The Benefits to the Beekeeping Industry and Society from Secure Access to Public Lands and their Melliferous Resources

Report to the Honeybee Research and Development Council of Australia

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Introduction

The ongoing national debate concerning beekeeper access rights to government controlled forest areas involves, like most resource security situations, interlinked economic, ecological and sociological or cultural considerations. To compound the complexity of the debate, each State seems to have or is developing access guidelines and management policies that are different in each case. Despite the different rules applied or under development, one thing remains common: the general policy process through which governments are approaching the resolution of the problem. In every case, governments (through their relevant agencies) tend to be taking a highly piecemeal or reductionist approach. Advice from various experts is sought and weighed up within an environment of intense beekeeping industry lobbying. In short, the decisions being made are more political than anything else. Effectively, judgements about the relative importance of the relevant economic, ecological and sociocultural aspects of any policy alternative are being made by a handful of key policy administrators. Though this has the appearance of a normal resource policy process, the distinguishing feature in this case is the sheer lack of objective information upon which to base a decision.

The debate has been characterised by the positioning into opposed camps of various 'expert' groups advocating the relevance of one restricted position over another. Under these circumstances, the role left for policy administrators is one of arbitration rather than management. In this case, the usual outcome is the prevalence of the most effectively organised and persuasive lobby group over the others. For this particular debate, the test of strength between the beekeeping and 'scientific' lobby groups has met with different outcomes in each State.

The major recommendation from this Honeybee Research and Development Council supported research is for a new approach for the consideration of the relevant issues. The advocated approach is virtually the opposite of that currently applied. Rather than persisting with the current piecemeal approach, the resolution of at least this particular resource policy issue should be facilitated through a fundamentally cooperative, holistic process involving the participation of relevant stakeholder groups from the information collection through to policy implementation phases.

Problem and Issues Summary

The central problem addressed by this research is the question of continued beekeeper access rights to forested areas under government control. Claims have been made by the scientific community that honeybees and beekeeping activities are imposing some damage to protected ecosystems. Concerns relate to the possibility of adverse selection on native insect and other animal populations imposed by honeybees in these areas. Honeybees are also claimed to be causing some disturbance to the ecological balance of plant communities (through concentrated pollination activity that favours some flowering species over others). Other claims relate to damage caused by beekeeping activity to roads and apiary sites within park and reserve areas. Some claims of adverse impact on tourism have also been proposed.

From the beekeepers' perspective, continued access to the national estate is vital to financial apiary viability. Beekeeping sites on public land are generally arranged through a system of transferable rights administered by public land agencies. Annual fees are paid by beekeepers to secure continued access. These sites are considered as a major productive asset by the beekeeping operations involved. Beekeepers claim that continued access to these sites is central to the perceived capacity of their business to support subsequent generations of beekeepers. Given the direct and indirect importance of beekeeping activities to the effective pollination of a large array of commercial crops and managed clover based grazing pastures, the continued viability of beekeeping is central to the viability of the more general agricultural sector.

The problem then, involves economic, ecological and sociocultural considerations (encompassing the capacity to pass on a beekeeping operation, the sociocultural health of regions supporting commercial beekeeping activity, and self esteem of current generation producers).

Summary of Findings

The single most important feature of the ongoing debate concerning continued beekeeper access to public lands is the multi-dimensioned and interlinked nature of the underlying considerations. The issues at hand cannot be considered in a partial way (ie, through focusing on ecological or exclusively economic considerations) as the debate is driven largely by concerns that are created through the interplay of economic, ecological and sociocultural considerations. To consider the problem from anything other than an holistic perspective, will prevent anything like a realistic assessment of the factors at hand. Piecemeal policy solutions will serve no one, will more than likely generate undesired ecological and economic consequences through time and are likely to be ineffective from a regulatory point of view anyway.

