ORARI-TEMUKA-OPIHI-PAREORA ZONE WATER MANAGEMENT COMMITTEE

FOR THE MEETING 3 APRIL 2017

Report for Agenda Item No 8

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Management of Plantation Forests in Flow Sensitive Catchments in the OTOP Zone – A Review

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Action Required

The Zone Committee considers the current level of protection provided for flow sensitive catchments in the OTOP Zone as part of the Healthy Catchments Project.

Overview

- Trees are very effective at intercepting rainfall. A mature tree cover will reduce runoff compared to pasture and shrubland. The change in runoff is proportional to the area of forest cover. However, at below 20 percent of forest cover, this effect becomes difficult to understand.
- The Land and Water Regional Plan (LWRP) identifies eight sub-catchments within the Pareora and Opihi River catchments as 'flow sensitive catchments', and controls new forest plantings in these areas.
- There has been no technical work undertaken to assess whether plantation forests in the Upper Orari catchment could affect the water yield from this catchment.

Recommendations

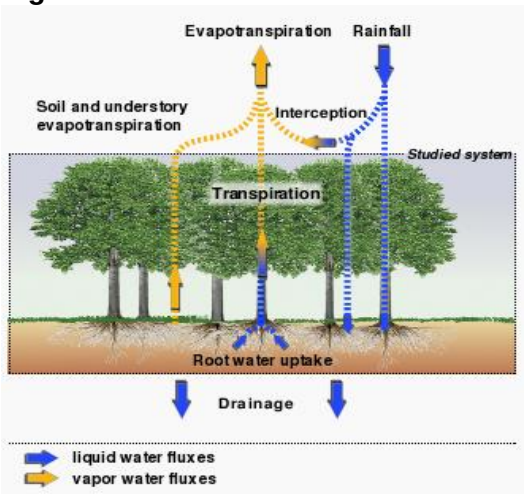
- The existing controls in the LWRP for managing the introduction of new forestry in the Healthy Catchments Project area are maintained;
- Further work is undertaken in the Orari Catchment to establish whether this should be a flow sensitive catchment;
- If this work proves that the Orari is flow sensitive, then the LWRP is amended to include the Orari as a flow sensitive catchment.

Background

Concern was expressed at public meetings held by the Zone Committee about the potential effects of plantation forests on river flows in the Healthy Catchments Project area (Appendix One). This paper briefly summarises the effects of plantation forests on water yield from catchments, and describes the Land and Water Regional Plan's policies and rules that regulate new forestry in flow sensitive catchments.

Effects of Plantation Forestry on Water Yield

Figure 1



Source: https://appgeodb.nancy.inra.fr/biljou/en/fiche/bilan-hydrique
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The introduction of tussock grassland, scrub or pasture can reduce the amount of water (water yield) within a catchment. Trees reduce water flows by intercepting rainfall and transpiring water that would otherwise enter the soil and eventually flow into a waterbody (Figure 1).

Research has shown that an increase in forest cover will reduce:

- Low and annual flows, with intermittent reaches and ephemeral streams likely to be drier for longer periods.
- Flood flows, with the greatest effect on peak flows from smaller storms.

Various catchment studies (summarised in Fahey et al 2004; Davie & Fahey 2005; Quinn & Phillips 2016) have shown that a change in land use from pasture to forestry can reduce the annual water yield from a catchment between 30 to 80 percent. These percentages are lower where plantation forests have replaced scrub vegetation.

The effects of forestry on water yield vary from catchment to catchment. The planting of new forestry areas where most of the runoff is generated, such as valley floors and riparian zones, will have a disproportionate effect on stream flow.

The interplay of local factors, including the type of soil, climate, the area of forest plantings, the extent of canopy cover, and forestry management practices, all influence how much water leaves a catchment. The harvesting of trees for example can result in higher flows from a catchment, compared to a similar pastured catchment, but these flows will begin to decline after a short period once new forestry plantings become established (Quinn & Phillips 2016).

In dry catchments with limited water storage, the effects of forestry on river flows, instream values and downstream abstractors can be significant. The effects are similar to multiple water takes – with one important difference – unlike abstractions, water yield reductions from plantation forests cannot be stopped once a minimum flow restriction is reached.

Plantation Forestry in the Healthy Catchment project area

Plantation forests are defined as trees that are specifically planted and managed for harvesting and producing timber and other wood based products, or as a carbon sink regardless of whether they are exotic or indigenous species[3]. While these forests may significantly reduce river flows, they also have many potential benefits, such as erosion control, protection and improvement of water quality, sequestration of carbon dioxide,

[3] Land and Water Regional Plan, Section 2.9, pg 46

and provide economic returns on land that has low productive potential for agriculture. Currently, forest plantings occupy 29.5 percent (171.3 hectares) of the land in the Healthy Catchments project area, with the largest plantings occur in the Temuka River catchment.

