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U N I V E R S I T Y

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Using landholder perspectives to evaluate and improve recovery planning for Lake Toolibin in the West Australian wheatbelt

By **Jennifer K. Munro** and **Susan A. Moore**

Summary Over the last two decades, recovery plans have emerged as one of the most widespread policy and management responses for endangered species. Often these plans include public and private lands, and the associated government departments and private landholders. Toolibin Lake, in the West Australian (WA) wheatbelt, is a case in point, with a recovery plan focused on an internationally recognized wetland on public land within a predominantly privately owned, agricultural catchment. This paper draws on recent questionnaire and interview-based research with landholders, to evaluate the influence of the recovery plan on conservation activities. Almost all landholders in the Catchment (93%) are involved in revegetation activities, with the availability of subsidies from the WA Government playing a strong role in adoption and its extent. The main constraints to adopting conservation actions, such as revegetation and fencing remnant vegetation, were cost and logistics. Correspondingly, the greatest incentive was financial inducement. Strengths of the recovery plan were identified as increasing awareness, demonstrating government effectiveness, and making funding available to landholders. The communication efforts by the WA Department of Conservation and Land Management (CALM), the agency leading the recovery process, were lauded while at the same time the need for improved liaison was noted. Weaknesses were the lack of information and direction from CALM, bureaucracy, limited funding for CALM, and variable adoption across the Catchment. Recovery planning in this Catchment and other similar settings could be improved by a continuing commitment to two-way communication between all those involved, ongoing recognition of the complexities of the government–community interface in recovery planning, and continuing subsidies for conservation actions on private lands where high biodiversity values are at stake.

Key words: *agriculture, catchment, incentives, landholders, natural resource management, perceptions, recovery planning, revegetation, subsidies.*

Introduction

Australia's high biodiversity values are widely acknowledged, with endangered species making an important contribution to this diversity. Many of these species occur in small fragmented remnants, a number in private ownership (Lambeck 1999). One of the most widespread responses to endangerment and the associated threats has been recovery planning. This approach was formalized in the Environmental Protection & Biodiversity Conservation Act 1999 (Cth), but had already been underway in states such as Western Australia (WA) for at least a decade. Recovery plans may be prepared and coordinated by government departments, such as the Department of Conservation and Management (CALM) in Western Australia, community groups, such as local catchment groups, or non-government organizations, such

as the World Wide Fund for Nature Australia (Blyth *et al.* 1995). Very often, recovery planning involves a coordinated effort by government agencies, private landholders, and, on occasions, members of the business community (e.g. Alcoa Australia in WA).

The West Australian wheatbelt faces enormous problems from dryland salinity, associated with the clearing of the native deep-rooted perennial vegetation. Throughout this landscape are dotted numerous small nature reserves, many providing refugia for threatened species, but which are also threatened by salinity. Recovery planning in the WA wheatbelt involves many players, including government agencies, predominantly CALM, and landholders with endangered species on their lands. Often, recovery actions are needed on both private and public lands, making it essential that the landholders affected are willing and able to assist. For a wetland, for example, the wetland itself may be a public nature reserve and hence a CALM responsibility. The surrounding lands, however, where native species revegetation and fencing of remnants are required, are often privately owned agricultural lands with management decisions made by private citizens.

The importance of involving community members, and especially landholders with threatened species on their lands, has been clearly acknowledged in recovery planning (Buchy 2001). To date, however, few efforts to formally survey landholders regarding recovery planning and their views and associated needs have been undertaken and reported. Such knowledge is critical as more plans are prepared for these mosaic landscapes with high biodiversity values and as existing plans are revised and updated. Surveys of this type are essential if recovery planners are to determine and then facilitate the adoption of the recovery actions needed.

Methods

Study area

Toolibin Lake and its catchment, in the central wheatbelt of Western Australia (Fig. 1), provided an ideal study site, based on its high conservation values, extent of private ownership, and history of recovery activities. The Lake is one of the last remaining freshwater lakes in the WA wheatbelt. It was recognized as a threatened ecological community in 1996 (CALM 2003), based on its dense living stands of sheoak (*Casuarina obesa*) and paperbark (*Melaleuca strobophylla*) trees (Bowman *et al.* 1992). It is also on the Ramsar Directory of Wetlands of International Importance because of its high diversity of waterbirds and large number of breeding species (CALM 2003). The Lake is one of six natural diversity recovery catchments in Western Australia and, as such, receives intensive technical and financial management and support (Wallace *et al.* 2002).

