HOW TO STIFLE ACTIVE FOREST MANAGEMENT - THE WUNGONG CATCHMENT TRIAL IN WESTERN AUSTRALIA

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I have set down the history of the Wungong catchment trial in order to provide a record that shows how difficult it is to implement any active forest management in the northern jarrah forest. This account may be of interest to forest managers in other parts of Australia. As a consultant to the Water Corporation, my views are coloured by this involvement. Others are invited to add to this discussion.

The Wungong proposal

The Wungong catchment trial, entirely funded by the Water Corporation, commenced in May 2002 and was terminated in October 2013. It began as an instruction by Parliament to the Water Corporation for a briefing to both Houses on the potential for "catchment clearing" to enhance water yield into the water catchments located in the Hills area near Perth. The Manager of the Infrastructure Planning Branch at the Water Corporation asked me to assist with that briefing. I was then engaged, part-time, as their consultant for the period of the trial. This involved discussions with stakeholders, obtaining the required environmental approvals, liaison, planning, site selection, establishing demonstration trials, advising on monitoring and on research needs. Foresters Jack Bradshaw and Roger Underwood were subsequently engaged as consultants on silviculture and on fire. We received good support in the implementation from field foresters Richard Boykett, Ian Freeman and Frank Bailey, employed by the Agencies responsible for forest management.

It was clear that some Parliamentarians, particularly farmers, were focussed on "roaded catchments" as the solution. However, the Water Corporation had experienced problems with these in some drier areas of the State and put forward a strong case for thinning the overstocked forest as an alternative. There were sound data from the 1980's that thinning of forest in higher rainfall areas was beneficial to stream-flow (eg WAWA 1987) and so the Corporation was instructed by the Minister to proceed with a trial. The Wungong catchment was selected on a number of criteria: it was State forest; there were no old-growth forests; it had been highly disturbed by logging (up to four times), mining (30 percent) and dieback disease (60 percent) in the past; it already had five long-term gauging stations; it was also situated close to Perth and readily accessible. However it is not located in the highest rainfall area. In retrospect, a catchment with higher rainfall/lower evapo-transpiration and less mining rehabilitation would have produced higher yields and been more suitable.

Community consultation and planning occurred during 2003 and 2004. A draft proposal was prepared in 2005 seeking approval for a 12 year, $20 million study to thin about 7500 ha over 4 years and produce an additional 4-6 GL of water. The proposal was publicly reviewed, the Water Corporation collated and provided a response to these comments and EPA then gave advice to the Minister. The trial commenced in April 2007, five years after the initial briefing to Parliament (Water Corporation 2007). During these five years critical changes to catchment processes had occurred.

Observed changes

Much was already known about thinning effects on tree growth and on water yield (eg Ruprecht et al 1991, Stoneman et al 1996). Rainfall in 2002, 2006 and 2010 was well below average and, by the

mid 2000's, the Wungong stream changed from a perennial stream (for 90 years) to one that, by 2010, was dry for up to six months. Many of the larger pools were now also dry. Such a drastic change would surely imply major reductions in soil storage, in depth to deep and to shallow ground-waters. Regularly monitored deep groundwater bores within the forest had already shown a decline from 1976 of about 0.33 m per annum that had continued for three decades (Kinal and Stoneman 2012). Re-monitoring of shallow ground-waters located near stream in the Cobiac sub-catchment now showed that these no longer intersected the soil surface during winter and that the deeper groundwater bores were declining at a rate of 5m each decade (Reed pers com). These changes could be expected to lead to loss of vigour and health in both overstorey trees and stream-zone vegetation, on which many of the threatened fauna species were dependent (Batini 2011).

However the ecological need for the thinning of regrowth native forests and the plantations on bauxite pits were not well understood at this stage. Thinned forest could also arguably be aesthetically attractive and useful for recreational activities.

Responses

From the beginning there was strong opposition from the Conservation Council, the Conservation Commission and the EPA to thinning that was seen to benefit only tree growth or water yield. The Conservation Commission (in whom the State forests are vested and who are also responsible for the Forest Management Plan and the conservation of biodiversity in forest areas) was opposed and its Chairman (a former office bearer with the Conservation Council) and senior staff often used delaying tactics when approvals were sought. The Water Corporation assigned the equivalent of three full-time staff to this trial and they were always supportive and very professional. There was also support at the Directorate level. The Staff from Forests Products were positive, but the response from other Government departments was disappointing.