Flow sensitive catchments in the OTOP zone

A flow-sensitive catchment is defined as a catchment where:

"… a river which is dependent on rainfall as its main source of flow, has limited ability to store water, and where evapotranspiration can be expected to exceed precipitation between December and April resulting in very low flows in summer and autumn compared with mean flows." [4]

A long list of potentially flow sensitive catchments in the Canterbury Region has been investigated over the past 17 years. Nine catchments or sub catchments in the OTOP Zone are mapped as flow sensitive catchments in the LWRP[5] (Appendix One) on the basis of a series of technical studies carried out between 2004 and 2008 by National Institute of Water and Atmospheric Research (NIWA) (Appendix 2).

Six of these catchments are situated in the Opihi River catchment, and three in the Pareora River catchment. Several small catchments, e.g. Opawa River, Taiko Stream, which form part of larger flow sensitive catchments, were identified to protect specific instream values.

No flow sensitive catchments are listed for the Orari River catchment. During the Land & Water Regional Plan Hearings, ECan staff noted that identification of flow sensitive catchments was an ongoing process, and that the sensitivity of the Orari catchment is not known, but suggested that it could be reviewed by the Zone Committee during the sub region process[6].

Managing forestry plantings in flow sensitive catchments

The LWRP must give effect to the Canterbury Regional Policy Statement (RPS). The RPS seeks to manage the adverse effects of land uses on the flow of water in surface waterbodies or the recharge of groundwater by managing the planting or spread of exotic vegetation species in catchments where the species are likely to have significant adverse effects on flows in surface water bodies[7].

The LWRP controls the area, density and species of tree planted[8]. An exception is where tree-planting is required to control deep-seated soil erosion. Within a flow sensitive catchment, the regional plan rules[9] allow replanting of an existing[10] plantation forest, as a permitted activity, if an existing forest was harvested within the last five years. New areas of plantation forest would require a resource consent, as a controlled activity, provided that:

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[4] Land and Water Regional Plan, Section 2.9, pg 42

[5] Land and Water Regional Plan, Table 14.7 Flow Sensitive Catchments, pg 333

[6] Section 42A Report Volume 1 – Proposed Canterbury Land and Water Regional Plan`pg 300-303.

[7] Canterbury Regional Policy Statement 2013 Policy 7.3.5, pg 78

[8] Land and Water Regional Plan, Policy 4.75 , pg 42

[9] Land and Water Regional Plan Rules 5.72 & 5.73.

[10] The forest existed at 1 November 2010.

- The total area of planted forest does not exceed 20 percent of a small flow sensitive catchment (≤ 50km^2); or
- For larger catchments, new plantings[11] do not reduce 7 day MALF[12] by more than 5 percent and/or the mean flow by 10 percent.

The resource consent application must be granted, but conditions may be imposed on the location, density and timing of the species planted. If the above criteria are not met, new forest plantings are a restricted discretionary activity, and an application may be granted or refused. The potential effects on a broader range of matters[13] would be considered, including river flows and associated uses and values, groundwater recharge, benefits for slope stability, erosion control, water quality, carbon sequestration, biodiversity, and the spacing, density and tree species.

Any increase in the area of new forestry plantings for commercial purposes in a flow sensitive catchment would require resource consent and the potential effects of river flows would be one of the matters that would be considered by a decision- maker.

The upper Orari River catchment is not currently subject to the flow sensitive catchment provisions. Many parts of this catchment are potentially suitable for plantation forestry, and some additional technical work should be undertaken to assess the potential effects on the 7 day MALF and mean flows of the Orari River and its tributaries. Depending on the results of this work, the Zone Committee could then decide whether to add all or part of the catchment to the list of flow sensitive catchments in Section 14 of the LWRP (Healthy Catchments Project area).

References

Davie, T., & Fahey, B. (2005) *Are low flows affected by vegetation change in the same way as annual yield?* Landcare Research.

Duncan, M., Dey, K. (2006). *The effect of vegetation change on water yield for flow sensitive catchments in Canterbury: Phase 3*. Environment Canterbury Report U06/69. September 2006

Fahey, B.D., Duncan, M.J., and Quinn, J. (2004) Impacts of forestry. In: Harding et al (eds); Freshwaters of New Zealand. NZ Hydrological Society and NZ Limnological Society. pp 33133.16.

MFE (2016) A Way Forward for National Direction 2016. Ministry for the Environment publication no INFO 766. September 2016.

MPI (2016a) *National Exotic Forest Description as at 1 April 2016*. Ministry for Primary Industries & New Zealand Forest Owners Association.