The majority of the Catchment is used for grain and sheep farming, being privately owned by 31 landholders. By 1972, 90% of the Catchment had been cleared. The main threats to the Lake arise from salinization of its water (sourced from both saline surface flows and saline groundwater recharge; CALM 2003). Recovery activities began in the 1970s with the responsible government agency, the Department of Fisheries and Wildlife, focusing on the Lake and its immediate environs.

The first recovery plan was completed in 1992 (Bowman *et al.* 1992). External consultants, with CALM and landholders, developed the plan. The plan was reviewed and redrafted in 1994 by the Toolibin Lake Recovery Team and Technical Advisory Group (TAG), with members including CALM officers, landholders, representatives from other government departments (e.g. Water Authority, Department of Agriculture), and the Australian Nature Conservation Agency. The Recovery Team and TAG guided implementation of the plan. In the second half of the 1990s, a recovery officer dedicated to Lake Toolibin was appointed.

Over the last decade, recovery activities have included emergency engineering solutions, specifically, diversion of saline surface water flows using surface drains and groundwater pumping to lower the saline watertable beneath the Lakebed. Other activities include fencing remnant vegetation, and biodiversity and commercial plantings. Over this time, management has shifted from being primarily Lake-focused to incorporate recovery of the wider Toolibin Catchment through activities on private agricultural lands. CALM currently subsidizes conservation actions, such as revegetation, fencing remnant vegetation, and alley farming, on these lands.

Study aims and design

The study's aim was to investigate landholder's perceptions of recovery planning in the Toolibin Lake Catchment, with the purpose of recommending how recovery planning and associated activities could be improved. A case study approach (Yin 1991), drawing on multiple forms of evidence, was used. Evidence included informal discussions with CALM staff involved with Toolibin, document review, and landholder questionnaires and personal interviews. The CALM-based discussions and review were used to describe the recovery history of the Lake and its Catchment. The questionnaires and interviews were used to access landholder perceptions, with perceptual research widely recognized as providing essential information for the evaluation and improvement of performance (Starbuck & Mezias 1996).

A mail-out questionnaire was sent to Catchment landholders, following initial contact by phone. The questionnaire was used to obtain demographic details and information on how landholders valued the Lake, conservation actions undertaken, and the effect of CALM subsidies. Questions also addressed constraints to undertaking conservation actions and conversely, potential incentives for increasing them. Conservation actions were defined as those designed to reduce or contain threats to the nature conservation values of the Lake and its Catchment. Close-ended questions were used, with landholders asked to indicate preferences from a set of offered answers (Frankfort-

Nachmias & Nachmias 1992). These answers were sourced from similar questionnaire-based research work in the WA wheatbelt by Jenkins (1998) and Moore and Renton (2002).

The personal interviews with landholders were based on open-ended questions (Frankfort-Nachmias & Nachmias 1992). The first part of the interview addressed farm management, focusing on conservation actions as well as associated constraints. The second part asked about the Toolibin Lake Recovery Plan, specifically its implementation strengths and weaknesses, and the quality of CALM's communication.

The quantitative questionnaire data were analysed predominantly as percentages, as the data set was too small to warrant using analytical statistics. The qualitative data from the interviews were analysed using grounded theory and associated coding (Strauss & Corbin 1990). Researcher-derived codes were used to synthesize and sort observations arising from the data. The end product was comprehensive descriptions of recurrent themes from the interviews. For example, coding of landholder responses concerning constraints to adoption showed that the reasons were financial, motivational and logistical.

Results

Of the 31 landholders in the Catchment, 28 completed the questionnaire (90% response rate), while 24 completed the interview (77% response rate).

