CSIRO PUBLISHING

Pacific Conservation Biology, 2021, **27**, i–iii
https://doi.org/10.1071/PCv27n1_OB

Obituary

Tribute to Dr Susan (Sue) Victoria Briggs AM: exceptional practitioner of translating research into policy development and natural resource management (10 June 1950–18 December 2020)

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Susan (Sue) Victoria Briggs was born in Sydney on 10 June 1950. From 1959 to 1968, she attended Abbotsleigh School, an independent school for girls in Wahroonga, Sydney. She topped science during most of her time at school. She also started the school's science club. She completed her Bachelor of Science in Agriculture at Sydney University in 1972, her Masters of Natural Resources at University of New England in 1976, and her Doctor of Philosophy at the Australian National University in 1990. All three of her university theses were on aspects of wetland ecology.

In the late 1960s and early 1970s, the Australian states and territories were initiating their flora and fauna research capabilities. At that time, the New South Wales (NSW) Government commenced a research program on wetland ecology and water birds. Also, at that time, Dr Harry Frith, the inaugural Chief of CSIRO Division of Wildlife Research at Gungahlin in the Australian Capital Territory, headed a major program on wetland ecology and water birds. The NSW Government placed their wetland unit with Frith's program. In 1975, Sue replaced the first NSW Government Research Officer at Gungahlin. It is worth noting that Sue started work in a field dominated by males, many of them 'alpha males', some of whom resented female research staff, particularly those engaged in field work including directing male technical staff. Sue was effective at working with these research officers and out-publishing many of them.

From the time she joined the NSW Government with the National Parks and Wildlife Service (and successor organisations) until she retired in July 2011 (Fig. 1) as a Principal Research Scientist with the NSW Department of Environment and Climate

Fig. 1. Sue Briggs in the foreground with Danielle Ayres and Julian Seddon in 2005 (photograph Phil Gibbons).

Change, she was based at the CSIRO Division of Wildlife Research and successor divisions.

Between 1972 and 1998, Sue published 81 scientific papers and technical reports relating to wetland ecology, conservation and management. These included papers on: monitoring the impacts of hunting on duck numbers (7); the results of early aerial surveys of water birds in Eastern Australia (2); and importantly, 27 papers and technical reports to Federal and state agencies on the management of wetlands, including ephemeral wetlands in agricultural areas.

From 1998, Sue published papers, technical reports, and operational manuals on a wide range of subjects, including: wetland ecology and management (3); impacts of tourist operations on seals, whales, and penguins (8); integrating people into nature conservation (2); conservation and management of native vegetation, its soils and associated biota (41); problems of failure of ecological scales and institutional boundaries to overlap (4); offsets and economic incentives for natural resource management (6); relationship between science, policy, and education (5); and, operational manuals for codifying science in computer-based decision support tools (5).

On her retirement from the NSW Government, until her untimely death from cancer on 18 December 2020, Sue was an Adjunct Professor in Ecosystem Management at the Institute for Applied Ecology at the University of Canberra. During this period, as well as acting as a mentor and supervisor to students, she taught courses, including: Environmental Planning and Assessment; Ecology and Biodiversity; Environmental Conflict Management; Conservation Biology; Professional Practice in Applied Science; and, Professional Practice, Ecology, and Catchment Science.

Many research scientists publish their research in peer-reviewed scientific literature and do not attempt the difficult task of translating research into policy or practical management. From her early research on wetland ecology and water birds, Sue was one of the few who integrated her research, and that of others, such that it could inform policy and management. This she did throughout her research career, with exceptional conservation benefits for the nation.

This was demonstrated in the latter half of her career, when she became actively engaged in conservation and management of natural vegetation. Broadscale clearing of native vegetation has been, and continues to be, the greatest threat to biodiversity. One of the priorities of the NSW Carr Government (1995–2005) was to end broadscale clearing. As a result of the government's decision to achieve this, Sue became a champion, leader and driver in developing the mechanism to end broadscale clearing and ensure that the many opponents of this decision worked to achieve the outcome. This was done through the development of a computer-based decision support tool called the Property Vegetation Plan Developer, or PVP Developer. The decision to end broadscale clearing greatly concerned members of the farming community, as they thought this would limit their management actions. The PVP Developer was designed to allow the development of property management plans with farmers and their catchment management authorities (CMAs), such that legally binding agreements could be made that specified what could be managed and give landowners certainty of action. The over-riding principle was that any management actions must 'improve or maintain environmental outcomes'; what became known as the 'improve or maintain test'. That is, no action could be allowed which led to any further environmental degradation.