Complex ecological economic problems require an innovative rethink of traditional policy approach. The key observation from this research is that more is unknown about the problem than known. There is no unequivocal scientific evidence to support or reject claims of adverse ecological impact from beekeeping activity on public lands. The economic evidence is similarly limited. The economic consequences of policies designed to restrict access are likely to be very large and severe, largely described in terms of 'secondary' impacts on related agricultural activities with a high degree of dependence on effective honeybee pollination. In this environment of poor information, a stakeholder driven approach is required to support the consideration of policy/management alternatives. This report details an appropriate stakeholder driven mechanism for the joint consideration of key policy operatives and industry interests.

Objectives

To investigate the financial, ecological, social, institutional and behavioural dimensions of policy designed to restrict the access of beekeepers to public lands and their melliferous resources. The investigation is intended to specify an appropriate process for the consideration and implementation of relevant policy solutions. The ensuing discussion will be supported through a case study application to the beekeeping resource security situation in the State of Tasmania.

Background

The recent field of ecological economics is a suitable domain for the consideration of issues of this nature. Encompassing an amalgamation of economics and ecology, ecological economics investigations have the potential to capture a wider range of issues and influences than may be achieved with a more restrictive (and traditional) focus. The key feature of ecological economics is the underlying transdisciplinary nature of investigations. This means that problems are defined by stakeholders representing the ecological, economic and sociocultural dimensions of the situation at hand. Problems are ***defined*** by a process of cooperation. Solutions are similarly ***developed*** and considered through the same cooperative process. Finally, and ideally, solutions are ***applied*** and monitored by the same transdisciplinary group of stakeholders. From start to finish, there is no element of one interest group imposing its own perspective on others. There is a high degree of decentralisation implied for such a policy process. The authority centre remains with government, but the development and implementation aspects are placed under the jurisdiction of the relevant resource management communities.

Ecological economics implies as much for analytical process as it does for policy management and implementation. The conventional tools of resource economics are often not valid as they are usually too restricted in scope. The tradition is to attempt a monetary accounting of all relevant social benefits and costs arising from any policy alternative. While such an approach appears to be relevant for social decision making, in practice, the problems in dealing with difficult to value or impossible to value effects makes the general philosophy and practice of benefit cost analysis inappropriate for ecological economics practice. The approach to be adopted in this study is an ‘inductive’ rather than ‘deductive’ procedure. Deduction is the tradition of reducing problems to be manageable for the measurement of specific summary outcomes. Policy alternatives are ranked by these measured outcomes and the highest ranking approaches are selected. Inductive procedure, on the other hand, is orientated to ‘learning’ rather than prediction. The idea here is that complex ecological economic problems such as the beekeeper access debate are best handled by coming to terms with the issues at hand, or learning and sharing insights, and on that basis, developing management options from improved understandings. As is the case with all real world ecological economic problems, it is a fact that much of the detail of cause and effect will remain unknown and, even if known, will be subject to a high degree of uncertainty or dynamic complexity. In other words, the detail of the reality of any resource management problem is likely to remain below the resolution of any conceivable policy modelling activity. Decisions should be made in the light of this inherent uncertainty, not by assuming it away. The convention of resource policy is to note inherent complexity but to proceed on regardless as though all the facts are known or all the essential variability has been captured by the analyst's modelling procedure. An application of this kind of thinking to the beekeeper access issue is likely to produce policy solutions that are only vaguely relevant to the reality of the problems at hand. Any partially deduced plans will unravel with time as poorly considered or unknowable consequences are revealed through time. Much better to develop a sound appreciation for the inherent complexity of a situation such as this at the outset than to proceed on the basis of confidence in a few, time-isolated facts. And the most effective way to develop a sound understanding of complex ecological economic issues is through a facilitated stakeholder learning process.

Current scientific evidence relating to the impact of honeybees on native flora and fauna is not completely specified and is often contradictory. This study is designed to review and integrate existing scientific knowledge in this area with that pertaining to the economic and social implications of beekeeper access to public lands. One important socio–economic fact to be considered is the significant contribution of the beekeeping industry to society through pollination activities. Another is the reduced capacity of the beekeeping industry to service that role in the event of the wide–spread adoption of policies designed to exclude beekeepers from public lands.