Landholder characteristics, values and conservation activities

Over two-thirds of the landholders surveyed (73%) were aged 31–50 years (Table 1). In terms of formal education, 46% of landholders had secondary education as their highest level of schooling, while 27% were university qualified. Landholders valued Toolibin Lake for its wildlife habitat, community value/identity, ecological significance, and the productivity of the surrounding agricultural lands (Table 2).

Revegetation *(*93%), fencing of remnant native vegetation (86%), and soil treatments (86%) were the most commonly implemented conservation actions in the Catchment. For revegetation, fencing and alley farming, half or more of respondents had received CALM funding for the work (Table 3). In the interviews, the conservation actions identified by landholders as most important now and in the future included revegetation and fencing remnants, soil optimization, crop diversification, and engineering works (Table 4).

Farm planning is widely regarded as a conservation action (Cary *et al.* 2001). Two-thirds of landholders in this study (68%) did not use a farm plan for their property. Of those with a plan (32%), two-thirds (67%) developed it with help from a Community Landcare Coordinator (CLC). Those landholders with a farm plan were more likely to have undertaken conservation actions (Table 3). CALM subsidies influenced 68% of landholders in their adoption of conservation actions. Most landholders (86%) also said that subsidies also affected their scale of adoption.

Incentives for adoption collated from the questionnaire were better financial support, better compensation for non-productive land, and evidenced-based information on the benefits of conservation actions (Table 5). Constraints included the cost of materials and equipment to carry out work, and the lack of time/access to labour and funding (Table 6). From the interviews, where the first author emergently derived the categories, the constraints coalesced around financial, motivational and logistical concerns (Table 7).

Landholder views regarding implementation of the Toolibin Lake recovery plan

Strengths in implementation of the recovery plan were increased awareness, demonstrated government effectiveness, and availability of funding (Table 8). Weaknesses were lack of information and direction from CALM, bureaucracy, limited funding for CALM, and variable adoption (Table 9). When questioned about the quality of CALM's communication, as part of implementing the recovery plan, all those interviewed identified information provision as a strength. Although given as a strength, 63% of respondents also noted room for improvement, especially regarding liaison (Table 10).

Discussion

The influence of landholder characteristics and values on conservation activities

Because the relationships between age, education and adoption of sustainable practices remain questionable, are unlikely to be linear, and are confounded by a range of factors (AFFA 2002; Curtis *et al.* 2000; Cary *et al.* 2001;), they were not explored further in this study. The same uncertainties accompany suggested relationships between farming styles, environmental values, and adoption. Although the majority of landholders (82%) identified the Lake as having ecological values, recent research cautions against assuming a positive relationship between expressing environmental values and adopting sustainable farming practices (AFFA 2002). Rather, adoption is more strongly linked to beliefs about profitability and the risks associated with adoption (Barr & Cary 2000).

Conservation actions, including farm plans

Revegetation was the most common management action undertaken by Catchment landholders (by 93% of respondents). Jenkins (1998), in her survey of 143 landholders across five Shires in the WA wheatbelt in 1996, sought to determine landholder attitudes to a number of issues related to native vegetation on farmland and land degradation. She similarly found revegetation to be the most common conservation action (undertaken by 84% of respondents). The higher uptake in the Toolibin Catchment (93%) is likely to reflect its special status as a recovery catchment and associated greater availability of funding.

Alley farming was a popular conservation action in the Toolibin Catchment, adopted by 61% of landholders. In contrast, only 6% of Jenkins' (1998) landholders had adopted alley farming. This difference can be attributed to a number of factors. Most importantly, subsidies were available at Toolibin for this work but less so in Jenkins' Shires. Also important, the proximity of Toolibin to a proposed oil mallee processing plant appears to have stimulated interest in mallee plantings. And, as the enormity and intractability of salinity as a problem has become generally realized, interest has grown in alley farming as a potentially commercial way of combining salinity control using deep-rooted perennials while retaining grazing and/or cropping pursuits in the alleys between the trees.

