Project update

STATUS

- Interagency partnerships established
- Web site available
- Memorandum of Understanding (MOU)
- Technical Reference Group established
- Research and Monitoring Program coordinated (20 projects)
- Two research forums held
- Three draft Silviculture Prescriptions are available on the website
- Many community and stakeholder presentations have been given
- Audit process developed – Conservation Commission
- Demonstration sites established and tours held
- Project Implementation Plan prepared
- Risk profile documented
- On going communications provided – 6 newsletters distributed

OPERATIONS

- Dieback interpretation 40% complete
- Tree marking 17.5% complete
- Thinning 15% complete
- Prescribed burns done in Area 1

CHALLENGES

- Reliance on Regulators
- Meeting original estimate of increased water yields
- Dependent on Interagencies
- Land Tenure (Fauna Habitat Zone, Stream Reserve and Reservoir Protection Zone)
- Stakeholder understanding and acceptance

FUTURE

- Stream flow decline could threaten biodiversity
- CSIRO rainfall predictions mean...

EVERY DROP WILL COUNT!

www.watercorporation.com.au/wungong

The Working Group study the maps and plan their field trip to assess progress of the recent work.

Catchment Trial Wungong

Project Implementation Management Plan

Publication of this document is in the final stages and will be available on the web by the end of the month.

Please visit www.watercorporation.com.au/wungong If you require a hard copy email wungong@watercorporation.com.au or contact the communications coordinator **Marg Wilke on 9420 3662.**

Coming Events Calendar

Working Group meetings	Fortnightly
Media Tour (cadet journalist briefing)	30 April
Technical Reference Group meeting	21 May
Demonstration Tours	resume Aug/Sept
Annual Research Forum	September (date TBA)

Contact details

This newsletter is produced by the Water Corporation and is also available electronically at **www.watercorporation.com.au/wungong**. To subscribe or unsubscribe to this newsletter, please contact Margaret Wilke, Communications Officer on **9420 3662** or email **margaret.wilke@watercorporation.com.au**. For technical enquiries, please contact Bishnu Devkota on **9420 2042** or email **bishnu.devkota@watercorporation.com.au**.

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Reviewing the project

Dr Don McFarlane Portfolio Coordinator, CSIRO recently addressed the Wungong Working Group's April meeting in Jarrahdale.

Dr McFarlane, who is a member of the Wungong Technical Reference Group, is reviewing the Trial's research and monitoring projects to ensure impacts from the Trial are being effectively captured.

Many of the projects involve collaboration between scientists from several government agencies, Western Australian universities and large organisations. The main aim of the projects is to establish information that can assist in understanding the interaction between Land, Water and Biodiversity during and after catchment management.

Don recommended strengthening the data on thinned versus unthinned forest in some of the study areas.

"This included modelling responses, overall cost-effectiveness and the predicted impact of Climate Change that is altering the emphasis from water quality (turbidity) to quantity (stream runoff)," said Chris Botica, Project Manager.

Following the meeting, the team took advantage of the perfect weather for a half-day field trip in the Catchment. Forestry consultant Frank Batini, Hydrologist Keith Barrett, DEC Operations coordinator Richard Boykett provided insight into operations. Guest working group attendee and Environmental Scientist, Rob Kneebone who recently joined the Water Corporation's Kelmscott operations, was also made welcome.

The Trial spans 12 years with research and monitoring information being continually adapted within the project's definition.

"Further work on reporting mechanisms and KPIs will be done as a result of Dr McFarlane's work," added Chris.

Results will be made available on conclusion through this publication and at www.watercorporation.com.au/wungong

Dr Don McFarlane addresses the Wungong Working Group at Department of Environment and Conservation's Jarradale office.

Towards sustainable streams

Three articles in this issue highlight information on issues regarding stream flows in our catchment.