Focus of the Study

Given that a similar beekeeper access debate is currently under consideration in each and every state, it would be a very large job to consider the relevant policy processes in each case. The ecological economic background to the beekeeping industries in each state have many unique features. Ecologies are different, the economic dimensions are different and the policy infrastructures vary across state boarders. Given this, and the orientation of the study away from deductive procedure, it was decided to focus the study on the access situation in the state of Tasmania. Tasmania is the most well defined case study for this research, given the predominance of leatherwood as the focus of bee foraging in areas under public administration. The industry is relatively small and very concentrated in the hands of the top ten beekeepers. The lessons from the Tasmanian situation, the issues at hand and the suggested processes for dealing with them are, however, generally transferable to other states. On this basis, the Tasmanian situation can be considered as a 'learning site' for the rest of the Australian industry and public lands administrators. The much larger scale and greater complexity of mainland operations, however, would recommend a very systematic policy development process and a higher level of stakeholder participation and empowerment. This report is aimed at specifying the focus and mechanisms of such a systematic approach.

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Honeybee Resource Security Policy Overview

An important foundation of commercial apicultural activity is access to the melliferous resources of forest lands. Beekeepers have traditionally accessed forests under crown ownership through a system of apiary site rights. Generally, private forest land is of much lower significance as a floral resource to beekeepers given the invariably smaller areas involved and often much lower density of botanically relevant species. Throughout Australia, access to conserved lands (State forests and National Parks) remains a central component of apiary productivity. Native forest areas are the most important source of large scale 'honey flows' (the production of honey from one predominate melliferous resource concentrated over the relatively short time frame of a single flowering cycle).

During the course of any year, a commercial beekeeper will typically access up to six different 'flows' to produce the annual honey crop. Of these various flows, those produced from conserved lands will usually be the largest (the exception being the occasional – and certainly irregular – production of clover honey from agricultural land or honey from specific monocultural cropping regimes). Forests provide both honey and pollen. Pollen is vital to the health of any honeybee colony and is central to the 'conditioning' of hives prior to or following managed crop pollination activities.

Background to Beekeeping

For virtually the length and breadth of civilisation, honeybee colonies have provided an (albeit unwilling) source of honey for human consumption. The first authenticated record of men pursuing bees is a cave painting in Spain, dated at around 8,000 years before the present era. The management of honeybee colonies for honey production is a more recent innovation. It is certain that the ancient Egyptians kept bees specifically for this purpose (at least 2,500 years before the present era). The keeping of bees in movable comb hives (essentially the definition of 'modern beekeeping') is a legacy of the innovativeness of Lorenzo Langstroth who patented a hive in 1852 which remains in widespread use today.

Tradition, therefore, has a long history in the beekeeping industry. Traditionally, bees have been kept exclusively for honey production. The by–products of honey production include beeswax, queen bees and bees themselves. All three by–products constitute inputs into the managed honey–production process. Beeswax is also sold outside the beekeeping industry for various other uses. Pollination may also be regarded as an output of the hive. Its value to society probably far outstrips that of honey (Gill 1991). Indeed, the traditional application of beehives for honey production is under serious 'threat' in many parts of the world, particularly in the USA and New Zealand. It is now commonplace, at least in the former country, for beekeepers to devote themselves (and their hives) entirely to the servicing of pollination contracts and to consider honey as a by–product. Why this should be and whether this is likely to happen in Australia are prominent industry concerns.

Pollination

Whether recognised for their efforts or not, bees have always pollinated plants. The honeybee (*Apis mellifera*) is a successful, if not the most effective, pollinating agent for a large range of crops. In Australia, it is usual for beekeepers to receive no payment for pollination services provided to growers of commercial crops. Beekeepers may consider themselves sufficiently rewarded by the honey product derived from such crops. The parties to a 'non–market' pollination contract may be unaware of the nature and magnitude of the pollination benefit being conferred. This may be due to ignorance on the behalf of the involved parties and/or to a dearth of technical information regarding the specific pollination benefit.

To further complicate the issue, bees do not need to be managed by man to confer pollination benefits. 'Feral' or unmanaged honeybees are capable of pollinating plants within flight range of a hive. Growers may advertently or inadvertently depend on this source for crop pollination. Apparently, many, if not the majority of, growers of pollination–dependent crops depend on such pollination in Australia and in other parts of the world where 'feral' honeybee populations are large.