The EPA and Department of Water (DoW) were only marginally involved, which was surprising given their responsibilities for environment and water resources. The forest managers (CALM, DEC then DPaW) took on both a regulatory role (Forest Management Branch) and a contracting role (Regional Services Branch) but never truly engaged as a Stakeholder or a partner. To my knowledge, their CEO and Director of Nature Conservation never attended a field visit or a research workshop. Despite a number of briefings to explain the reasons behind the trial, many of the wages staff employed in the thinning were also opposed to the program. Their main objection was to notching the smaller trees rather than felling and using the products. However this was not possible due to Government restrictions on export or use of native timbers for bio-energy. All other works in the District took priority over the thinning. All these actions caused substantial delays in implementation.

Community involvement

The Water Corporation was a strong supporter of external research as part of the trial. It funded research and monitoring of aquatic biodiversity (UWA), flora and tree health (Mattiske Consulting), fauna (Kabay Consulting-mammals, reptiles, birds, ants), nutrition (Murdoch University), detailed sensing of crown cover and tree health (Specterra), catchment modelling (Croton), cockatoos (WA Museum) and on public and recreational perceptions to thinning (Murdoch University). A large number of reports on this research were published for and by the Corporation and lodged on its website for public review. Corporation staff arranged to give talks where invited and organised four

public research seminars to discuss findings. There was also a quarterly update titled “Wungong Whispers”. A Technical Reference Group was also set up, including representatives that were philosophically opposed to the trial (some academics, the Shire and the Conservation Council) as well as supporters such as the IFA and the Forest Products Commission.

A number of demonstration plots were established in both native forest and rehabilitated bauxite pits, to show a range of alternative thinning densities (5 to 37 BAOB; 200 to 1800 sph) and of techniques (falling, notching, retention or removal of coarse woody materials (Batini 2012)). Over 1000 visitors came to these sites over the period of the trial. Staff regularly emphasised the need to maintain healthy forest and stream environments by managing the catchment wisely.

The Wungong trial also spurred the re-establishment of an improved network of rainfall, stream gauging and groundwater monitoring. These data showed that the rainfall/runoff relationship had changed since the early 2000’s, caused largely by lower shallow ground-waters near stream-lines, leading to much smaller, wetted, source-areas for generating stream-flow. Several staff from CSIRO became involved in hydrology and catchment modelling. There was also a Centre of Excellence for “Climate change woodland and forest health” established as a cooperative venture between Murdoch, UWA and the DEC. The Centre funded seven post doctoral staff.

Trial areas

Thinning was proposed over three areas that had been gauged.

Cobiac catchment- This sub-catchment was located in an area of low relief, in the lowest rainfall zone (historically 1100mmpa but less in recent years) and had been instrumented and then abandoned as a trial area by Alcoa. It had a stream gauging station, a pluviometer, and about 100 shallow and deep pisometers, all with some 10 years of data. CSIRO also selected the site for research and established additional transects with deep bores and neutron probe holes within “control” and “thinned” stands.

In accordance with a recommendation from the Conservation Commission and the EPA to include a wider range of densities in the thinning trial, a prescription was prepared for thinning Cobiac to 10 m2/ha BAOB. This was refused by the Conservation Commission on the grounds that they had intended the wider range of thinning to include only less intense thinning. The logic of retaining a higher density than routine thinning (about 15 m2/ha) when the intention of the trial was to increase water yield was never explained.

Thinning occurred on about 240 of the 360 ha (tree-marked by DEC) reducing basal areas from 34 to 18 m2/ha and crown cover by 46 percent, resulting in an increase in stream-flow (about 80mm total in four years, an increase of 54 percent), a rise in the shallow groundwater near the streams so that these once again intersected the soil surface in winter and the observed 0.5 m annual decline in the deep groundwater was halted. Post the extremely dry year in 2010, in the summer of 2011, deaths and poor crown health were observed in the un-thinned CSIRO control transects but not in thinned stands (Batini 2012).

The cost of treatment was about $700/ha, $500 for the initial notching and $200 for a follow-up coppice control. The additional water produced was approximately 150000 KL/an. The marginal cost of desalinated water for Perth is about $3/Kl.