The adoption of sustainable practices has been positively linked to the existence of a farm plan, suggesting that landholders using a farm plan are more prepared and proactive (AFFA 2002). In contrast, research by Curtis et al. (2000) found no relationship between the existence of a plan and adoption. The findings of this study align more closely with those of Cary et al. (2001), where having a farm plan was related to adoption of sustainable practices. Fewer landholders in the Toolibin Catchment than in the Shires surveyed by Jenkins (1998) had plans (32 vs 60%). One possible reason is as voiced by one interview respondent: 'I think everyone got a bit sick of it, we all got sick to the teeth of doing plans…there's been a lot of criticism on that, farm plans'. The increasing incidence of Landcare burnout (Byron & Curtis 2001) may be responsible for the lack of enthusiasm for farm planning in this study.

Incentives and constraints

A common way of encouraging adoption of sustainable practices is using financial incentives as a cost-sharing method to compensate landholders for management actions that provide wider environmental benefits (Barr & Cary 2000). Two-thirds (68%) of respondents indicated they were influenced by CALM subsidies in their decision to adopt conservation actions. In comparison, only 15% of landholders in Jenkins' (1998) study accessed funding for revegetation activities, helping to explain, in part, their lower level of adoption of revegetation.

Interestingly, however, far more landholders in Jenkins' study versus this one were undertaking activities, such as revegetation, with no subsidy; 69% of replanting landholders were not subsidized in Jenkins' Shires, while only 28% of replantors were unsubsidized in the Toolibin Catchment. These results emphasize that although financial incentives are important, they are not the only way to stimulate the adoption of sustainable practices (Barr & Cary 2000). What subsidies may critically influence, however, is the scale of adoption, with 86% of respondents in this study noting subsidies as positively influencing their scale of adoption. The significant positive effects of providing financial assistance to increase adoption has been noted elsewhere (Curtis & Robertson 2003; Nelson et al. 2004).

The other incentives loosely coalesce around information; having evidence-based information on the benefits of management actions, information on the recovery plan, and accessible professional advice. Jenkins (1998) similarly identified funding to be the most important incentive for landholders, followed by information on management benefits. Requiring evidence-based information reflects the risk-averse nature of many landholders (Vanclay & Lawrence 1995). Lack of confidence in recommended management actions has been acknowledged as a barrier to adoption, accompanied by a dislike of complexity, risk aversion, and a desire to remain aligned with existing social norms (Barr & Cary 2000; Curtis & Robertson 2003).

As would be expected, the constraints closely relate to the incentives. Costs, in both time and money, were emphasized (Tables 6 and 7). Curtis and Robertson (2003) noted cost to be the predominant constraint experienced by landholders, followed by logistics (e.g. time management, availability of labour). Financial constraints to adoption have also been emphasized in other studies (e.g. Cary et al. 2001; Nelson et al. 2004).

The other main constraint, evident from the interviews but not from earlier survey work (e.g. Jenkins 1998), was lack of motivation. Burnout, and an associated lack of motivation, has become a growing concern with regard to the adoption of sustainable conservation practices (Byron & Curtis 2001). Motivation, coupled with access to financial resources, is needed if adoption is to occur on any significant scale (Cary et al. 2001).

Evaluating implementation of the Toolibin Lake recovery plan

The availability and effectiveness of information, government performance, and the availability and level of funding were mentioned as both strengths and weaknesses (Tables 8 and 9). In terms of information, respondents noted that the plan had increased awareness but clearer direction and more information from CALM were needed. A related comment, centred on communication, was the need to improve liaison within the Catchment, in particular through CALM having an advisory rather than policing role (Table 10). The networks that can make conservation actions possible rely on the development of trusting relationships between individual government officers and local people (Moore 1995).

For the performance of government, strengths were coordination across departments and 'getting on with the job', while the paired criticism was slowness in getting actions underway (i.e. the 'bureaucracy'). Funding subsidies for conservation actions were identified as a strength by respondents and the perceived inadequacy of current government funding for CALM as a weakness.

The centrality of CALM in landholders' reflections on the recovery plan's strengths and weaknesses, draws attention to the complexity of the relationship between landholders who have the responsibility and the ability to implement recovery actions on their lands and CALM as the government department responsible for managing threatened species irrespective of land ownership (Blyth *et al.* 1995). Communication is one area where this complexity is apparent with comments that CALM is doing a good job juxtaposed with numerous suggestions for how liaison can be improved.