There are, therefore, three identifiable kinds of honeybee pollination:

(i) pollination provided on a **contractual basis** by beekeepers to a grower for a specified contract fee;

(ii) pollination provided **incidentally,** at no charge to the grower, by commercially managed colonies engaged in honey production; and

(iii) incidental pollination provided by **feral** honeybee colonies at no charge to the grower.

The Australian pollination services market is currently characterised by a preponderance of types (ii) and (iii) pollination.

Feral and managed honeybees are equally capable of pollinating plants. Where feral bee populations are high, incidental pollination may (but in practice is never likely to) completely satisfy a specific crop's pollination requirements. However, the pollination requirements of some crops (such as almonds) are unlikely to be satisfied by anything other than managed pollination. Where crops are grown in large scale monocultural conditions, such as almonds in California and the Riverina and some large–scale cucurbit operations in Queensland, managed colonies of bees are usually required. Viable commercial pollination markets also exist where feral bee populations are low or nonexistent because of widespread pesticide usage and/or bee disease and parasite infestations. The active pollination markets in Washington and Oregon in the USA may at least partially be attributed to the prevalence of Varroa mites in those States (D. M. Burgett 1988, personal communication). Varroa is known to virtually eliminate feral bee populations and impose additional management and cost requirements on commercial operators. Though currently absent from the Australian system, the limited success of quarantine arrangements in the USA to contain the spread of this and other bee diseases would suggest at least caution against complacency in domestic containment policies.

The pollination services market is not as active anywhere in Australia as it is in parts of the USA or in New Zealand. Active domestic pollination markets exist for the almond crop in the Riverina region of New South Wales and Victoria, the commercial seed production market in Tasmania and Victoria, large–scale monocultural cucurbit operations in Queensland, for isolated pome and stone fruit growing areas in all States, and on a more sporadic (and informal) basis for a diversity of other crops. Nevertheless, grower and beekeeper interest in the pollination services market is growing.

The stature of honeybee pollination as an issue of social significance is evidenced by several recent investigations. In its report on the biological control of Paterson's Curse, the Industries Assistance Commission (now Industry Commission) noted submitted evidence suggesting that the eradication of that important nectar source would subsequently reduce the amount of managed and unmanaged pollination provided by bees as bee populations decline in response (IAC 1985, p. E.12). The IAC noted substantial difficulties in estimating the value of the pollination benefit to agricultural industries. Nevertheless, for its best estimate of the value of pollination, the benefits of biological control were estimated to exceed the various costs (including that associated with lost pollination). The Tasmanian Department of Parks, Wildlife and Heritage recently convened an investigation into the implications of barring managed honeybees from World Heritage Areas. One of the primary costs of any such exclusion is claimed to be reduced pollination. Similar debates regarding beekeeper access to national forests are underway in other States.

In a more recent analysis, this author (Gill 1991), using an economic surplus approach, estimated the annual value of domestic pollination to be around $1 billion. This estimate was based on the value of the supply shock across all pollination–benefited crops arising from the hypothetical exclusion of all pollinators (of which honeybees are the most significant). Much of this valuation would be attributable to the activities of ‘feral’ honeybees and to incidental pollination.

The technical literature pertaining to the agronomic benefits of managed honeybee pollination is large. Six international pollination symposia have been organised since 1960 to serve as fora for consideration of plant–pollination technical relationships. A recent appraisal of the technical literature undertaken in conjunction with this study revealed over 300 articles pertaining to the results of field pollination trials since 1970. Australian researchers are active in this field. (Notable publication and dissemination fora include the proceedings of a Pollination Symposium hosted by the New South Wales Department of Agriculture at Dubbo in 1981, producer–orientated publications, and industry conferences such as the recent International Bee Congress in 1988 and Second Australian Conference on Tree and Nut Crops in 1988.) A publication by the United States Department of Agriculture (McGregor 1976) provides a summary of the advantages of managed pollination for commonly cultivated crops. This publication is probably the most widely referenced source of pollination recommendations in the world at present.