Chandler catchment- This sub-catchment of 1750 ha, in the 1200 mm rainfall zone had been extensively mined for bauxite by Alcoa. About 25 percent now consisted of internally draining pits which had been rehabilitated and were now heavily stocked with either exotic or native eucalypts, from 10 to over 25 years of age. In addition, without consultation, and despite the Water Corporation suggesting an alternative site, DEC decided to add a large "fauna-habitat zone" within this catchment. This meant that about 45 percent of the key water –producing, near-stream areas were now not available for thinning. Thinning proceeded on the 25 percent covered by bauxite pits and in the available 30 percent of native forest located on the periphery. Unsurprisingly there was no increase in runoff detected.

Costs were higher at approximately $1200/ha due to the very dense revegetation on bauxite pits (up to 4000sph in younger stands).To reduce costs, we had carried out a small trial over 7 ha in summer and commercially thinned some of the older rehabilitated areas planted to exotics, from about 25 to 8 m2/ha. Some 500 tonnes of product was sold as "mixed chip" and almost covered the costs of extraction. We then proposed to thin the remainder of the exotic plantations commercially during winter when logging machinery was readily available. Although the pits had been mined and were mostly well drained, winter logging was refused by DEC on the basis of "excessive soil damage". We offered to carry out a trial logging over a small area to test this out. This was also refused. These areas were then notched to waste at considerable cost.

Treatment Area 4- These two sub-catchments were located in the highest rainfall area (historically >1250mm), on steeper, rocky slopes on each side of the Wungong reservoir. There were high expectations of a substantial increase in yield by thinning. However there was opposition, on the grounds of water quality (sediment and faecal pollution) from both the Water Corporation's Water Quality Branch and the DoW. These staff rated potential water quality concerns far higher than the measured loss in yield. They initially required an untreated buffer zone around the reservoir of 200m that would have negated most of the thinning effects. After much consultation there was agreement to reduce these buffers to 50m. The Fauna Habitat Zone proposed in TA4 by DEC then had to be moved elsewhere and all of the Diverse Habitat Zones identified by DEC were field-checked. Then some smaller areas were tree-marked for inspection by various stakeholder groups and at different times. The areas were advance-burnt in preparation for thinning. All of these stages had to be approved by various regulators, which took considerable time.

Forest Management Plan

By the time that all these steps had been taken, the draft Forest Management Plan 2014-2023 had been issued for public comment by the Conservation Commission. Following substantive submissions by the Water Corporation, the FPC and the IFA, the new draft plan now included provisions that would permit silviculture of forests for both "environmental enhancement" and for "water production". Buoyed by these inclusions, we took the new Chairman of the Commission and key staff on another field visit. The Commission however decided it would not approve the thinning in TA4 during the review period for the FMP. As the State was close to going to the polls, the Minister supported this view. The Corporation was then advised to defer any further field work. In total, about 1400 ha had been treated in six years, far short of the 7500 ha target in four years which had been proposed.

During October 2013, the Board of the Corporation determined that, as thinning for water production was now incorporated into the newly approved Forest Management Plan, the Wungong trial had achieved its aims and should be terminated. Subsequently, a number of key stream gauging and rainfall stations were closed. The position of the Water Corporation and its Board is understandable. For ten years they had funded (to the tune of several million dollars) and supported a program that was unpopular with many other government agencies, some of which had actively delayed and frustrated its implementation.

Silviculture for "environmental enhancement" or for "water production" was now approved by Government and it was time that the agencies responsible for the FMP (Conservation Commission and DPaW) took this responsibility seriously. The ecological benefits of thinning were likely to be more significant than the water yield benefits. The Water Corporation would still be involved in a whole-of-government program, but would not lead it.

There were also other factors involved. In the face of a drying climate, the intensity and frequency of thinning required to maintain some of the historical water yield was substantially greater than previously envisaged (Reed et al 2012) and despite the high cost, an investment in desalination was independent of climate, operationally more acceptable to the Water Corporation and politically more acceptable to the government.

IFA involvement

Although these silvicultural objectives were retained in the final plan "Forest Management Plan 2014- 2023", the program was unfunded and the State was facing a large funding short-fall due to falling mineral royalties and changes to GST. The IFA then wrote to the State Treasurer pointing out that, based on publicly available data, funding of a thinning program over high-rainfall forested catchments could actually save the State a considerable sum of money in the medium term. The IFA requested a meeting with Treasury officers to discuss this matter further.

