is less clear is the importance of the materials which are transported into the lower reaches of the rivers during flooding.

Over the next two years I plan to examine the importance of these inputs to the riparian ecosystems. Any changes in the hydrological regime of a river will certainly influence transport of this type. Whether such changes are induced by an impoundment or a shift in regional climate, as has occurred previously in the Namib, changes can be expected in the downstream biotic communities. Of interest is the fact that only one publication exists addressing floodwater sampling in an ephemeral river for nutrients and organic matter.

These linear oases are important systems in many respects. The upper reaches of most of these rivers run through commercial farmland before passing onto communal farmlands. In both settings the water and vegetation resources are utilized and are important assets to the country. The rivers, fed by runoff from areas of higher rainfall, are sites of high biological production in an otherwise low energy environment. They are thus focal points for wildlife and humans alike.

All of the rivers flow into proclaimed conservation areas, such as the Skeleton Coast Park. In these and adjacent areas, the rivers support diverse populations of wildlife, including the famous desert elephant and rhino. They also provide some of the most spectacular and interesting scenery in Namibia with their deep canyons and unusual fluvial deposits. Much of the ecotourism in western Namibia is centred on these river systems. The feature that makes them most attractive for all users, namely the availability of water, may however ultimately be their downfall.

As Namibia struggles to provide water to its expanding and rapidly urbanizing population, ephemeral rivers are becoming ever more attractive sources for meeting this growing demand. Similar developments are occurring in arid regions around the world as water is rapidly becoming a precious commodity in the global marketplace. There is great concern that water development within these systems may have severe effects on the downstream environment. Because of the developing conflicts between water, agriculture, conservation and ecotourism, a great need has arisen for a better understanding of the ecological dynamics of these systems.

The final phase of my work will be the preparation of an environmental awareness document, focusing on the importance of these systems to Namibia. The production of this document is being funded by the Swedish International Development Authority (SIDA). Our objective is to collate and summarize all of the existing information on these systems. Particular emphasis will be given to how development is likely to affect these systems and how they in turn will likely limit development as we seek to preserve their integrity. This publication will be distributed widely to schools throughout Namibia, as well as to politicians and foreign...
development agencies.

These systems are a unique part of Namibia’s natural heritage and if well managed, can serve a wide variety of users. By developing a better understanding of their dynamics and raising the awareness in regard to their functioning, I hope to ensure that the linear oases of the Namib will remain intact as unique and valuable features in Namibia’s landscape. In the meantime I’m watching the eastern sky as the clouds are beginning to build, setting the stage for more flooding in the Kuiseb River!