INSIDE

SOIL DRYNESS INDEX (SDI)
– what's happening on the forest floor

Lower winter rainfall in our forested catchments results in a reduction in stream flow, temporary drying of perennial streams, changes in the composition of aquatic invertebrates and falling water tables. **"Can similar changes be observed in the upper soil and surface fuels?"**

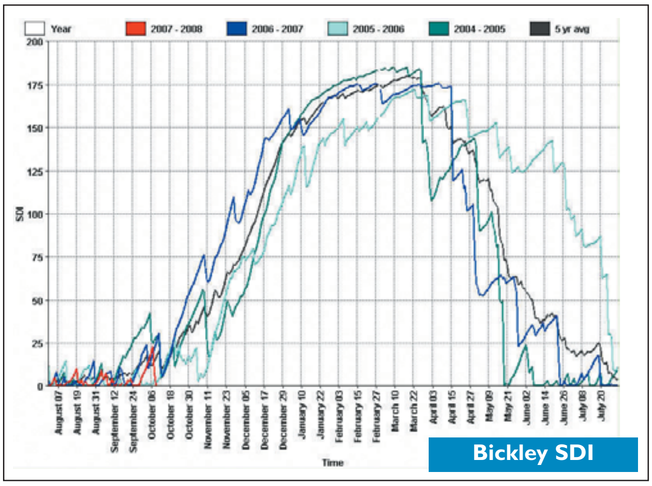
The Soil Dryness Index is a model used in Western Australia for predicting the seasonal drying of soils and fuels. The SDI is a number that represents the net effect of rainfall and evapotranspiration in producing cumulative drying in deep forest litter, heavy fuels, living vegetation, and the upper soil layers. It may be a useful index for catchment managers as well as foresters.

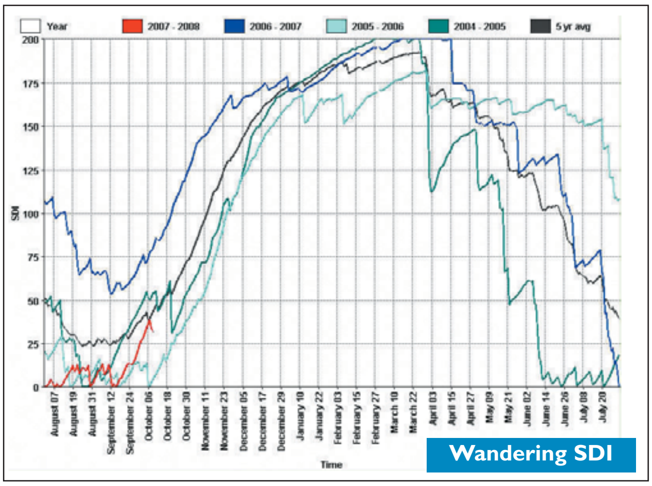
The dryness of fuels is recognized as one of the most important factors affecting forest fire behaviour. Fire managers need to be aware of the SDI in order to plan adequately for fire management operations such as prescribed burning and wildfire suppression.

Prolonged drought results in an increase in the quantity of fuel that is available for burning, because at high SDI levels, a high proportion of dead logs ignite, as do dead branches in the tree crowns. Severe bushfires, such as the recent "Hills wildfire" in 2005, have almost always occurred during periods of high SDI.

Most prescribed burning in WA forests takes place in spring when logs, soils, vegetation and deep forest litter are still moist. SDI values are a useful guide to the period over which successful and safe prescribed burns can be expected and is a useful measure of difficulties with mop-up and the likelihood of re-ignition.

Graphed SDI values can be useful for comparing soil dryness and seasonal fire severity from year to year and from place to place. The graph shows the SDI for Bickley (higher rainfall) and for Wandering (lower rainfall) for the three years 04/05 to 06/07. The upper levels reached are similar but the dry autumn and winter in 05/06 is distinctive. In most years the SDI reaches zero in May/June after the opening winter rains, but in 05/06 this did not happen until August for Bickley and not at all for Wandering !! This also meant that the 06/07 fire season started much earlier with the SDI climbing rapidly at each of these sites.





The SDI appears to be a very useful indicator of the dryness of catchment soils and the stresses placed on the vegetation. Consideration of SDI values should assist hydrologists with the interpretation of water table and flow data.

Acknowledgement: DEC Fire Management staff who provided the graphs and some text

Recovery of water tables after thinning

In the previous issue of Wungong Whispers, we discussed the large falls in the water tables below jarrah forest on water supply catchments that have been recorded over the past 30 years (Vol 5 pp 2). The drop in water tables makes it much more difficult for rainfall to reach the stream through the interflow processes. This results in a major reduction in streamflow with all its associated negative ecological consequences.