The Treasurer referred the IFA to the Minister for Environment. The IFA wrote again, pointing out that because such a thinning program spanned several Ministries and Departments, it could only be co-ordinated by either the Premier or the Treasurer. Also that funding was the key, that the overall benefits would exceed costs and that no individual Department should bear this financial burden. The Treasurer did not reply to this letter or to a subsequent letter. The Liberal Party has clearly not forgotten the backlash led by "Western suburbs doctors and lawyers" that erupted after the Regional Forest Agreement was signed some years ago, which resulted in the election of the Gallop Labor government. Sound forest management is clearly an expendable pawn in the Political process.

Reservation or Management

There is a naïve view in the Conservation Commission, the Conservation Council, many Academics and some in EPA and DPaW, that Tenure is much more important than management. If an area is designated as a National or Regional Park, or a stream zone or a fauna habitat zone then it will "ipso facto" be sustainable. No matter that streams are drying, that water tables are falling, that some trees are dying from drought and that forests are defoliated periodically by wildfire. These events have been described to me by a key member of the Conservation Council as "natural", and are

thereby acceptable, whereas any adaptive intervention such as thinning or fuel reduction burning is "unnatural" and must be vigorously opposed.

There are about 2.5 million hectares of forest in the south-west of WA. From 1919 to 1985 these were managed by professional foresters in the Forests Department. From 1985 to 2006 a new Department (Conservation and Land Management) was responsible but, until the late 1990's, most of its senior staff had trained as foresters. Since 2006 there have been two Departments responsible for forest management; Conservation and Environment (to 2013) and now Parks and Wildlife. With each change the role of foresters has diminished. A low point was reached when, with some 50 professional foresters to choose from, the position of Director of Forests was filled by a journalist.

Over half of the forest area in the south-west is already reserved (1.5 M ha), is unavailable for logging and is managed conservatively. This is an extremely large "control area" yet there is inadequate monitoring of the environmental condition of these forests and of trends.

Adaptive management

The winter of 2010 was the lowest rainfall on record. In the next summer, crown scorch, deaths of some trees and mid-storey species were obvious throughout the western, high-rainfall forest areas, as well as rehabilitated mine pits (Davison et al 2011). An aerial survey of the Wungong catchment estimated that between 5 and 8 percent of the forest was affected.

The major changes we have already seen to streams, water tables and tree health should spur forest managers to establish and to monitor several large "adaptive management" trials that test a range silviculture and fire management regimes, including "do nothing" controls. An area of 50,000 ha that was actively managed according to sound forestry practices would constitute only five percent of the current area of State forest. Unless we do this soon, we will not have suitable baselines for comparison in the future.

However, any thinning for "environmental enhancement" needs to be funded from an income-producing activity: either timber or water products. These regrowth forests will only produce lower-quality end products at the first thinning and there are also unnecessary Policy restrictions on the export of logs from native forest and on their use as bio-fuels. However the water benefits can be substantial. An extra 50mm of flow equates to 500 Kl/ha which may be sustained for 4-6 years after each thinning. Admittedly there are costs incurred by the Corporation for water treatment (chloride and fluoride) and for distribution (by gravity from forested catchments), but the cost/Kl would be small. The cost of desalinated water is about $3/Kl.

Despite the lip service given to adaptive management there seems little interest in actually doing it, as evidenced by the Wungong trial. Most of the forest is held in public ownership which restricts innovation and the range of management options that could occur were more forested lands held as private property. While foresters argue in favour of further silvicultural intervention and adaptive management trials on a larger scale, despite all the evidence, there is also strong opposition in sectors of the community to any intervention and there is also continuing pressure on Government to "protect" the balance of State forests by reservation. Are they concerned that trials will show that "do nothing " is not the best environmental option?

The northern jarrah forest is facing a serious and five pronged attack: Firstly, there are the documented and substantial effects on biodiversity resulting from a marked reduction in rainfall; Secondly, these are aggravated by the changes in forest condition caused by bauxite mining, a lack of thinning in regrowth stands and a reduction in prescribed burning; Thirdly, there is the "greening" of the senior bureaucracy and of Academia; Fourthly, there is the inertia in government processes that slow down any proposal for action and Fifthly, there are the Politicians who continue to use forest reservation as a sop to the electorate.

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