MANAGEMENT, RESEARCH AND ECOLOGICAL THEORY: THE VISION AND THE REALITY

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I would like to make two points at the outset of this paper. Firstly, I do not intend it to be a scholarly or scientific work. Rather, I will put forward my views on the problems we face and suggest approaches which can be taken in overcoming them. Secondly, I will be concentrating on the Western Australian scene, and on issues pertinent to the Department of Conservation and Land Management (CALM), rather than taking a national or international perspective. I am sorry if this leads to a presentation which is parochial, however it reflects my background and my preoccupation. It also does what I hope all CALM managers and scientists do: focuses on the most important problems at hand.

I also wish to say at the outset how much I approve of the concept and the format of this workshop. It is unusual for policy makers, research scientists and district managers to sit down together for a "jam session" on philosophical issues and their relationship to the real-world demands of ecosystem management. Too often each group convenes its own get-together (the policy meeting, the research working groups or the managers meetings) and this physical separation entrenches philosophical differences, and in turn leads to the adoption of the familiar and ridiculous stereotypes about researchers, managers and those at Head Office. Anyone who has experienced the intellectual stimulation and the joy of learning which can arise in multi-disciplinary groups, quickly becomes bored and irritated by contrived research-versus-management arguments.

Land management and wildlife conservation in Western Australia is going through difficult times at the moment because there is an expanding task, rising public expectations, constant critical and unforgiving attention from environmental groups, all at a time of diminishing resources. We are subject to pressure from competing bureaucracies in Government, all after a maximum slice of the resource cake and we are increasingly imposing upon ourselves higher and higher standards of excellence. This stems partly from professional pride, but is also a result of the intense personal commitment to conservation which runs right through our Department.

At any time, but <u>especially</u> in tough times, it is imperative that a conservation and land management agency meets the following three requirements.

1.It must ensure that its policies and practices are firmly based on the best available scientific information about the ecosystems it is managing.

2.It must make the best possible use of its collective intelligence and energies.

3.It must develop a positive vision, ie, the clearest possible idea of where it wants to be, so that it can bridge the gap between the real world of today and the ideal one of tomorrow.

I see these imperatives as fundamental to ecological (ie, conservation and land) management everywhere and; in the remainder of this paper I will try to look at how each might best be tackled in the Western Australian context.

THE SCIENTIFIC BASIS FOR MANAGEMENT

Everyone agrees that the management of natural ecosystems, whether for nature conservation, for

recreation, resource production or simply for the protection of particular human values, should be firmly based on scientific principles, ie, "ecological theory". Setting aside for the moment the problem that few people actually understand what is meant by the term "ecological theory", there is a fundamental dilemma in this thesis. On the one hand, the ecosystems we manage are enormously variable and impossibly complex and the amount of our scientific knowledge is scanty, while on the other hand, we cannot stop the clock! On all sides, society is intervening in natural processes, harvesting native plants and animals, and altering landscapes. We cannot simply order all this to stop, on the grounds that we do not know enough. In any case, even a "do nothing" policy can represent an artificial intervention. Most difficult of all is the question of scale of resolution - there is always a level of uncertainty to which research has not yet penetrated - and no matter how much we seem to learn, there is always more we do not know. I can think of few cheaper targets than the adequacy of our scientific research, and therefore the basis of our management. There have been recent attacks on this score from such points on the critical spectrum as the Southwest Forest Defence Foundation (Anon 1986) and the Chief of the Division of Forest Research in CSIRO (Landsberg and Parsons 1984).

The fact is, of course, that we can never know "everything". We may never even know "enough" in some situations, such as the massive perturbations associated with mineral sand mining in kwongan, or bauxite mining in the jarrah (*Eucalyptus marginata*) forest. Nevertheless, we are not helpless, nor should we be professionally intimidated in this situation. There are six steps we can take to maximise the scientific validity of our management, and to minimise ecological mishaps.

1.We must continue to maintain a strong research effort in conservation and land management. That is critical to our survival. We must also support the research efforts of others in relevant fields.

2.We must focus research effort onto the most serious problems. These are where the basic elements of the ecosystem (air, water, soil) are being degraded, where species or communities are threatened with extinction, where we need to ensure the sustainability of harvested natural resources, and where there is an opportunity for economic benefit.

3.We must have effective mechanisms for constant review and updating of the four basic elements of our management system. These are:

i)reserve location and adequacy;
ii)policy statements;
iii)management plans; and
iv)operational prescriptions.

These elements should be reviewed and revised on the basis of the latest research findings, and the results of systematic performance and ecosystem monitoring.

4.We must continue to seek to oppose (or defer) interventions in ecosystems where the outcome is uncertain, and to encourage research effort by the proponents.

