

# Wungong Whispers

## Draft for a silviculture guideline

The Wungong project team, with assistance from Department of Environment and Conservation staff, have been working hard to finalise a draft Silviculture guideline and a supporting document to progress the continuation of the Wungong Catchment Trial.

Since the original development and implementation of the Trial in 2005 the south west region of Western Australia has experienced poor rainfall – most notably during 2006 and 2010.

This trend supports estimates of rainfall reductions to 2030 due to climate change published in the CSIRO's Technical Report No 7, 2007.

"Groundwater levels in the Catchment have, in places, dropped by about one to two metres, and the 2010 streamflow data show that many streams that once flowed all-year are now dry for several months," explained Michael Loh, Project Manager.

Under this declining rainfall regime, the original proposal to thin to 15 m<sup>2</sup>/ha will no longer recover these depressed groundwater levels high enough to re-establish sufficient streamflows in the Wungong Catchment or to make the work viable.

The aim of this sub-catchment trial, based on actual rainfall patterns from the last 10 years, is to restore soil moisture, groundwater levels and

streamflow duration to that which prevailed in the 1990s.

A more intense selective thinning, to 8-10 m<sup>2</sup>/ha, over an area of about 15 per cent of the original proposal has been selected for the continuation of the trial.

Amanda Reed, senior engineer for the Water Corporation said that catchment models show a potential recovery of streamflow volumes to more than 70 per cent of the flows recorded between 1990 and 2000.

Mr Loh said that research and monitoring projects will continue, however the next phase of the project will focus on thinning in TA4.

"Two new gauging stations have been installed in the sub-catchment to monitor this new work," said Mr Loh. "Groundwater levels will be inferred through analysis of the streamflow recorded from these and the existing Waterfall Gully gauging station," he added.

Areas not to be treated in TA4 will be confirmed with DEC.

The trial thinning proposed for TA4 will enhance soil moisture, watertables, streamflow and tree health. The additional water in the ecosystem is likely to benefit the survival, crown health and seed production of jarrah and marri, as well as maintenance of understorey flora and its associated wildlife.

An article discussing the observed hydrological changes and their expected impact on biodiversity in the northern jarrah forest appears in the latest LANDSCOPE magazine Vol 27 no 2 pp 47-51.



Relevant ecological and hydrological data has been included in the supporting document which is expected to be finalised with the draft Silviculture guideline by May 2012.

When completed the draft Silviculture guideline and the supporting document will be made available on the Water Corporation's website and if requested, in hardcopy.

Stakeholders and the wider community will be invited to comment on the draft Silviculture guideline during the public consultation process.

Following an advertised 6-week period, all submissions will be considered and formally addressed. Once finalised, the draft Silviculture guideline will be approved by the Department of Environment and Conservation after seeking advice from the Conservation Commission.

Further information can be obtained by emailing [wungong@watercorporation.com.au](mailto:wungong@watercorporation.com.au) or by contacting the Project Manager, Mr Michael Loh on 9420 3728.

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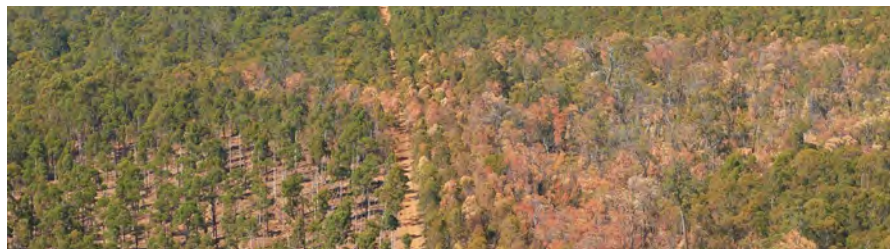
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# Case study: bio physical environment

There are few examples of adaptation to climate change in the bio-physical environment. This is primarily because of the complexities of the bio-physical environment and the difficulty in quantifying potential or observed impacts attributable to climate change. Adaptation measures for the bio-physical environment will heavily rely on building resilience in catchments and ecosystems.

An ambitious example of building resilience into natural ecosystems is the forest thinning trial in the Wungong catchment to the south east of Perth. The Water Corporation's Wungong Catchment Trial is a \$20-million project that began in 2005 and will span 12 years.

The objective of the trial is to assess whether carefully planned forest thinning can be used to 'bio-engineer' the catchment back to an approximation of old growth form to increase streamflows and hence water yields to the Wungong Reservoir, restore formerly perennial streams and aquatic habitats while restoring or maintaining natural biodiversity. The Water Corporation can no longer depend on its Darling Range reservoirs for water supply because of their declining reliability in response to the severe drying trend in south-western Australia.