MPI (2016b) *Wood availability forecasts – Canterbury 2015*. Ministry for Primary Industries. June 2016

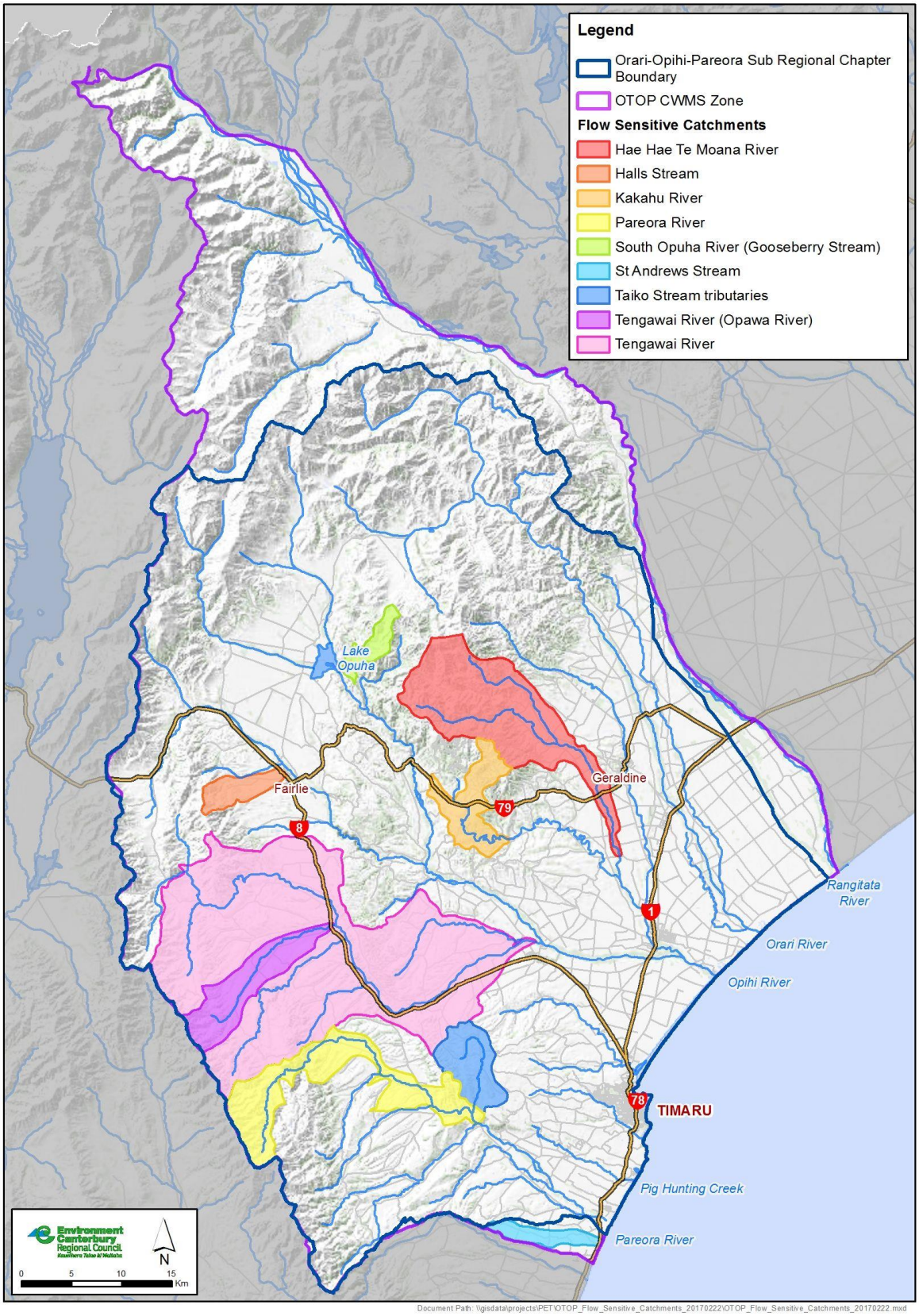
Quinn, J., & Phillips, C. (2016) Production Forestry. In: Advances in New Zealand Freshwater Science. NZ Hydrological Society and NZ Limnological Society

[11] New plantings are defined as plantings after 1 November 2012

[12] 7 day MALF = 7 day Mean Annual Low Flow

[13] Council has reserved its discretion to these matters listed in the rule. Consent conditions may only be imposed on these reserved matters.

Appendix One – Healthy Catchments Project Area



Appendix Two: Summary of technical studies of flow sensitive catchments in the OTOP zone

Major catchment	Sub-catchment	Flow sensitive part of the catchments	References
Opihi	Opuha River	North Opuha river, catchment upstream from Clayton Road	Duncan (2004) Duncan & Image (2004)
		Gooseberry Stream above the inflow site to Lake Ophua	Duncan, Ponder-Suttin & Wech (2008)
	Opihi River	Halls Creek upstream from State Highway 8	
	Temuka River	Hae Hae Te Moana River above confluence with Kakahu River	Duncan (2004) Duncan & Image (2004)
	Kakahu River	Catchment upstream from Hall Road	Duncan, Ponder-Suttin & Wech (2008)
	Tengawai River (Te Ana a Wai)	Whole catchment upstream from Picnic Grounds Recorder site	Duncan & Image (2004)
		Opawa River upstream from Tengawai River (Te Ana a Wai) confluence	Duncan, Ponder-Suttin & Wech (2008)
Pareora River	Pareora River	Catchment upstream from Pareora Huts	Duncan & Dey (2006)
		Taiko Stream upstream from confluence with Pareora River	
	St Andrews Stream	Whole Catchment	
Orari River			

The catchments shaded blue are identified as flow sensitive in the Orari-Opihi-Pareora section of the Land & Water Regional Plan