

# Quantifying canopy nectar and the impact of logging

Brad Law and Mark Chidel  
Science and Research,  
NSW Department of Primary Industries

## Forest Resources

- Soil nutrients
- Foliage nutrients
- Litterfall
- Decorticating bark
- Hollows
- Coarse-woody debris
- Flowering phenology
- Vegetation structure
- Floristics
- Invertebrates (litter, surface, flying)
- Vertebrates

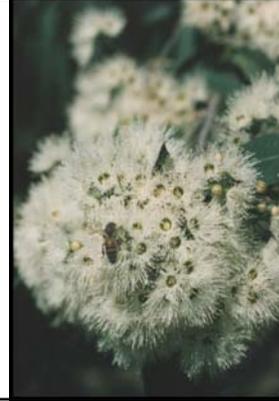




## Nectarivores of South-eastern Australia



- 7 species of marsupials
- 5 species of bats
- 32 species of birds
- insects ??



## European Honeybees

- Eucalypts provide nectar for about 70 % of the honey crop in NSW;
- Commercial hives are now largely excluded from National Parks;
- Greater reliance by beekeepers on State Forest tenure;
- > 1,000,000 kg of honey produced from spotted gum in 1994.



Research :

## The Effects of Logging on Nectar Production in Eucalypts

- Spotted Gum
- Grey Ironbark



Important to:

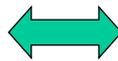
- beekeepers
- timber industry
- nectar-feeders

Study location – south coast NSW

## Experimental Design

For each species, measure nectar in:

- Small trees
- Large trees



- Young regrowth forest (5-10 years old)
- Old regrowth forest (15-30 years old)
- Mature forest (> 50 years old)

## Study aims

- Test predictions that flowers on large trees produce more nectar than those on small trees
- Does nectar production change with tree age (i.e. as the tree or forest ages)?
- How much nectar is produced in trees retained after a forest is logged?
- What is the impact of logging at a compartment scale?



## Variability in nectar production between years

- Repeat nectar measurements over at least 2 years: 2003 and 2005
- benchmark our measurements each year against honey productivity recorded by local beekeepers





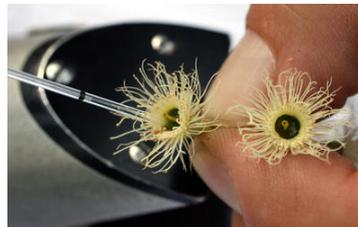
## Methods - measures of nectar

- *Morning and Afternoon Standing Crops* - estimates nectar available in open flowers to diurnal floral visitors.
- *Nightly Nectar Production* - estimates nectar produced in flowers bagged over-night and measured in the morning.



## Methods - Measuring nectar per flower

- Calibrated capillary tube used to measure nectar volume ( $\mu\text{L}$ ) per flower
- Refractometer used to measure sugar concentration (%) in sample
- $\text{mg sugar per flower} = \text{volume} \times \text{sugar concentration}$
- 20 flowers measured per tree



## Scaling up measures of nectar

*Tree level:* mean sugar per flower x number of flowers per tree

- count flowers in a section of canopy and multiplied by number of canopy sections in tree

*Site or stand level :* mean sugar per tree size class (small, medium, large) x numbers of trees flowering in that size class

- count flowering trees and allocate to size class in a 200 m x 10 m transect at each site



## Spotted Gum

Nectar measured at –

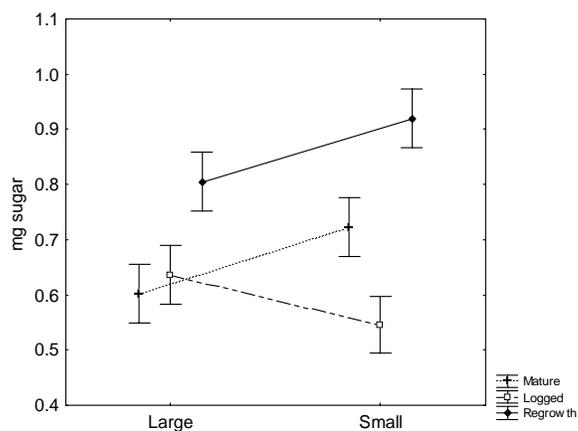
- 9 sites
- 36 small trees and 36 large trees
- 1,440 bagged flowers
- 720 unbagged flowers (am and pm)



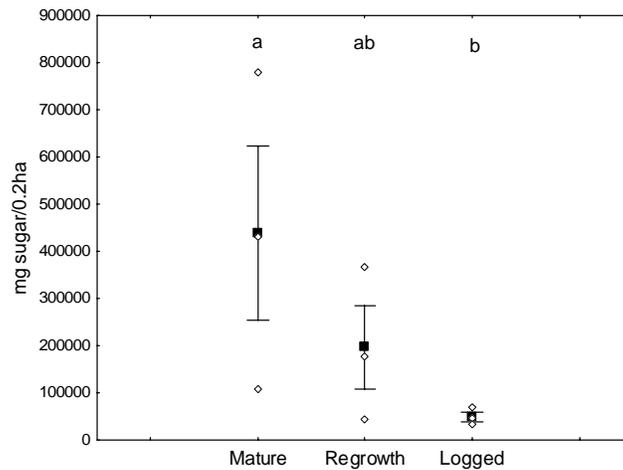
## Effect of Logging on Sugar at the Individual Flower Level

