

Managing the Impacts of Afforestation on Water Yield

Chris Fowler and David Pedley of Adderley Head discuss The Canterbury Experience

Introduction

Of all the natural resources within our environment, few would disagree that the most important of all is fresh water. By international standards, New Zealand has an abundant and clean supply of fresh water. However, as demand for water continues to increase, the management of this valuable resource is becoming more challenging.

The responsibility for managing water lies with the various regional councils throughout New Zealand. In the Canterbury region, Environment Canterbury (ECan) has recently released its decisions on the Natural Resources Regional Plan (NRRP). The NRRP contains a specific chapter on water quantity, which seeks to manage the amount of water in Canterbury's rivers and aquifers. One of the methods used to manage water yield is to control land use, including specific controls on forestry activities in the region.

This article tells the story of the forestry sector's experience with the issue of water yield in Canterbury. It provides a brief outline of the issue, ECan's proposed solution, the forestry sector's response, and the final decision of the ECan Commissioners. It then considers the impact of this decision on forestry activities in Canterbury and the potential implications for other regions in New Zealand that may face similar pressures in the future.

What is the Issue?

In basic terms, the issue of concern to ECan is that tall vegetation such as plantation forest has the potential to intercept rainfall by collecting water on its canopy. Some of this water is then evaporated back into the atmosphere and prevented from entering rivers and streams. This process is known as interception loss or wet leaf evaporation.

The process of interception loss is illustrated in Figure 1, which compares the soil moisture storage for pasture and canopy across a two and a half year period. This graph identifies that the biggest difference between the two vegetation types is during autumn and early winter. During this time, the forest canopy does not allow as much autumn rain to enter the soil and it takes longer for the soil to reach full saturation.

ECan was concerned that if plantation forestry was not controlled in some hill country catchments, interception loss would increase and result in reduced flows in rivers and streams. These reduced flows would have a negative impact on instream ecological, cultural and amenity values and reduce the reliability of supply for existing water uses.

