LANDSCAPE LOGIC
LINKING LAND AND WATER MANAGEMENT TO RESOURCE CONDITION TARGETS

Fact sheet for managers and policy-makers #13
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Streamside management zones for water quality protection

What we found

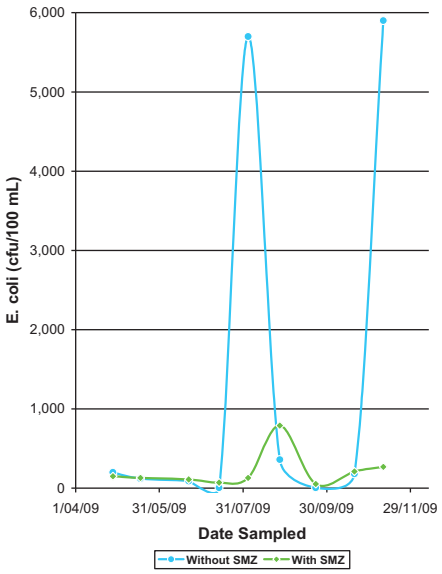
Cattle exclusion using a fenced streamside management zone (SMZ) that included a forest plantation reduced the delivery of sediment, phosphorus and bacteria to a headwater stream.

The buffering effect on turbidity became quite noticeable within a year of SMZ establishment, and it was most apparent during storms that coincided with a grazing event during a relatively wet winter-spring period. Effects on nitrogen also appeared positive, but pre-SMZ monitoring indicated that some of this effect might not have been SMZ-related. Overseas research indicates that substantial positive effects of SMZs on these parameters can be expected.

The benefit of the SMZ for turbidity was evident when grazing on one occasion was associated with off-scale turbidity readings (> 300 NTU) in the catchment without an SMZ compared to 50–140 NTU with the SMZ. During the dry-weather period preceding that winter the turbidity was about 16 NTU without and 5 NTU with an SMZ. The only negative effect of SMZ establishment on water quality parameters was a small, transient increase in turbidity during one storm that was attributed to sediment coming from the cultivated mounds. Turbidity at that time peaked around 29 NTU while turbidity without the SMZ was 11 NTU.

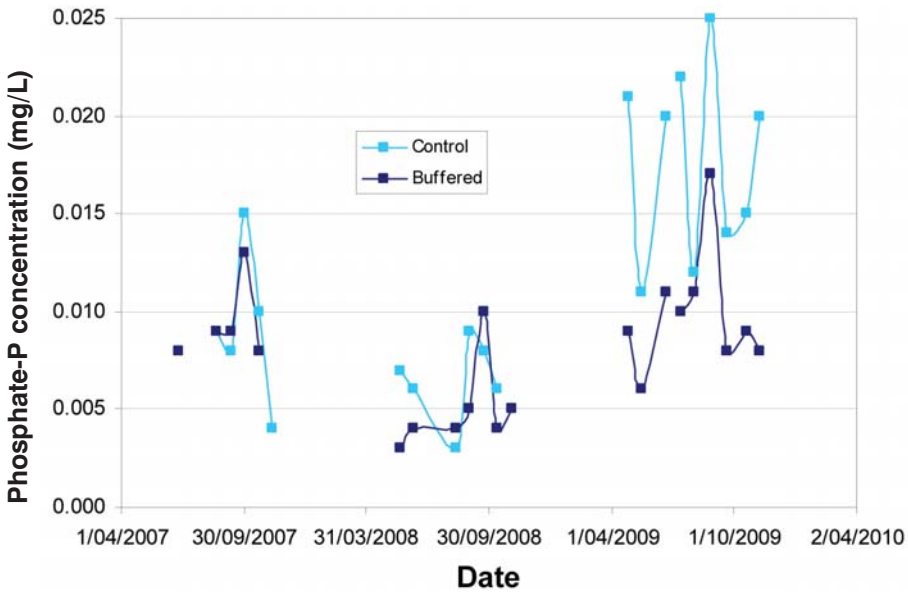
Sediment trapping by pits created during cultivation for trees probably contributed to reduced delivery of these contaminants to the stream, along with the presence of tall, ungrazed, remnant pasture. In addition, below-ground processes were probably important for moderating dissolved N and P delivery. Observations and simulation modelling predicted that nitrate removal via denitrification occurred throughout the catchment where a water table existed, i.e. about halfway up the hillslope. However, nitrogen uptake by pasture and trees was probably a far more important nitrogen removal processes in this catchment, and denitrification could not be expected to increase with SMZ establishment.

Research at this site will need to continue for several years to determine if establishing trees in an SMZ, which in this case occupies 6% of the catchment, will have a measureable effect on stream flow.



Implications for managers

Exclusion of livestock from



streams can substantially improve water quality. Marked water quality benefits can be expected only where SMZs are established over a large proportion of headwater stream-length, and even narrow buffers can deliver substantial benefits. In our case SMZ width ranged from 10–30 m. Even with SMZs, major sources of poor water quality will remain at points where livestock continue to have access to the stream and drainage from roads and tracks is not diverted across pasture or other vegetation before it reaches the stream.

Logistical and financial considerations are very important for establishing SMZs. Establishment of an SMZ requires a definition of situation-specific objectives, e.g. aesthetic, property values, stock safety, commercial options, water quality, habitat enhancement, and the use of native or introduced plant species. Secondly, potential financial and non-financial costs and benefits need to be weighed for different options. Thirdly, detailed plans are needed for establishment and long-term maintenance of the SMZ. Fencing and off-stream watering points for livestock and stream crossings can be expensive and therefore a major consideration.

Commercial tree farming for wood production or carbon credits is an option compatible with many commercial and environmental objectives. Dry-weather crash grazing might be an option for utilising grass within the SMZ once trees have reached a suitable size, but the effects on water quality have not yet been evaluated. We encourage potential practitioners to seek advice from agro-forestry regulators and advisors.

Photo 1. The paired-catchment SMZ experiment consists of catchments with (1) and without (2) an SMZ containing a plantation of eucalypts and acacias planted in 2008. Additional SMZs shown adjacent (left) and below these catchments are one year older

How we did it

We established a paired-catchment study in a single paddock in a mixed grazing and native forest landscape in southern Tasmania. Fertilizers were not used on pastures or native forest for several years prior to and during the study. Water quality measurements for one year prior to SMZ establishment pre-treatment data. Changes as a result of the SMZ were determined by comparison with these pre-SMZ measurements and with the adjacent catchment that did not have an SMZ. Stream flow, temperature, salinity and turbidity were monitored every 15 minutes, and several other water quality parameters (e.g. oxygen, bacteria, nitrogen and phosphorus) were monitored about 3-weekly or less frequently using grab samples. Several storms were automatically sampled every few hours for several days for measurements of various water quality parameters.

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