What is important is whether and how this trend can be reversed

There are data available for the period 1985 to 1993 for a range of thinning studies that were carried out near Dwellingup in WA. These results were published by Water and Rivers Commission (WRT 16, 1997) and key findings are summarised in the following paragraphs.

Data show that water tables in all three experimental catchments rose after the thinning as a result of a decrease in interception and transpiration by trees, and then stabilised after a few years.

Water tables rose at an average rate of 0.6m to 1.2 m per year over a period of 5-6 years. A greater change was recorded in boreholes located on slopes (3.9 to 7.3 m rise) than in valleys (2.3 to 6 m rise). Water tables in valleys showed a seasonal range of between 1.5 and 2 m and on slopes of between 2.5 and 4 m. Valley bores responded more quickly to rainfall. Local soil and geomorphic properties also influenced the observed changes in water table.

These data suggest that the falls in water tables recorded in the Cobiac experimental catchment (1-1.5 m in valleys and 3-5 m on slopes) could be reversed within 3-4 years by thinning the surrounding forest.

Thinning benefits – the remaining vegetation, soil and stream environments

– Frank Batini

While some have criticised the Wungong thinning trial as being driven solely by our human needs for water, thinning of densely overstocked jarrah regrowth stands will also benefit soil moisture, water tables and streamflow.

These changes in their turn will benefit the growth and health of the remaining vegetation, as well as the terrestrial and aquatic fauna. What is left over will then flow into our dams.

To demonstrate this, in the table below, an annual rainfall of 1100mm has been partitioned between an unthinned and a thinned stand of jarrah regrowth.

An extra yield of up to 200 mm into streams and the aquatic environment is equivalent to 200 litres for each square metre of forest or 2 million litres for each hectare that is thinned. The estimated difference in transpiration between thinned and unthinned stands of 150 to 320mm is equivalent to 150-320 litres for each square metre or 1.5-3.2 million litres for each hectare of forest.

Differences in transpiration values of up to 320 mm were reported by CSIRO scientists from comparisons between unthinned and very heavily thinned stands (from 44 to 7 square metres per hectare.) Interception and transpiration are key players in our Mediterranean environment and account for between 85 and 95 percent of all the rain that falls in forest areas.

Water is a key driver for all ecosystem processes.

The only way to provide more water to a forested environment is to reduce the loss by transpiration and evaporation. This can only be done by reducing the competition between the trees. This can be accomplished by thinning, by control of coppice and by regular prescribed burning.

In the unthinned scenario, competition is high, growth rates are poorer, water tables are falling and streams are drying up.

In the thinned scenario, the crowns expand, growth is maintained for longer, water tables rise and streamflow increases. In the period 2008-2012, the water yield into streams may be lower, especially in the early years following thinning, as the water tables have fallen substantially and will need time to recover.

These comparisons are not static. In years of drought the differences between treatments will be less and in years of above average rainfall they will be greater. Also, as the remaining tree crowns expand, the differences in water use between thinned and unthinned will gradually reduce. When the trees begin again to compete for the available water, another thinning will be necessary.

11 Little Raindrops

...a primer in forest hydrology

Eleven little raindrops fell from the sky,
one fell on a leaf and so became dry.

Ten little raindrops having so much fun,
nine were transpired by trees so that left only one.

One little raindrop all in a dream,
half was evaporated and half fell in a stream.

Half a little raindrop feeling all alone.

Flowed into a dam, met friends, but then was gone.

	Unthinned	Thinned		Comments
		Heavy	Lighter	
No of trees	560	60	110	Actual data, demonstration plot
Basal Area	57	9	17	Actual data, demonstration plot
Leaf cover %	75	18	30	Actual data, demonstration plot
Rainfall	1100mm	1100	1100	All in the same, higher rainfall zone
Interception	110	50	70	An estimate. Fewer leaves. More water to the soil and available to plants
Transpiration	900mm	580	750	Less total water use but more water is available for use by plants that are left.
Soil Moisture	No change	No change		Upper soil profiles dry at end of summer
Soil evaporation	60mm	120	100	An estimate. Greater evaporation from bare soils
Water tables	- 40mm	+ 120	+70	Actual data. Water tables fall in unthinned and rise in thinned
Water to stream	30mm	230	110	Actual data from thinning trials in 1990's

Water balance - Trend of falling water tables is reversed, water is stored in soil profile, streams flow for longer.