ECan's Proposed Solution

To address this issue, ECan identified the various

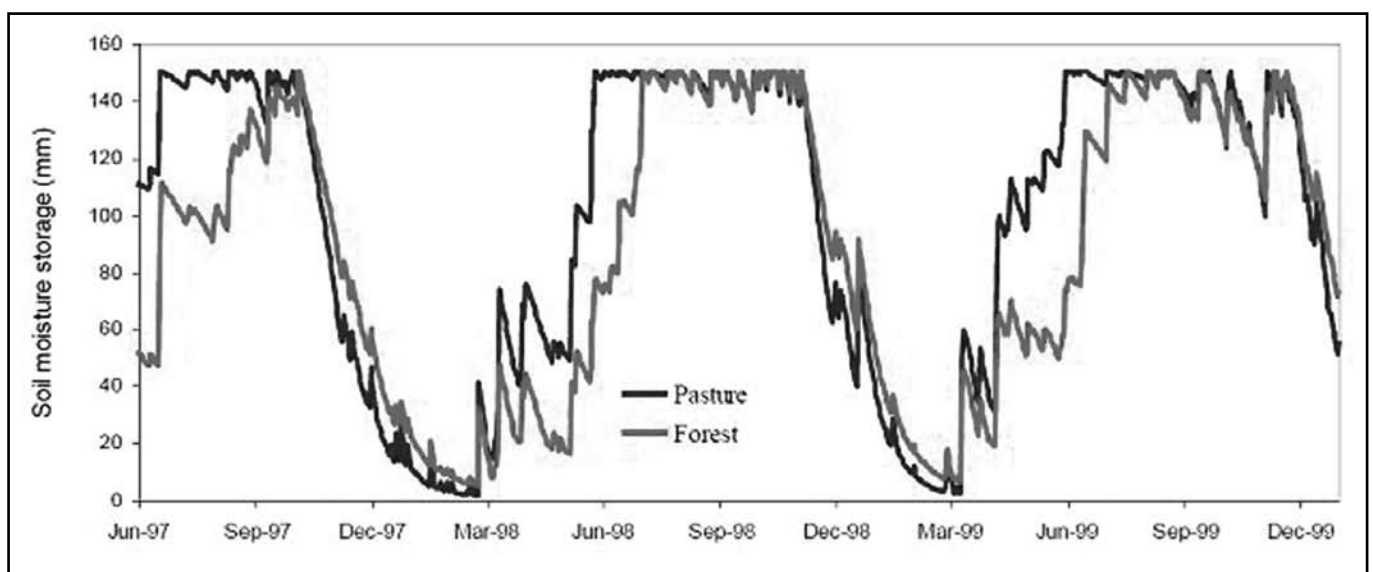


Figure 1: Comparison of soil moisture storage for pasture and forest

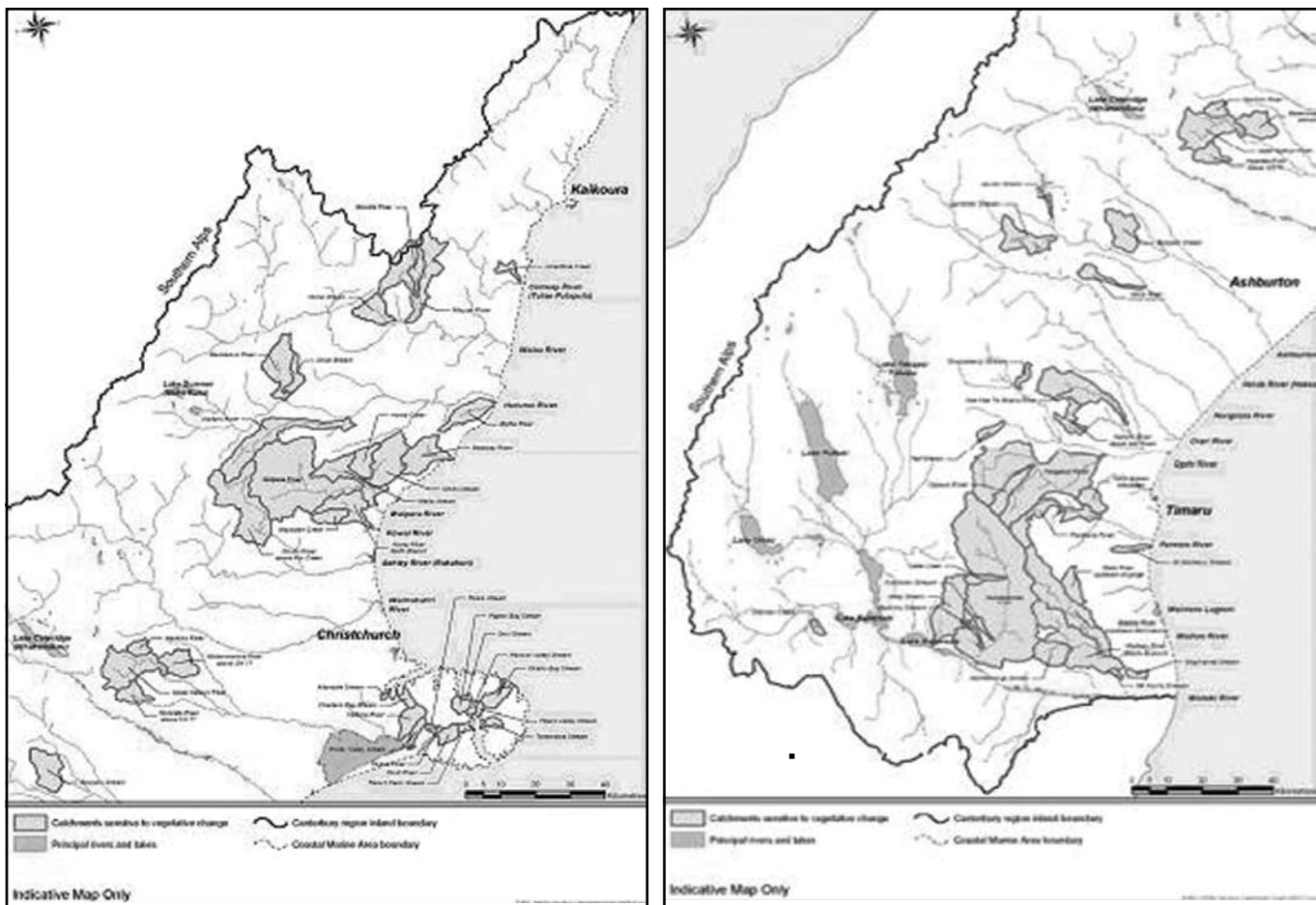


Figure 2: Location of flow sensitive catchments

catchments within the region that were thought to be most susceptible to reduction in flows. This included those catchments that naturally have low water storage capacity, commonly experience low rainfall and are generally below 600m altitude. Fifty-nine areas were identified as “flow sensitive catchments” and are illustrated in Figures 2 and 3.

Of these 59 flow sensitive catchments, nine were identified in a separate schedule within which plantation forestry was subject to specific controls. However, the NRRP indicated that additional flow sensitive catchments would be included in this schedule once flow data became available.

In relation to those identified catchments, the following restrictions were imposed:

- **Existing forest** - replanting could occur provided that it did not exceed the area of forest that previously existed; and
- **New forest** - the total area of new plantation forest was limited to between 5 and 20% coverage of the property on which it is located.

The effect of these controls was to impose onerous and extensive restrictions on new plantation forestry in the

Canterbury region. Although it only applied to a limited number of catchments, the land within these catchments was the most suitable land for plantation forestry due to its location, characteristics and value. In contrast, continued pastoral use of this land was becoming increasingly uneconomical and unsustainable.

By limiting the amount of afforestation based on a small percentage of each individual property, the controls would effectively prevent the establishment of larger consolidated blocks. Within limits as low as 5%, it would simply not be feasible to acquire a large enough property to generate the economies of scale necessary for commercial planting. The only new forest that could be established would be smaller dispersed forests with reduced economic benefits and increased environmental effects.

In summary, the proposed controls were a serious threat to the future of plantation forestry in Canterbury and one which could not be ignored.

The Forestry Sector's Response

The implications of the proposed changes would potentially affect a large number of individuals and companies with forestry interests in the Canterbury region.