5.Wherever possible, "control areas" must be set aside, characterised, and looked after.

6.Wherever there is uncertainty, the "experimental management" approach, involving the setting up and testing of working hypotheses, must be adopted.

This approach may not satisfy the sternest critics of our research inadequacies. It will probably not prevent an occasional mishap, but it is a professional and positive approach to the dilemma of having to manage with a permanently deficient data base, and provides constant opportunity for improvement and refinement of operations.

Before leaving this subject, there are four important points I would like to add.

1.There can be a world of difference between scientific theory and scientific fact. Like any manager, I am wary of theories which have not been thoroughly tested or which do not appear to gel with what I actually see on the ground. A good example of this was the theory of the hot fires-legumes-dieback interaction in the jarrah forest (Anon 1976). Despite the fact that it was rapidly superseded by the impeded subsoil drainage theory, the "hot burns cure dieback" story became a popular fad, and still turns up to haunt me, in scientific publications (Raison et al. 1984), in letters to the editors of newspapers and even in my daughter's high school biology class notes.

As Richard Hobbs has pointed out (this publication) the field of ecology is huge and the science is inexact. Both researchers and managers must therefore be constantly on the alert as to what is fact and what is idea. Substantial changes to policies, management plans or prescriptions based on the latter may not be progressive.

Moreover, in the distinction between fact and hypothesis, managers are dependent on their scientific colleagues. This dependency imposes a considerable responsibility on research ecologists and research managers.

2.We must remember that even prescriptions for management based on well designed research and careful analysis can have unpredictable side effects. A good example of this is the change to the fecundity of fox populations predated upon by CALM research scientists (Kinnear pers. comm.). As I will discuss below, the principle of the unexpected consequence underlines the necessity for all research to be scaled up to trials, before it is adopted as an operational procedure.

3.Ecological requirements cannot always take priority over everything else. For example, whilst it might satisfy ecological theory to allow karri (*E. diversicolor*) forest national parks to be "cooked" by an occasional high intensity wildfire, this ignores the aesthetic value of these beautiful forests, ie, the principal reason for which they were reserved. By the same token, present day aesthetics may have to be sacrificed for the long-term conservation of the ecosystem.

4.Useful research information does not derive exclusively from research scientists performing statistically valid experiments. Managers can set up creative leader trials, can make revealing observations, and can select and set aside control areas. Furthermore, they can constantly alert research scientists to planned operations or unplanned events where simple surveys and plots can be established and provide important data. There are certain rules for management staff carrying out research trials (see Table 1), but given compliance with these, extremely useful information can be produced.

INTEGRATION OF RESEARCH AND MANAGEMENT

I have written previously on the different orientation, values and preoccupations of research scientists and managers (Underwood 1983, 1984). Unless these are understood, and effectively dealt with, they can lead to an unhealthy organisation, the symptoms of which are irrelevant research, frustrated staff and a lack of creativity and progress in management. But worst of all, a lack of effective integration of research and operations staff will prevent the most efficient application of our collective intelligence and energy to conservation and land management.

Three courses of action can be taken to maximise integration of research and operations; the use of multidisciplinary teams, efficiently managed research extension, and the development of a positive approach to liaison.

Multidisciplinary teams. When research and management staff unite to tackle a land management or wildlife conservation problem, they get to know each other and the scientist can provide the results of his/her work, or his/her knowledge of the work of colleagues. The manager can outline the constraints under which he/she operates. In addition, the gaps in research knowledge become glaringly obvious, as do the limitations of the manager's influence and capabilities. As a consequence, a joint commitment to improving the whole system emerges.

This is a very important process, and on the whole I have found that it works very well, irrespective of whether the task is to draft a policy or a job prescription. It can fail, when a team member is "playing" to another constituency, or when the problem is too "dirty" (Mason and Mitroff 1981), and these are potential difficulties to which a manager must be alert when setting up multidisciplinary teams.

Management of research extension. Having studied this problem in some detail as a research worker and a manager, I have concluded that the onus for effective research extension falls very squarely on the shoulders of the research scientist and his/her director. If they manage it properly it will happen; if they don't, it will not. Most managers (particularly in large, complex regions) simply do not have the time to scan the scientific literature and to integrate research findings.

In my view, five essential steps must always be taken to ensure successful integration of research findings into management.

1.Research findings must first be presented to research colleagues. This is to confirm the validity of the work in terms of design, analysis and conclusions, but more importantly to make sure scientific staff agree amongst themselves upon the implications to management and what is actually to be presented.

2.Research findings must then be written up in non-scientific language and presented to operations staff in the form of new, or revised policy or prescription. This must be accompanied by a description of the expected benefits and likely costs of the innovation proposed.