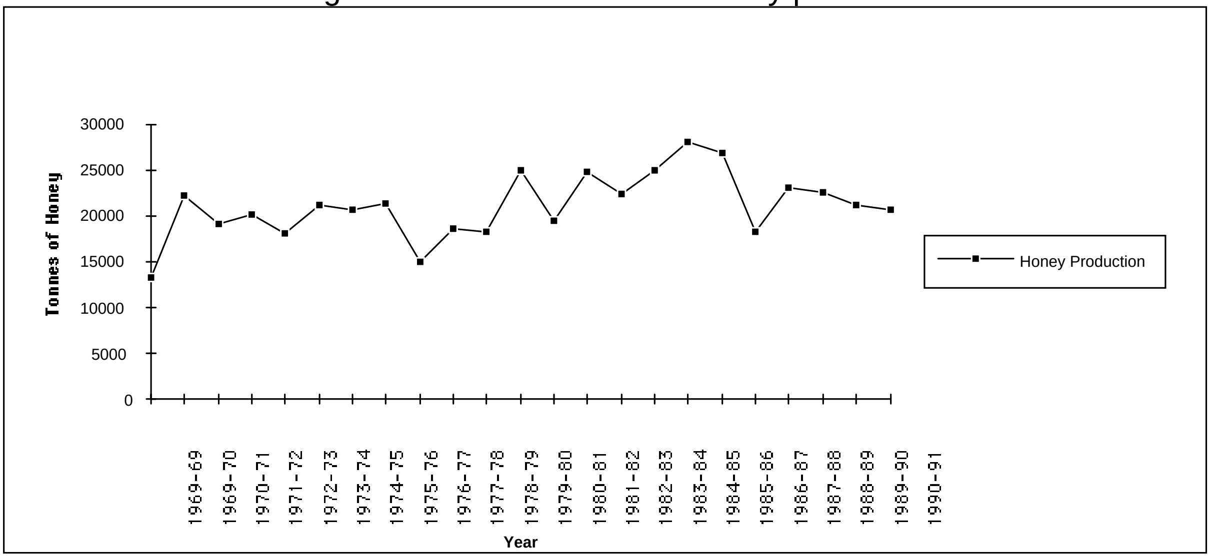
Honey Production

Honey production remains the primary focus of the Australian beekeeping sector. The Australian environment is, generally, particularly well–suited to this activity with local producers averaging around 80 kilograms of honey per hive per year compared with only 30 kilograms in California and even less in other states. However, as will be discussed later in this section, the profitability of this activity appears to be low, with break–even honey prices never far from actual market values. Record low returns during the 1980s prompted an Industries Assistance Commission Inquiry into the state of the market and consideration of possible avenues of government assistance (IAC 1984). It is pertinent that one of the major recommendations of that Inquiry was that the industry should focus on developing an active market for pollination services as a diversification from complete dependence on the relatively volatile market for honey. Most of this volatility is induced by price movements in the world market into which the majority of Australian production is sold.

As is evident from Figures 2.1 and 2.2, the honey production sector is approximately stable (there is no real evidence of growth or decline) in terms of total honey production and number of producers. An apparent decline in hive numbers from 1985–86 by 31 per cent and a corresponding decline in honey production over the same period (of 26 per cent), must be interpreted in the light of a change in the Australian Bureau of Statistic's statistical base in 1986. Following that year, only operators with an Estimated Value of Agricultural Operations of $20 000 or more have been included in the statistical data base. Prior to 1986, all producers with 40 or more hives were included.