As originally planned, the PVP Developer had four main software components or tools covering: salinity; land and soil capability; water quality; and biodiversity. The tools dealing with salinity, land, and water quality were relatively straightforward and uncontroversial. Farmers understood the need to avoid increasing soil salinity and erosion and protecting soil productivity. The biodiversity tool was a different story. There was no comparable tool available and it had to be built from ecological and conservation principles. Sue drove the development of this tool and provided much of the intellectual input. She and her team used research into conservation biology and landscape ecology and codified it into a computer-based tool that could be used to examine development options and decide if any planned activities did, or did not, meet the improve or maintain test. Scientifically, and from a policy perspective, this work was innovative, ground-breaking, but not without controversy as some of her colleagues believed the approach was too much of a compromise between conservation and development and many farmers felt it represented an unreasonable restriction on their activities. Creation of the tool was not easy as an enormous amount of work needed to be done and many opposing parties had to be consulted, and worked with, in developing the tool. Sue was not only involved in the scientific development, she also undertook the consultation with all parties and worked with political advisors and ministers in several portfolios. The biodiversity tool was called BioMetric and became an essential part of the PVP Developer.

While the PVP Developer was being constructed, it became obvious politically and scientifically that the PVP Developer would meet enormous resistance from many farmers and graziers, particularly in the Central West and Western Divisions of NSW. In these divisions, there is a long standing environmental problem resulting from what was known as thickening of 'woody weeds' or 'invasive native scrub', now known as INS. INS results from an episodic environmental event when there is major regeneration of a particular species of shrub or tree. The species regenerates so prolifically that there may be thousands of stems to the hectare. This creates dense single species stands with no understory. INS can cover large areas and has posed environmental and social problems for over 150 years. Areas affected by INS provide no grazing benefit, can lead to soil degradation, and have a relatively poor native fauna associated with them. The PVP Developer with its four tools; BioMetric, salinity, land and soil capability and water quality had no provisions for managing INS. Without a tool that dealt with INS, the PVP Developer would not be any use for many properties in the Central West and Western CMA areas. Some farmers used this lack to create major political problems in relation to achieving an end to broadscale clearing.

Sue was the major driving force behind developing the INS tool for the PVP Developer. The INS tool was developed in less than a year, which was amazing as the other four tools had taken over 2 years to develop. Sue not only brought much of the scientific intellect to the development of the tool, she conducted most of the discussions with the opposing parties; the farmers and conservationists. The farmers wanted *carte blanche* to clear

all INS and many conservationists did not want any INS to be removed. Sue worked with these warring parties and led the development of the INS tool. The result of her hard work was a tool that made the PVP Developer very effective. Reports from the Central West and Western CMAs showed that farmers who were dead against the PVP Developer and legally binding property plans became active in entering agreements based on the PVP Developer, particularly the INS tool and encouraging others to do the same. This was a great gain as INS was being managed and there were major positive benefits to the native biota as well as increases in property productivity.

While developing the BioMetric tool for the PVP Developer, Sue realised that there were major gaps in our knowledge of native vegetation and its associated fauna. Some of these gaps needed to be filled to enable more effective environmental management. To fill some of these gaps, she obtained a $7 million grant from the NSW Environment Trust to conduct an integrated 3-year research program called 'Better Knowledge Better Bush'. It had eight partners, 13 sub-projects, and 50 staff. It involved research workers from NSW Government departments, CSIRO, several universities, and several CMAs. The research was aimed at producing practical outcomes to enable more effective management of native vegetation and its associated fauna. Having obtained the funds, Sue drove the program. This was not easy, as trying to get research workers to engage in integrated studies with practical outcomes is like herding cats. This research program was highly successful and much of the success is due to Sue's vision in setting up the program and exceptional hard work in keeping it on track and on time.

Similarly, while developing the INS tool, Sue realised there were critical gaps in knowledge needed to understand INS. She worked with the Central West and Western CMAs to set up an integrated research program to address these gaps, again with CSIRO, several NSW Government departments, universities, CMA staff, and graziers. This program was supported by more than $2 million, seven partners, and 30 staff. In 2010, this program produced 'Managing Invasive Native Scrub to Rehabilitate Native Pastures and Open Woodlands: a Best Management Practice Guide for the Central West and Western Regions' (https://www.lls.nsw.gov.au/__data/assets/pdf_file/0007/685222/managing-invasive-native-scrub.pdf, accessed 24 December 2020).

Through her exceptionally dedicated and hard work in developing BioMetric, the INS tool for the PVP, and her vision in setting up and completing integrated research programs to provide knowledge to enable more effective management of native vegetation including INS, Sue was a major force in reducing broadscale clearing of native vegetation in NSW. The environmental benefits that flow from her achievements are inestimable. It is noteworthy that most states and territories and the federal government have now introduced similar decision support systems to regulate land clearing to the one Sue initiated. Throughout this period, she drove herself hard, working 7 days a week for much of the time. As a result, she was held in high regard by conservationists, graziers and many of her colleagues.

Sue was a quiet, but incredibly effective achiever who did a great deal to safeguard Australia's unique biota. She was much more interested in achieving a positive outcome for natural resource management than in claiming any credit. Her inspiration was recognised nationally when she was made a Member of the Order of Australia in 2012 'For service to conservation and the environment through research and advisory roles supporting natural resources management and policy development', and professionally, when she was made a Life Member of the Australasian Wildlife Management Society.

Conflicts of interest

The author declares no conflicts of interest.

Acknowledgements

I am grateful to Juel Briggs, Professor Phil Gibbons, and Julian Seddon for critical comments on an earlier draft of this tribute.