3.In most cases, work must then be scaled

up to field level demonstration trials. These are best organised as collaborative projects between research and operations staff. They are designed to ensure proposals can be properly evaluated for cost, practicality and safety, and unexpected consequences.

4.Research scientists must participate in the initial training of operators and in early implementation. This ensures their rapid attention to teething problems and avoids serious misinterpretation. It also highlights the areas where research is incomplete. It is a responsibility of research directors to plan for each scientist spending part of his/her time on this work, even though it will be at the expense of more research.

5.Research scientists must contribute to subsequent reviews of procedures and prescriptions. This ensures the incorporation of their most recent findings and allows researchers to experience first-hand the problems and concerns of managers.

Unless these steps are systematically followed, research findings will languish, or worse, be misapplied.

Clearly, such an approach is generally more applicable within an agency like CALM than it is, for instance between a researcher in CSIRO and a manager in CALM, but, this is not always true and depends on the problem and the approach.

Research-operations liaison. This must be faced positively and must be actively managed if it is to occur properly. The mechanisms are familiar (seminars, field days, newsletters, workshops, publications, technical demonstrations, policy meetings) but the will to make the time and effort is often lacking. Unless there is a determination to have effective liaison, it can lapse. This may mean producing a forum for such interaction to occur, or at least be initiated and this workshop is an example of this approach.

I also emphasise the importance of social interaction and of sharing the fun of the job. Friendship is a very powerful positive influence, but again, it is something which does not just happen, it must be worked at.

In this section I have talked about how best to integrate research and operations, because not only will this improve the standards of ecological management, but will ensure best use of scarce human resources

I now want to turn to my final point. Without a vision, ie, a clear and positive idea of where we want to go in the field of ecological management, progress can only be slow and haphazard.

THE VISION

Andrew Burbidge (this publication) presented the case for nature conservation and suggested how our management must comply with the noble precepts of the World Conservation Strategy. I agree with him and I share these ideals. However, for goals to be meaningful at the level of park, reserve, and district management, they need to be scaled down from the international scene, and they need to be given priorities, in the same way that priorities need to be set at the higher levels, eg state, national and international. The resultant statement of ranked objectives can then form the fundamental basis for the structure of the research program and for the allocation of resources for management on the ground.

This is the ideal. In fact, it is probably the greatest weakness in conservation and land management in W.A. at the moment. While a comprehensive statement of objectives is emerging in the Corporate and Regional Management Plans, no system for allocating priorities has been developed. There is a major imbalance of resources (for important historical reasons) and great social and economic barriers to change. Current research priorities have largely been inherited from the agencies that amalgamated to form CALM each of whom had a more narrow charter than CALM. Research priorities can only be changed at a serious cost in terms of lost investments. In many areas of the State we do not have the staff or the funds to practice even the most elementary and scientifically valid ecological management (eg, control of feral animals, or management of fire). Despite these difficulties, I remain optimistic. Conservation and land management in W.A. has two wonderful advantages over that in many other parts of the world. Our population is still comparatively small, and community attitudes towards the environment in general are improving.

It is also my view that a vision does exist, but is not yet explicit, and that a system of determining priorities can be developed and implemented, even though it will be a gradual process. Until both these things are done our capacity to properly plan for the conservation of the biological and physical resources for which we are responsible, will be deficient. Our capacity to implement management plans on the other hand, is a matter of community and political priorities, and is outside the scope of this workshop.

CONCLUSION

In this paper I have tried to look at ecosystem management from the viewpoint of an agency charged with the task of conservation and land management in a State as huge and diverse as Western Australia. I accept that conservation management must be based on ecological principles, but I acknowledge that there are serious limitations in our data base and our resources. Nevertheless, I believe that we can meet our scientific, and our moral obligations to conservation if we observe four key principles.

1.Maintain an effective research effort.

2.Constantly review and update of management policies, plans and procedures, on the basis of current research findings, and monitoring programs.

3.Adopt a positive approach to maximising the effectiveness of collective intelligence and energy of all scientific and management staff.

4.Establish clear goals and priorities.

This approach will not immediately satisfy our critics, but must generally move us in the direction of better management, and therefore more effective land and wildlife conservation in W.A.

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Table 1. Rules for Research Trials by Management Staff

1.	Studies should be relatively short-term. (They nearly always lapse when the originator is transferred.)
2.	Experimental design should be checked out with an experienced research scientist. (Information collected which cannot be analysed is often useless.)
3.	A "Research Proposal" (or Research Working Plan) must be written and filed. In particular this must contain an objective and enough survey data to enable relocation on the ground.
4.	Results and conclusions must be reported, especially to the local senior manager and to the appropriate research scientist.
5.	If there is an appropriate outlet, the work should be published.