Figure 2.1

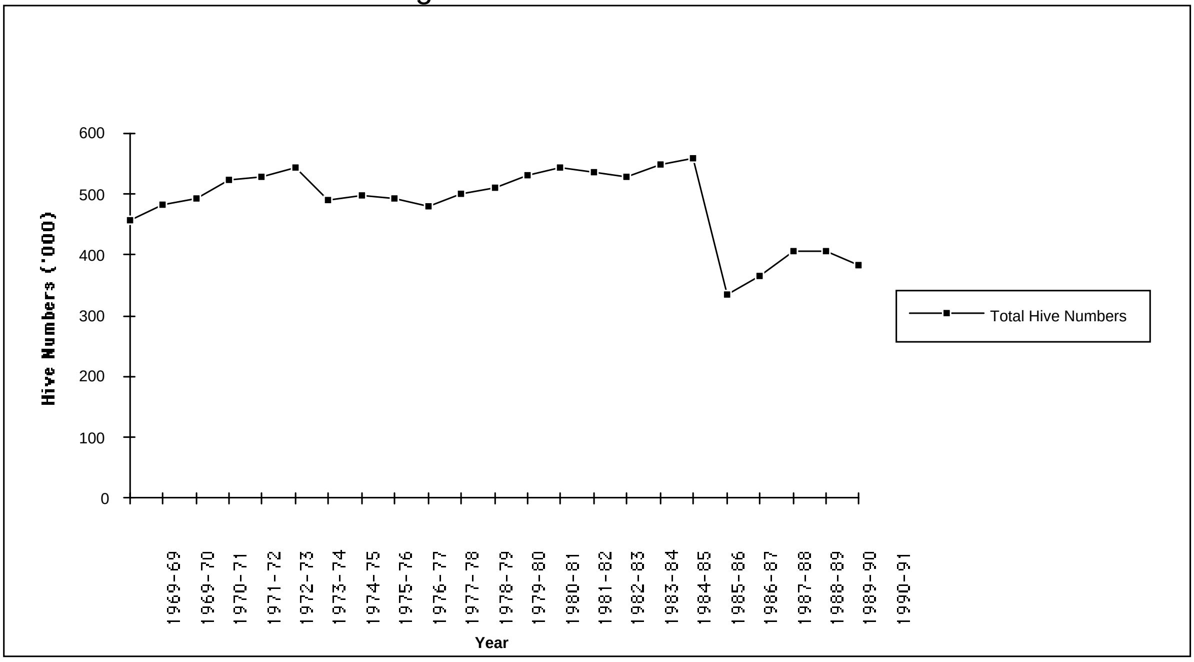
Long–run trends in Australian honey production



Source: Australian Bureau of Statistics 1992, *Livestock and Livestock Products, Australia, 1991-92*, Canberra.

Figure 2.2

Long–term movements in hive numbers



Source: Australian Bureau of Statistics 1992, *Livestock and Livestock Products, Australia, 1991-92*, Canberra.

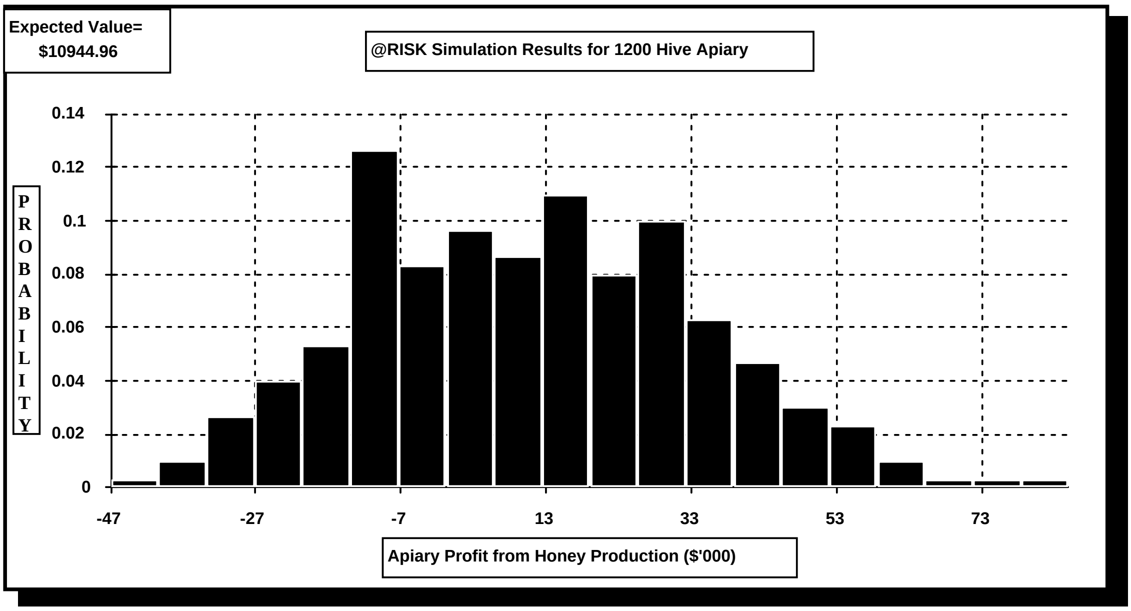
Another influence underlying the apparent sharp decline in hive numbers from 1986 may have been the major slump in honey prices at that time and the tabling of the IAC's report recommending no increase in assistance to the industry. A probably coincidental increase in honey prices commenced soon after that period and has been more or less sustained since.