Thinned (left) and unthinned forest (right) in the Wungong catchment, 15 April 2011, showing large areas of stressed and dying trees in the unthinned forest

Perth's forested catchments consist mainly of regrowth jarrah and marri eucalyptus trees. The Wungong Catchment is degraded, having been altered by past forestry practices, the introduction of *Phytophthora dieback* disease (a water mould) and bauxite mining. Jarrah (*Eucalyptus marginata*) is unusual, as it sprouts multiple stems from the stump when harvested. This is called 'coppicing', and has two serious consequences – one is the failure to replace the harvested tree with another valuable straight, single stem and the other is that the total leaf area of coppiced jarrah forest is about double that of 'old growth' forest. The increased leaf area means that the forest uses much more water than in its natural state, see graph below.

Old-growth transpiration accounted for 20% of the average annual rainfall for the experimental site, in contrast to 40% for regrowth. In April 2011, after a long hot summer, the consequences of the unmanaged regrowth on the forest's water balance became obvious.

Drought deaths in approximately 5-10% of the forest were seen, with many other parts yellowing and stressed. Stressed and dying vegetation was even observed in the healthiest part of the catchment,

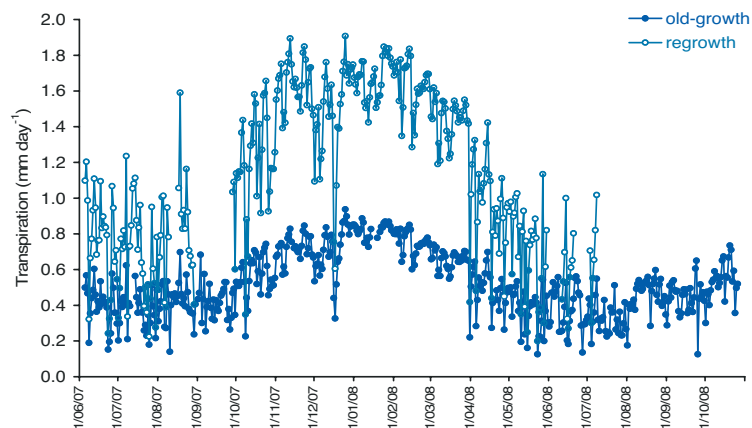
around the reservoir. Trees are known to lag in their response to water shortages, which suggests the situation may be worse than it seems. Trees in thinned areas were healthier than those in unthinned areas, indicating more favourable groundwater and soil moisture levels in the thinned patches – see the photograph above showing large areas of stressed and dying trees in the unthinned forest.

Dr George Matusick from Murdoch University has estimated that 16,000 ha of trees in the northern jarrah forest have died. This is about 1.7% of the total forest area, with an additional 5% showing signs of severe stress. These figures are staggering given the forest experiences an estimated 'normal' annual mortality rate of about 0.05%. The trees were found to die in patches which ranged from 0.3 ha to over 50 ha in size. Following the 2011 winter only 35% of dead stems showed signs of re-sprouting.

Rainfall in the south west of Western Australia has declined by about 12-15% since the mid-1970s; this has resulted in reductions in groundwater recharge and streamflows in the order of 70%. The Wungong study seems to show that the water balance of the jarrah forest is now at the limit – further drying will result in forest tree deaths on a massive scale.

Dr Richie Silberstein of CSIRO estimates that trees are now intercepting or transpiring about 98% of rainfall in most years. So the community has a choice – either to proceed with controlled forest thinning on a large scale, or to risk the uncontrolled collapse of more of the jarrah forest.

*Dr Robert Humphries, Manager Sustainability, Water Corporation Excerpt from Occasional Paper 27, Climate Change Adaptation and the Australian Urban Water Industry, March 2012, Water Services Association of Australia.*



Daily overstorey transpiration over time, calculated from sap velocity and sapwood area at the Dwellingup old-growth and regrowth stands. Missing data indicate periods of power supply or instrument failures (CSIRO).

# Cockatoo characters

Between 2009 and 2011 the Water Corporation funded research by Ron Johnstone, Curator of Ornithology at the Western Australian Museum on cockatoos within the Wungong Catchment.

Three species of cockatoo, Baudin's, Carnaby's and the Forest Red-tailed Black Cockatoo are found in the Catchment (Johnstone and Kirkby 2009). All three species use the catchment and surrounding areas to feed (primarily on marri and jarrah, but also on several understorey species), to nest and roost.

The main aim of this project is to document areas of critical habitat (breeding, roosting and feeding sites) within the catchment. In addition the threatening processes to cockatoos of permanent clearing of habitat, loss of old nest trees (through windblow and fire), competition for nest sites (from feral bees and other parrots) shooting, poaching eggs and young, changes in fires regimes, climate change and vehicles strikes are monitored.

## Ongoing care

All three species require access to permanent water, are classified as endangered and are protected by State and Federal legislation.

The Wungong catchment is therefore an important area for cockatoos and for this research on the effects of



climate change and forest management on cockatoos.