With their interests aligned, a group of forestry companies collectively referred to as the Joint Forestry Submitters (JFS) joined together to oppose the proposed controls.

JFS actively participated in the submission and hearing process for the NRRP. This culminated in a comprehensive presentation before the ECan Commissioners involving assistance from a wide range of experts with the relevant knowledge and experience to support JFS's position.

The key features of the approach adopted by JFS were as follows:

- **Highlight the benefits of forestry** - economic and environmental benefits, including effects on climate change.
- **Explain the negative impact of the controls** - including the significance of the restrictions, the practical implications for forestry in Canterbury and the wider economic and environmental consequences.
- **Challenge the basis of the controls** - expert hydrological evidence on whether the proposed controls are robust, necessary and would actually be effective at protecting the quantity of water in rivers and streams.
- **Provide a solution** - suggest an alternative approach that better achieves the intended objectives whilst minimising the adverse economic and environmental consequences.

The primary outcome sought by JFS was that the NRRP did not include any controls on forestry in relation to water yield. However, an alternative solution was proposed in the event that the Commissioners decided that some form of regulation was justified. This alternative included the following key changes to the provisions of the NRRP:

- Provide greater recognition of the benefits of afforestation.
- Amend the schedule of flow sensitive catchments so that it only includes the low flow producing area of the catchment (being the higher rainfall parts of the catchment that contributes primarily to the 7-Day Mean Annual Low Flow for the catchment).
- Amend the controls so that any restrictions on new plantings are not based the percentage coverage of an individual property, but on the percentage coverage of the entire low flow producing area of the catchment.

ECan's Decision

After consideration of the evidence, the ECan Commissioners concluded that there was justification for controls on new plantings in at least some flow sensitive catchments. However, they agreed with JFS that the controls proposed in the NRRP as notified were not appropriate.