Commercial apiary size tends to range from 100 hives to more than 1 200. The major parameters over which the operator has little control are honey price and yield. Another major parameter is the distance over which hives are transported in a year, which generally ranges from 5 000 to over 60 000 kilometres. Choice with respect to this parameter is essentially seasonally–dependent. Producers must balance the extra costs associated with more extended travel against the usually increased access to suitable honey 'flows' that travel affords. In rare cases, the carrying capacity of flora local to the home base apiary may be sufficient to yield a commercial output of surplus honey throughout the year. More usually, a beekeeper will need to 'migrate' his or her hives to various, often distant, suitable sites throughout the year. An average annual travel distance of around 60 000 kilometres is not unusual (B. Gulliford 1989, personal communication).

Apiary operation profitability was considered in detail through two previous reports by this author (Gill 1989 and 1993). Total apiary profitability for various sized operations was simulated across the feasible ranges for every key operating and market variable. As a general observation, apiary profitability and resilience against variable prices, input costs and seasonal conditions increases more or less in direct alignment with size (measured in terms of hive number). A simulated profit spread for a 1200 hive apiary is presented in Figure 2.3. Prospective returns could feasibly range from a loss of $42000 to a profit of around $70 000. The statistical mean across this range is only $10 945. The main factor underlying this variability is, of course, uncertain season quality (mainly the availability of nectar and pollen). The respective simulated mean profitability of a 700, 400 and 100 hive apiary was -$8762, -$9688 and -$11 044; all losses. These statistics, however, overlook the admirable innovative capacity of operators to reduce operating costs through building their own plant and reducing maintenance costs through dedicated 'in house' servicing. The relevant cost savings can be significant; enough to produce small profits where losses would otherwise be statistically expected. The fact remains, however, that the returns to honey production will always be variable and often marginal except for very large operators.

Figure 2.3

Simulated honey profitability results for a 1 200 hive apiary



Overview of Beekeeper Access Arrangements to Conserved Forest Areas

In each state, the major forest areas of significance to beekeeping are under the control of respective forestry departments and the National Parks and Wildlife Service. Access policies vary in each state across these organisations, though in general, it can be claimed that access to state forestry department lands is much more open that those under NPWS control. The NPWS is allowing restricted, continuing access to beekeepers in both Victoria, Queensland, Tasmania South Australia and Western Australia. In NSW, the NPWS which controls around 25 per cent of that State's forested area, has a policy to remove commercial beekeeping activity from those areas under its jurisdiction. Existing apiary sites can not be transferred and will lapse with the death of the lessee. No new sites have been offered since 1989. Limited access to NPWS controlled forests in Victoria and Queensland is enabled subject to specific requirements and under specific circumstances. NSW is the only state with a policy to completely remove beekeeping from conserved areas. The State of Tasmania faced a similar policy prior to the implementation of the current Tasmanian Wilderness World Heritage Area Management Plan in 1992. The experiences of the Tasmanian beekeeping industry and the relevant land management authorities to negotiate a more flexible plan for beekeeping access is worthy of some closer attention. The lessons from that experience will support the stakeholder driven policy procedure advocated in this report for other states.