The effectiveness of the plan's conservation actions in addressing salinity was not mentioned as either a strength or weakness. This result reflects both the current status of Toolibin and broader issues associated with salinity management. To date, the conservation actions at Toolibin have slowed and at best halted salinization of Toolibin Lake. As such, observers, reporting on maintenance of the status quo, are probably less likely to identify salinity management as a positive outcome identifying it more as a work-in-progress. In terms of broader issues, in a given catchment, remediation works and associated beneficial outcomes may occur in completely different locations. Without catchment-wide monitoring and sharing of results, individual farmers are unable to judge how their actions are contributing or otherwise to addressing salinity.

Management implications

This study has provided valuable insights into how Toolibin landholders view recovery planning and associated conservation actions in their catchment. It gives CALM and others involved direction on how to improve and further align recovery planning with community needs, and provides an important case study for effecting conservation management actions at a catchment scale, inclusive of both public and privately owned lands. The study also illustrates the value of drawing on social research to assist in the complexities of recovery planning and ecological restoration more generally.

The high level and extent of adoption and recognition of the ecological importance of Toolibin Lake demonstrates the value of having a focal point (the Lake) for community involvement in natural resource management. These high levels also demonstrate the benefits that commitment over time, to conservation outcomes, can achieve. This analysis has also detailed the recovery activities requiring further attention: ongoing two-way communication between all involved, recognition and management of the complex role for government in recovery planning, and the importance of financial incentives. A central feature of two-way communication must be providing evidence for landholders of the benefits of conservation actions.

Government agencies have a critical role in recovery planning as they have the legislative and resourcing framework that enables them to assist with and often guide the recovery of threatened species and ecological communities on private lands. Evident from this study and others is the continued need for effective interaction between government and private landowners in order to maximize conservation outcomes. In this study, all respondents identified provision of information as a strength of CALM's communication in the Catchment, suggesting that their approach provides a potential model for application elsewhere (i.e. recovery team, recovery plan, appointment of a locally based recovery officer).

This support was tempered by concerns regarding a lack of direction from CALM, a desire for more frequent updates (Table 9), and moving CALM from a policing to advisory role. These concerns collectively illustrate the complexity of CALM's role where they are expected to provide direction but also act in an advisory rather than directive manner. Part of the solution for CALM includes having ongoing presence in the Catchment to continue building trust (Moore 1995), as well as sharing the multiplicity of their role with landholders (e.g. regulator, knowledge broker, technical expert, fundor). Local catchment groups are a critical part of the solution, providing an essential forum and conduit for information flow among and between landholders and others, especially government agencies. The associated interactions provide an important opportunity to foster social capital and trust, a necessity in establishing good catchment relations.

In this study, the positive effects of subsidies in both facilitating and enhancing the scale of adoption were readily apparent. In the context of limited farm incomes and significant financial constraints experienced by the majority of landholders in Australia, the importance of such funding schemes in motivating landholders to adopt biodiversity management actions that provide off-site and wider catchment environmental benefits cannot be emphasized enough. Of continued associated importance, is the ongoing need to develop deep-rooted perennial crops for adoption in agricultural areas, which are commercially competitive with grain crops such as wheat. Only with a multifaceted approach, including subsidies and the development of commercially viable perennials, will it be possible to progress towards sustainable agricultural landscapes.

Acknowledgements

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Figure 1. Toolibin Lake and Catchment.

Table 1. Landholder age and level of formal education

Age (years)	Respondents (%)	Formal education	Respondents (%)*
21–30	4	Secondary (year 8–10)	27
31–40	35	Secondary (year 11–12)	19
41–50	38	Agricultural college	12
51–60	23	University	27
		Farm courses	15

n = 26. *Does not sum to 100% as some landholders did not answer.

Table 2. Landholder values for Toolibin Lake

Value	Respondents (%)*
Wildlife habitat	90
Community value/identity	86
Ecological significance	82
Productivity of surrounding agricultural lands	82
Aesthetic reasons	53
Bird watching/nature study	40

n = 28. *Does not sum to 100% as landholders valued Toolibin for more than one reason.