The Commissioners decided that the focus of the controls should be on achieving the following environmental outcomes:

- To protect at least 95% of the 7 day Mean Annual Low Flow (7DMALF); and
- To protect 90% of the mean flow.

The Commissioners considered that if these outcomes could be realised, this would achieve the objectives of protecting instream values and the reliability of supply for other water uses. With these outcomes in mind, the Commissioners requested additional analysis to assess the merits and practicality of the approach advocated by JFS.

This work produced maps showing the low flow isohyds (a line on a map joining points that receive equal rainfall) for several flow sensitive catchments identified in the NRRP. The maps showed the low flow producing areas of each catchment in green and yellow, as illustrated in Figure 3 below.

Based on this information, the Commissioners identified nine catchments (different to the nine originally identified) that justified some form of regulation. Adopting the approach promoted by JFS, each of these nine catchments was divided into the low flow producing area and the balance of the catchment. Figure 4 is an extract from one of the planning maps that illustrates a low flow producing area within a flow sensitive catchment.

Under the Commissioners' decision, new forest plantings in the nine identified catchments is a **controlled** activity, provided that the cumulative impact of all new plantings in that catchment since November 2010 does not result in:

- More than a 5% reduction in 7DMALF; and/or
- More than a 10% reduction in the mean flow.

As a controlled activity, this means that resource consent application will be required, but that ECan must grant consent. ECan may however impose conditions on a range of specified matters including the location and size of the area to be planted and the proportion of planting in the low flow producing area.

[See Figures 3 and 4 over page]

What is the Impact?

On the whole, the Commissioners' decision is a clear improvement for the forestry sector compared to the original NRRP provisions as notified. In particular, the identification of low flow producing areas within catchments and the removal of restrictions on individual properties in favour of catchment based limits are notable

