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Water management in native forests and plantations

Land Management & Forestry Services

In New South Wales, water for human use is often sourced from dams, rivers and streams within catchments comprising a mix of different land uses, but usually including a forest component. Forests are widely recognised as a source of clean water as they grow in locations that generate runoff, stabilise soil and moderate the peaks and troughs of rainfall. In comparison to urban and agricultural land uses, properly managed forests yield water relatively low in contaminants meaning that the need for treatment, and its costs, are minimised.

While the cleanest water is generally sourced from forests, some forest management activities, without mitigating action being taken, have the potential to impact at a local level upon the quality and quantity of water that is available to downstream users and the aquatic environment. Elevated concentrations of suspended sediment, leading to turbidity, is the most common risk factor from forest management activities. This risk arises as a result of soil disturbance during forest harvesting or the construction and use of forest roads. Elevated levels of suspended sediment may also be caused by uncontrolled events such as high intensity wildfires or riverbank erosion during floods, or indeed by other human activities related, for example, to agricultural practices or urban development.

Codes of practice

Legislation, Codes of Practice and the conditions of Environment Protection Licences are followed in State forests to ensure that any adverse impacts on the quality of water supplies are minimised as a result of forest management activities. Indeed, one of the objects of the Forestry Commission (Forests NSW) set out in the *Forestry Act 1916* (NSW) is 'to preserve and improve, in accordance with good forestry practice, the soil resources and water catchment capabilities of Crown-timber lands and land owned by the commission or otherwise under its control or management'. Forests NSW is also committed to the protection of soil and water quality under its Environmental Policy and Ecologically Sustainable Forest Management (ESFM) Strategic Plans.

Forests NSW has adapted its forest management techniques to reflect world's best practice. It has done this by implementing mitigating actions determined to be effective following research by either its own personnel or by others, including the Cooperative Research Centre (CRC) for Catchment Hydrology (now E-Water CRC), CSIRO and universities. The practices used by Forests NSW include many protection measures, such as the maintenance of undisturbed streamside filter strips, use of silt fencing, construction of appropriate road drainage and stream crossings and limits placed on road use during wet weather.

Water monitoring

As part of a continual improvement framework, Forests NSW is committed to monitoring the effects that its activities may have on the environment, including aquatic habitats and water sources.

Consistent with both our management objectives and the relevant environmental legislation, Forests NSW has put in place a comprehensive, mandatory water quality monitoring program, called the 'Phase 1' program, since 1999 in native forests and pine plantations. The aim of the Phase 1 program was

to determine whether licensed forestry activities had an identifiable impact on water quality (turbidity and suspended sediment concentration), and if so, to quantify the level of that impact.

Results of the program have consistently showed that (a) water from streams in native forests is of a higher quality than water from pine plantations, and (b) forestry activities in both plantations and native forests raised the levels of turbidity and suspended sediment in streams but due to the implementation of best management practices these impacts were minor and temporary.

Forests NSW continues to be involved in water monitoring and water quality research projects. It is currently involved in Australian Research Council funded projects with Griffith University, the Australian National University and the University of Melbourne, investigating the impacts of forestry activities on aquatic ecosystem health and developing decision support systems to minimise such impacts.

Forest hydrology research

In addition to the prescribed water quality monitoring program, Forests NSW has been conducting hydrology research projects for more than 30 years, investigating the impacts of forest management activities on water quality and quantity. At present Forests NSW operates more than 35 stream gauging and water quality monitoring stations in a number of regions, including North East, Central, Southern, Hume and Macquarie regions.

Results of native forest hydrology studies

Hydrology studies have shown that the amount of water that is yielded from a native forest depends upon a number of factors, such as the age of the forest and the proportion of the forest that is affected by timber harvesting activities at any point in time.

Following harvesting, there is generally an increase in the amount of water that is yielded by a patch of forest. This is because there are fewer trees to intercept rainfall or to transpire water through their leaves. Therefore more water infiltrates into the soil or flows over the soil surface and into streams.

Several years after harvesting, the amount of water flowing into streams from a patch of native forest may decline as the forest regrows and the young trees intercept and transpire more water. Sometimes the amount of water yielded from a patch of younger re-growth forest can fall below that of an established, older forest. The actual amount of water used by a re-growth forest can vary depending upon many factors, such as the tree species present, the amount of rainfall received and the density of re-growth. However, over time the amount of water yielded from a patch of re-growth native forest levels out again as the forest reaches maturity.

Results of plantation forest hydrology studies

Plantations are an important land use and contribute significantly to the supply of wood products and employment in regional NSW. The value in turnover from the forest industries in NSW in 2006–07 was estimated at some $4 billion. In addition, plantations can provide positive environmental benefits by reducing salinity, providing uniform stream flows, reducing erosion, and sequestering carbon dioxide.

Water yield in plantations is very much driven by annual rainfall and also the age of the trees. As a generalisation, planted forests use more water than grassland but over a full plantation cycle, average less than native forests.

Australian studies show that any long-term reduction in water yields due to the development of plantations at a catchment level are minor and are overshadowed by other changes in the environment, such as changes in rainfall patterns. A report by the Bureau of Rural Sciences indicates that, at the catchment level, the water yield impact of plantations is not significant enough to be measured if the plantations do not exceed 20% of the catchment.

In NSW, plantations do not exceed 2% of any major catchment in the Murray Darling Basin and any measurable impacts are certainly overshadowed by the area of natural forest and woodland that has been cleared for agriculture. For example, plantation forests occupy 0.8% of the Lachlan region, 1.4% of the Macquarie–Castlereagh region and 1.6% of the Murrumbidgee region.

The CSIRO Murray Darling Basin Sustainable Yields project sheds further light on the relevant issues within sub-catchments of the Murray Darling Basin. Several reports were recently published to assess the relative impacts of, among other things, commercial forestry expansion, farm dam development, additional groundwater extraction and climate change.

In the Macquarie–Castlereagh region, the CSIRO best estimate is that due to the combined effects of climate change, farm dam development and additional groundwater extraction there will be a

13% reduction in mean annual runoff by 2030. By contrast, CSIRO considers the impacts of commercial forestry expansion to be 'negligible'.

In the Murrumbidgee region an additional 17,000 ha of commercial forestry plantations is predicted by 2030. The CSIRO best estimate is that this will result in reduction of mean annual runoff by less than 0.4% by 2030. By contrast, the best estimate of the combined effect of climate change and farm dam development is a resultant 10% reduction in mean annual runoff by 2030.

In some small catchments within NSW, forest plantations do occupy a substantial area and relative to some land uses, average water yield may be reduced over a rotation. Such water impacts are localised and variable over time. The pattern of changes in runoff attributable to a new plantation varies with annual rainfall and plantation age as well as thinning, harvesting and other management practices. For example, flows may be enhanced in response to thinning the plantation.

The NSW Government is obliged under the National Water Initiative to ensure that significant interception land uses, such as plantation forestry, are managed so as to not undermine the integrity of our water entitlement systems. In water systems that are fully allocated, over-allocated or approaching full allocation the Council of Australian Governments (COAG) has agreed that interception activities assessed as being significant should be recorded and any proposals for additional interception activities above an agreed threshold size, will require a water access entitlement. Such measures will be applied to the plantation forestry sector and must be implemented by no later than 2011.

Industry & Investment NSW is working with the NSW Office of Water (part of Department of Environment, Climate Change and Water) on the implementation of these measures. The economic and environmental importance of plantation forestry demands we find a balance between our timber and water resource objectives. Forests NSW is committed to achieving this balance.

Further information

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