Table 3. Adoption of conservation actions (from questionnaire)

Management action	All respondents (%)*[a]	Farm plan in use (% respondents)*[b]	No farm plan in use (% respondents)*[c]	CALM-funded actions (% respondents)*[a]
Revegetation	93	100	89	65
Fencing	86	100	79	46
Soil treatments	86	100	68	NF
Contour banks/drains	79	89	68	5
No minimum^{-1} tillage	79	100	63	NF
Alley farming	61	78	47	59
Fodder shrubs	61	78	53	NF
Cultivating along contours	50	44	53	NF
Perennial pastures	29	33	26	NF

[a]n = 28. [b]n = 9. [c]n = 19. *Do not sum to 100% as many landholders have adopted more than one action.
CALM, Conservation and Land Management; NF, not funded by CALM.

Table 4. Most important conservation actions for landholders now and in the future (from interviews)

Management action	Characteristics	Most important action now (% respondents)*	Most important action in the future (% respondents)*
Revegetation, fencing remnants	Revegetation	79	50
	Alley farming		
	Fencing remnant vegetation		
Soil optimization	Soil treatments	25	23
	Minimum/no till		
	Working to/with contours		
Crop diversification	Perennial pastures	8	27
Fodder shrubs (e.g. tagasaste)			
Engineering works	Drainage	4	32

n = 24. *Does not sum to 100% as landholders described more than one action.

Table 5. Incentives for adoption of conservation actions (from questionnaire)

Incentive	Respondents (%)*
Better financial support	79
Better compensation for non-productive land	64
Evidence-based information on the benefits of conservation actions	64
Information on the Toolibin Lake Recovery Plan	54
More accessible professional advice	46

n = 27. *Does not sum to 100% as landholders identified more than one incentive.

Table 6. Constraints to adoption of conservation actions (from questionnaire)

Constraint	Respondents (%)*
Cost of materials/equipment	77
Lack of time/access to labour	67
Lack of funding	63
Poor condition of Catchment	33
Lack of work in surrounding areas	29
Unclear responsibility	19
Lack of on-site advice	18
Other	7

n = 22. *Does not sum to 100% as landholders identified more than one constraint.

Table 7. Constraints to adoption of conservation actions (from interviews)

Constraint (% respondents)*	Illustrative responses
Financial (73%)	'In the end it's money; whether you can generate increased income from doing something about salinity or whether someone pays you to do it.'
Motivational (50%)	'Lack of inclination… to get out there and do it.'

Logistical (27%)	'It's mainly a matter of time, a combination of time and money, and cost-benefit analysis.'

Table 8. Strengths of implementation of the Recovery Plan (from interviews)

Strength (% respondents)*	Illustrative responses
Increased awareness (67%)	'Everybody seems to know about Toolibin Lake.'
	'They've always kept us up-to-date with what they're trying to do.'
Demonstrated government effectiveness (42%)	'Government departments working together…shows how it can all work.'
	'CALM can actually do it, they've…worked on this and done a really good job.'
Availability of funding (38%)	'The funding that's been available has certainly been a strength.'

Table 9. Weaknesses of implementation of the Recovery Plan (from interviews)

Weakness (% respondents)*	Illustrative responses
Lack of information and direction from CALM (38%)	'A newsletter or Fax: once a month or so…I'm on the recovery team and even I don't always know what's going on.'
	'Hasn't been any clear direction of what they want from us.'
Bureaucracy (21%)	'Bureaucracy can be a bit of a problem when you've got government departments trying to work with landholders.'
Limited funding for CALM (13%)	'Financial limitations is a weakness…I think that's probably the biggest thing that stops CALM from doing more work.'
Variable adoption across the Catchment (13%)	'The Toolibin Lake thing was too big, and not enough of the other catchment areas… did what we did here.'

Table 10. Strength and weakness of Conservation and Land Management's communication (from interviews)

	Illustrative responses
Strength (% respondents)	
Provision of information on catchment management and Toolibin Lake (100%)	'They…make us aware of what they're doing…or what they'd like to do.'
Weakness (% of respondents)*	
Problems with liaison (63%)	'If they interacted…not as a policeman, you know, as an advisor.'