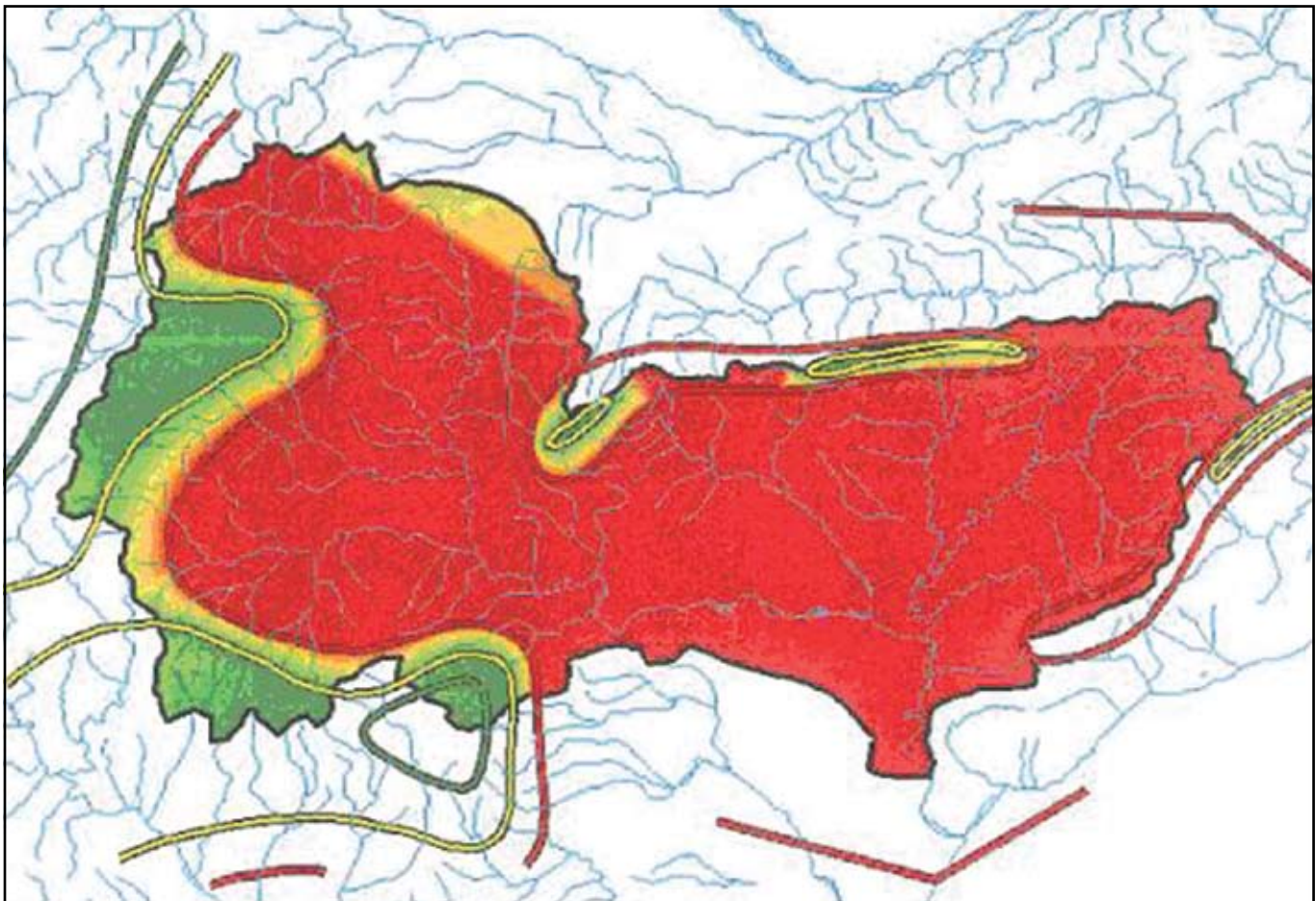


Figure 3: 7-Day MALF for the Waipara and Teviotdale catchment

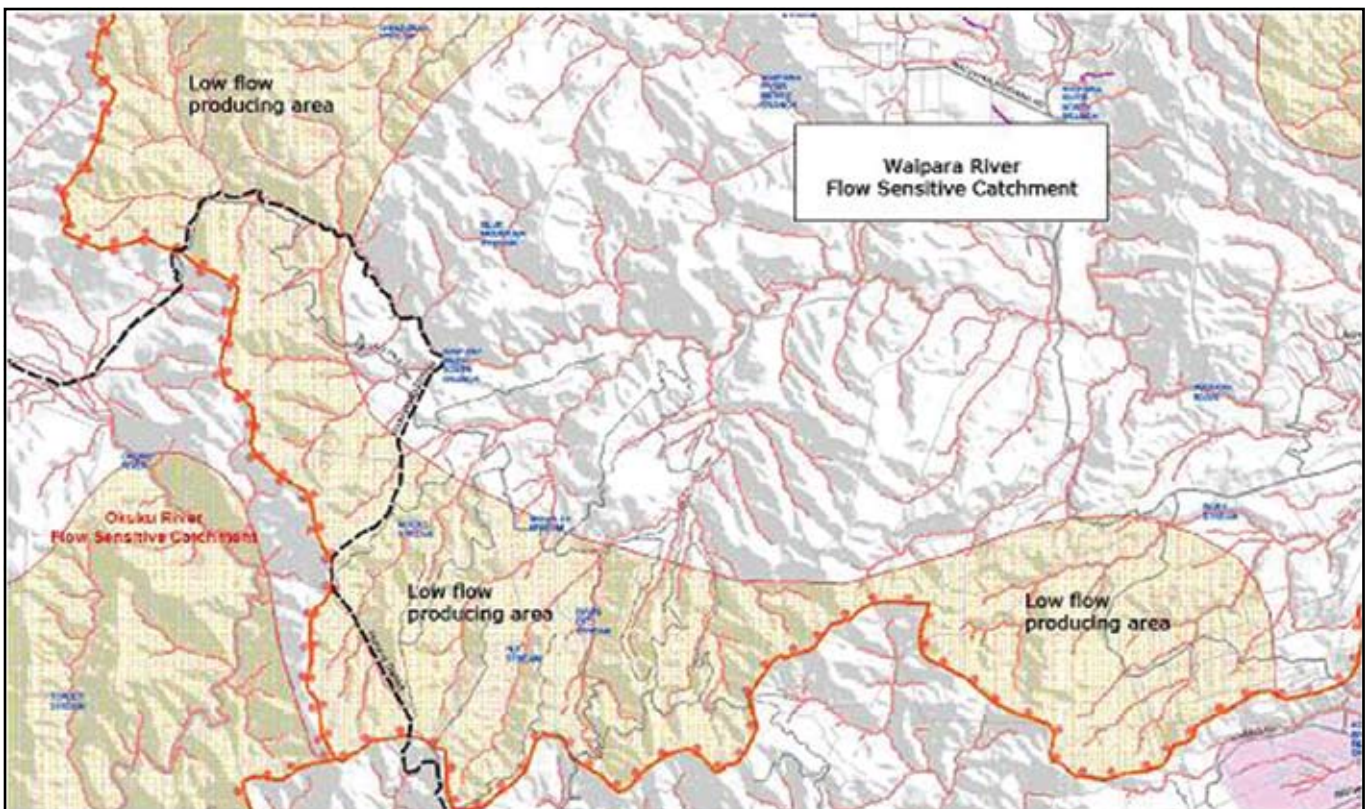


Figure 4: Example of flow sensitive catchment, including a low flow producing area

changes. The new provisions will certainly not have the same detrimental effect on new plantings in the region as would otherwise have occurred.

Notwithstanding these improvements, there remain some risks and uncertainties for the forestry sector under the new provisions. Imposing limits on a catchment wide basis creates an element of “first in, first served”. In other words, there is only a limited amount of forestry that can occur in each catchment until the flow levels specified in the rules are reached. Applicants first in time will benefit from the new rules and eventually use up this allocation, creating a circumstance where no new forest plantings can occur without a full resource consent process.

In addition, the following questions remain unanswered:

- What evidence will be required to demonstrate that a proposed plantation will not breach the flow thresholds specified in the rules?
- How will ECan exercise its ability to impose conditions on the location and size of the area to be planted?

What this experience does illustrate is the benefit of collaborative action by the forestry sector when there is alignment of interests. This approach enabled a much more comprehensive case to be presented, which resulted in the some significant changes to the NRRP. This may not have been possible if each interested party attempted to engage in the process separately in an uncoordinated manner.

Potential implications

Although the decision is specific to the Canterbury region, the findings of the Commissioners may also have implications for other areas in New Zealand that are facing similar pressures on water yield now or in the future. These regions may look to Canterbury as an example of how to manage new forest plantings and adopt some of the controls now present in the NRRP.