These species have survived in a catchment that has been logged three to four times since 1900 (though some patches of older trees were left on steep slopes and ridges), that has been prescribed burnt regularly since the 1960s, that has been extensively affected by Phytophthora dieback disease (about 60 per cent) and that has been extensively mined for bauxite (about 30 per cent).

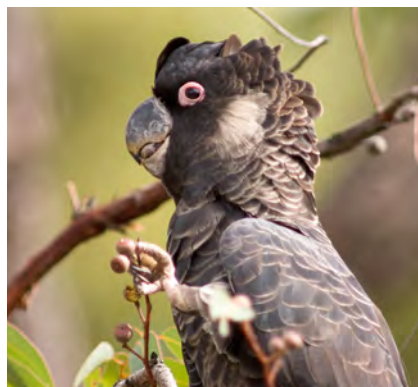
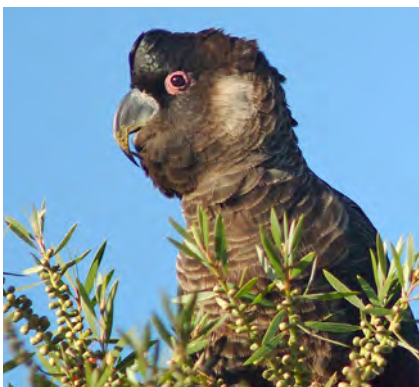
Flowering and seeding of jarrah and marri is intermittent and dependent on rainfall, with some years much better than others. Also, the larger trees with big, healthy crowns produce most of the available seed (Abbott and Loneragan 1986). After thinning, the trees are less water-stressed and produce large healthy crowns (Spec Terra data for Water Corporation). In summer 2011, many

drought deaths were observed in unthinned forest within Wungong but none in areas that had been thinned in 2008 (Batini pers. com).

The proposal to thin parts of Treatment Area 4 (TA4) will not target known nest sites (mainly veteran marri trees) or roosting areas (often large trees near streams) as determined after survey by Museum staff. The silvicultural prescription selects the bigger trees for retention; habitat and future habitat trees will also be retained.

The trial thinning proposed for TA4 will enhance soil moisture, water tables, streamflow and tree health and is likely to benefit the survival, crown health and seed production by jarrah and marri.

The proposed silvicultural activity may well increase the availability of food and access to water in pools for resident cockatoos.



From left to right, a male baudin's, a carnaby and the red tailed black cockatoo.

## Project team update

### Welcome to our Community Engagement Officer

Kylie MacPherson has joined the Wungong Team as Community Engagement Officer, replacing Rima Itani who has taken up a new role in the corporation. Kylie has recently returned from a working holiday in Canada and Croatia. She is highly qualified in communications planning and is keen to undertake the stakeholder and community engagement activities for the project.

### Farewell to our Project Director, Chris Botica

Sadly we farewelled Project Director, Chris Botica in January. Chris has decided to spread his wings and we wish him all the best in his new endeavours. The Wungong Team is indebted to his wonderful willingness to listen to our concerns and those of the wider community. His knack of empathising with others together with his strong interpersonal skills of good management and direction will be missed.

## In the spotlight – Landscape article

Frank Batini, our Project Consultant's article titled "Dry times in the northern jarrah forest" published in the Summer 2011-12 edition of "Landscape" is a timely update and well worth reading. The article discusses the work and research that is being done in the Wungong Catchment to save biodiversity and regenerate groundwater in the forest.

Limited copies are available, if you would like a copy of the article please email [wungong@watercorporation.com.au](mailto:wungong@watercorporation.com.au)

Students from Murdoch University visit the Wungong Catchment.



## Cobiac catchment trial summary

The Cobiac experimental catchment is 370 ha and 220 ha were thinned in summer-autumn 2008, reducing the stem numbers by two-thirds and the basal area by half. Monitoring data show that, since thinning:

- The shallow and deep water tables have risen by some metres
- The stream-flows in 2009 and 2011 increased significantly (2010 was a drought year)
- The crown health of the retained trees has markedly improved, irrespective of the Phytophthora dieback status, and
- Tree deaths and crown deterioration occurred in the un-thinned control.

A detailed report is being compiled and will be placed on the website when completed.

## Calendar

### February 2012

**2 February** – Site visit with staff from Water Corporation and Department of Water.

**6 February** – Site visit with staff from the Murray Darling Authority (Canberra).

**15 February** – Site visit with staff from La Trobe University, Victoria and Department of Rural Development, India.

### March 2012

**8 March** – Trial update presentation to the Parks of the Darling Range Community Advisory Committee meeting.

**19 March** – Site visit with Murdoch University Land Management students.

### April 2012

**13 April** – Site visit with Curtin University Conservation Biology and Sustainability students.

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