Tree size had little effect

Regrowth produced more nectar per flower, especially in small trees



## Effect of Logging on Nectar at the Stand Level



## Effect of Logging on Nectar at the Compartment Level (200-400 ha)

Within logging zone prescriptions:

- riparian buffers,
- high conservation old growth forest,
- over-ridge connection corridors,
- threatened species habitat,
- habitat trees and recruits.



Results in 39 % of the gross compartment area being informally reserved

## Effect of Logging on Nectar at the Compartment Level

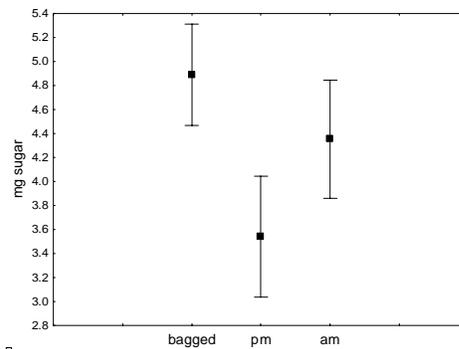
Assuming 61 % of a compartment's area is logged, then a compartment of mature forest would produce –

- 2.2 times the nectar as a compartment of recently logged forest with existing prescriptions
- 1.5 times the nectar as a compartment of 15-30 year old regrowth forest

## Surplus Nectar in 2005



- Open flowers contained less nectar than bagged flowers,
- on average, more than 70-90 % of nectar was left unconsumed



Nectar was not limiting, even in recently logged forest

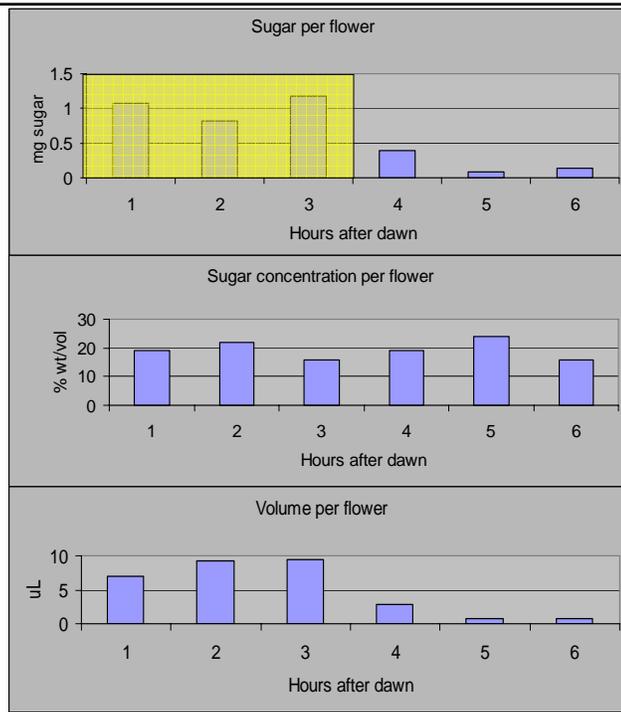
## 2003 – Poor Flowering

- Bushfires in 2002 and 2003
- Drought in latter half of 2002/ early 2003

Result - limited and patchy budding/flowering

- beekeepers were unable to maintain bees on flowers. “Worst spotted gum flowering in 50 years”

Spotted  
Gum -  
Standing  
crops,  
n=39



## How productive is Spotted Gum Forest?

Forest Type	kg sugar/ha/night	Source
Spotted Mature Forest	3	<b>This study</b>
Spotted Gum Regrowth forest	1	<b>This study</b>
Spotted Gum Recently logged forest	0.3	<b>This study</b>
Sydney Sclerophyll Forest	0.05	<b>Pyke (1980)</b>
Sydney Heath	0.2	<b>Armstrong (1991)</b>

## Insights from Research

- Tree size is not a major influence on nectar produced by an individual flower.
- But large trees have many more flowers than small trees and flower more reliably.

## Insights (contin.)

- At the stand level, logging reduces nectar in old forest by a factor of 10 times;
- Retention of old forest reduces the impact of logging in a compartment – factor of 2 times for recently logged forest;

## Insights (contin.)

- In a prolific flowering year (2005) the spotted gum nectar resource is vast
  - surplus nectar is produced and logging has no impact in those years;
- Nectar is limiting in poor flowering years - management should focus on reducing impacts on nectar in those years.

# Acknowledgements



**Australian Government**  
**Rural Industries Research and  
Development Corporation**



**NSW DEPARTMENT OF  
PRIMARY INDUSTRIES**



- South coast crane drivers
- South coast beekeepers
- Many brave volunteers