However, it is important to note that the scientific understanding of this issue and its relative importance compared to other environmental considerations continue to change. For example, recent central government initiatives including the Proposed National Environment Standard for Plantation Forestry and the Emissions Trading Scheme substantially alter the environmental obligations and financial incentives for forest owners.

These broader issues may well cause further change to the regulation of new plantings as the state of knowledge improves and priorities change. In the Canterbury region, although the NRRP decisions have only recently been released, there is already talk of a significant overhaul of the planning framework in the near future that may well

see water yield and other issues revisited in order to achieve greater alignment with the Canterbury Water Management Strategy.

Conclusion

There is clear evidence that in some catchments, plantation forestry can have an impact on water yield by intercepting rainfall and preventing it from entering rivers and streams. Given the increasing pressure on water supply for a range of uses and values, this is likely to result in further consideration of this issue in various regions throughout New Zealand.

When considering potential regulation of new plantings, it is important that afforestation effects on water yield are not viewed in isolation. Any proposed regulation should also take into account the benefits of plantation forestry, the economic and environmental consequences of the proposed regulation, and the availability of other alternatives to achieve the desired objective.

Participants in the forestry sector should continue to keep an eye on any proposed changes to the relevant plans within their region that may address this issue. As has been illustrated by the Canterbury experience, it can be valuable for the sector to engage with these processes in a coordinated manner to ensure that the rationale behind any controls and the potential implications are well understood before any restrictions are imposed.

Disclaimer: This is a brief summary for information purposes only and is not legal advice

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