

Regular Article

Cost-effective alternatives for mitigating *Cryptosporidium* risk in drinking water and enhancing ecosystem services

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- Abstract
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Keywords:

catchment management; water treatment; pathogens; cost-effectiveness analysis; water quality; watershed; economic valuation

[1] Under the multibarrier paradigm, water quality management barriers that mitigate risk to consumers are required at multiple points from the *catchment to the tap*. We present a cost-effectiveness analysis of 13 catchment- and treatment-based management alternatives for mitigating *Cryptosporidium* risk in the Myponga water supply catchment, South Australia. A broad range of costs and benefits are identified and valued, including setup, operation and maintenance, and opportunity costs, and benefits for ecosystem services including water quality, biodiversity, carbon sequestration, and farm production services. The results suggest that the cost-effectiveness of investment in water quality management can be substantially enhanced by considering the costs of management and the benefits for ecosystem services, in addition to *Cryptosporidium* removal effectiveness. Cost-effectiveness of investment in management alternatives is dependent upon the desired level of *Cryptosporidium* removal effectiveness by both the catchment and treatment barriers. The combination of a spatially targeted 25% restriction in water course access of nondairy cattle and treatment by enhanced coagulation provides the most (net) cost-effective *Cryptosporidium* risk mitigation strategy. This combination may achieve 0.614 log removal at a net cost of A\$0.7 million and (net) cost-effectiveness of A\$1.14 million per log removal. Additional risk mitigation can be achieved through the addition of ultraviolet irradiation treatment, higher levels of water course access restriction for cattle, and the adoption of dung beetles in the catchment. Economic valuation of a range of costs and benefits of management priorities can support cost-effective water quality management investment decisions and inform elements of policy design such as cost-sharing

arrangements and spatial targeting.

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