



## SCIENTIFIC EXCHANGE

### Final Report

(Due within 3 months of project completion)

#### *Part 1 - Summary Details*

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Cotton Catchment Communities CRC Project Number: **5.10.10.42**

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**Project Title:** Scientific Exchange Mitchell Burns

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**Project Commencement Date:** 29 June 2009

**Project Completion Date:** 3 November 2009

**Research Program:** Adoption

#### *Part 2 – Contact Details*

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**Administrator:** Ms Luda Kuchieva

**Organisation:** The University of Sydney

**Postal Address:**

**Ph:** 8627 8106

**E-mail:** luda.kuchieva@usyd.edu.au

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**Principal Researcher:** Mitchell Burns

**Organisation:** The University of Sydney

**Postal Address:** 254 West Botany St, Rockdale NSW 2216

**Ph:** 0403 932 912

**E-mail:** m.burns@usyd.edu.au

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**Supervisor:** Professor Ivan Kennedy

**Organisation:** The University of Sydney

**Postal Address:** Building A03 Ross Street, The University of Sydney NSW 2006

**Ph:** 9351 3546

**E-mail:** i.kennedy@usyd.edu.au

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**Other Staff & Collaborators – Please list**

Signature of Research Provider Representative: \_\_\_\_\_

### ***Part 3 - Travel Report***

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The points below are to be used as a guideline when completing your final report.

#### **1. What were the:**

##### **a) Major findings, outcomes and highlights.**

Major highlights include:

- Collaborating with world leaders in ecological risk assessment
  - i. Carrying out herbicide pulse exposure experiment at the University of Guelph, Canada
  - ii. Learned how to run exposure models used by regulatory agencies in the USA and Europe, and those developed by private organisations (Waterborne Environmental Inc. and DuPont)
- Presenting at the American Chemical Society conference in Washington, DC, USA

Major outcomes:

- Pulse exposure toxicity experiment using two species of Duckweed (*Lemna minor* and *L. gibba*) were found to potentially recover.
- Gained experience in how to run exposure models, using environmental simulators developed by DuPont and Waterborne Environmental inc. and other regulatory transport models used in the USA and European Union.
- Gave a presentation at the American Chemical Society conference in Washington, DC, USA about catchment-scale ecological risk assessment in Australia, incorporating my probabilistic risk work on diuron in the Gwydir River catchment, and spatial work produced by DuPont and Waterborne Environmental Inc.
- An invited paper on this collaborative work will be presented at the 12<sup>th</sup> IUPAC International Congress of Pesticide in July 2010, Melbourne

#### **2. Detail the persons and institutions visited, giving full title, position details, location, duration of visit and purpose of visit to these people/places.**

Name: Dr. Keith R. Solomon

Position: Professor in Toxicology

Location: Centre for Toxicology and School of Environmental Sciences  
University of Guelph, 2120 Bovey Building Gordon Street, Guelph, ON, Canada

Duration: 3 months

Purpose: Carry out laboratory pulse exposure toxicity experiment on two species of duckweed (*Lemna minor* and *L. gibba*)

Name: Dr. Aldos C Barefoot

Position: Environmental safety assessment Research Fellow

Location: DuPont Crop Protection, Steine Haskell Research Centre, Newark, DE, USA

Duration: 3 days

Purpose: Training in regulatory exposure models that are used by DuPont and the United States Environmental Protection Agency (USEPA)

Name: Dr. Gerco Hoogeweg

Position: Soil scientist/GIS specialist

Location: Waterborne Environmental inc. 897b Harrison st, S.E. Leesburg, VA, USA

Duration: 9 days

Purpose: Training in spatial exposure modelling

**3. a) Are there any potential areas worth following up as a result of the travel?**

A number of areas have been identified are worth following up. These include availability of spatial models developed by DuPont and Waterborne Environmental Inc. for my use in modelling the Gwydir River catchment; and potential for publication of pulse exposure work at the University of Guelph, Canada.

Waterborne environmental inc. has agreed to provide me with models that they have developed and used in catchment-scale spatial exposure modelling of the herbicide Diuron. I will be following up on this arrangement with Dr Gerco Hoogeweg in the New Year (2010) when I plan to begin work on spatial exposure modelling.

The pulse exposure toxicity experiment produced some very interesting results. Preliminary assessment of the data suggests that it may be publishable. It is expected that this article will be co-authored by fellows at the University of Guelph (Professor Keith Solomon) and University of Manitoba (Professor Mark Hanson).

**b) Any relevance or possible impact on the Australian Cotton Industry?**

Ecological risk assessment is likely to play a vital role in the management of agrochemicals in agricultural catchments of Australia. Toxicity data is often used to identify risk in the environment. The significance of the toxicity experiment that I conducted at the University of Guelph highlights the failure of standardised toxicity experiments accounting for pulse exposures likely to be observed in the environment, and the potential for organisms to recover following exposure substantiates this notion. The implications that this poses

to the cotton industry is quite large, considering the level of importance that toxicity data plays in identifying risk.

Although no spatial modelling was carried out for the Gwydir River catchment, the potential outputs will have far reaching implications for the cotton industry, pending the results produced from the modelling. The maps to be generated will enable identification of potential areas in a catchment that contribute significantly to chemical loading in catchments.

**4. How do you intend to share the knowledge you have gained with other people in the cotton industry?**

The outputs gained from the toxicity experiment and future modelling will be communicated primarily in the form of scientific publications and as chapters in my thesis. When the modelling has been finalised it may be best to communicate maps in the form of presentations and possibly as a workshop.

**5. Executive summary. Provide a one paragraph summary of the scientific exchange, suitable for posting on the Cotton CRC web site.**

A 4 month scientific exchange to the University of Guelph in Canada; and DuPont and Waterborne Environmental Inc. in the USA enabled work with world leaders in the area of ecological risk assessment of agrochemicals. Under the supervision of world leading toxicologists, Prof. Keith Solomon and Prof. Mark Hanson, a toxicity experiment was conducted that investigated the potential recovery of two species of Duckweed (*Lemna gibba* and *L. minor*) following exposure to the herbicide Diuron at the University of Guelph, Canada. When the macrophytes were exposed to a range of concentrations, Diuron was found to reduce the population growth rate (widely considered a significant toxicology endpoint for aquatic macrophytes and algae), which is not new, however, following exposure the macrophytes were found to recover to a point that is not significantly different to the population growth rate of the control cultures. The results of this experiment may highlight questions about whether standard toxicity data adequately represent exposure scenarios that are commonly observed in catchments.

At DuPont and Waterborne environmental experience was gained in the development of and running a spatial exposure model developed by these organisations. Under the supervision of Dr. Aldos Barefoot and Dr. Gerco Hoogeweg I was able to participate in the simulation modelling and data gathering processes. It is hoped that I will be able to use these same models to predict spatial environmental fate and exposure in the Gwydir River catchment. Further to this, testing a number of management scenarios will also be used to investigate the impact that they may have on the fate of chemicals.

The scientific exchange provided me with an invaluable opportunity to work with world leaders in the area of research, that I would not otherwise be possible in Australia.