Overview of the Beekeeper Access Situation in Tasmania

The Tasmanian beekeeping industry is, unusually, focused around one specific floral resource above all others: leatherwood. Another major feature is the small number of commercial scale beekeepers operating in that state. Around ten beekeepers account for 60 per cent of all hives, a greater proportion of total state honey production and for sixty per cent of all hives used in commercial pollination. Honey produced from the leatherwood tree (*Eucryphia Lucida and Eucryphia milliganii*) accounts for 60 to 70 per cent of Tasmanian honey production (the remainder being ‘white honey’ derived from blackberries and clover).

Leatherwood honey is very distinctive in appearance and taste, commanding a price premium in the honey market. Leatherwood grows in both State Forest areas and in the Tasmanian Wilderness World Heritage Area under the control of the Department of Parks Wildlife and Heritage. Of these various public lands, the latter is by far the most important in terms of total leatherwood honey production. The WHA and adjoining conservation areas account for 80 per cent of Tasmania’s leatherwood honey. There are around 45 apiary sites operated in the WHA itself.

The relevant regulations controlling beekeeper access to the WHA are detailed in the Tasmanian Wilderness World Heritage Area Management Plan (1992). The main points are listed below.

- Commercial beekeeping will be permitted to continue where roads and vehicle tracks remain open.
- Where closure of a vehicle track for management purposes would involve loss of an apiary site, a replacement site will be provided if available on Crown Land. This may be within the WHA if pre-existing disturbed sites, such as roadside quarries, are available.
- Apiary sites will be limited to those already in use or disused roadside cuttings, quarries etc.
- Consideration may be given to the establishment of one or more additional apiary sites if there is a proven nectar resource and existing road access which is to be retained.
- Each apiary site will be subject to a standard six year licence agreement that specifies conditions under which the site is to be managed and operations conducted.
- Under the supervision of the Department, machinery may be used to maintain the surface of sites where this is necessary for safety reasons.
- As far as practicable sites are to be screened from passing traffic.
- Site licences may be transferred to beekeepers registered with the Department of Primary Industry with the approval of the Department.

This schedule of conditions meets with the full approval of beekeepers operating in the State and was, significantly, largely a product of skilled and dedicated negotiation on the part of the Tasmanian beekeeping community during the development of the management plan. This research project encompassed a series of personal discussions with the spectrum of stakeholder representatives who were directly involved in this negotiation process.

To achieve the preceding ends, the management plan involved the tabling of all available scientific research regarding the ecological impact of managed honeybees in the areas under consideration in addition to reports on the economic impact of a beekeeping industry that would essentially fold in the event of an excluded access policy outcome. Scientists, resource managers, beekeepers, environmental lobby interests and policy administrators considered and shared their different perspectives on the issues at hand. Key success factors underlying a favourable outcome for beekeepers included:

- a united, strategically astute and very well organised representation from the commercial beekeeping sector;
- lack of definitive scientific evidence to support the exclusion of honeybees from the WHA;
- the availability of objective economic evidence to document the social contribution of beekeeping activities centred on continued access to leatherwood resources; and
- a land management administration with an inclination to consider all points of view.

Of all these factors, the last was probably the most instrumental to the observed outcome. The Planning process involved a much higher degree of stakeholder representation and involvement than has been the case, say, in New South Wales. This result may be largely the result of greater facility through smaller, more accessible, stakeholder groups. It may well be that smaller communities have an advantage in negotiations of this nature where the interfacing between different interest groups is enhanced through smaller group sizes.

The extension of such a successful negotiation process to a larger community (like NSW) requires a higher degree of innovation with respect to facilitating communication between relevant, invariably more isolated and dispersed stakeholder groups. In other words, the recommended process of stakeholder negotiation will need quite a different management structure and approach in small as opposed to large communities. The import of this claim is the subject of the remainder of this report and the specification of some guidelines for large community stakeholder negotiation is its major aim.

Summary of Beekeeper Concerns

As has been demonstrated earlier in this chapter, beekeeping can rarely be regarded as a financially lucrative endeavour. Beekeepers tend to remain in the business more because of important lifestyle considerations and the prospect of the occasional very good season. Lifestyle considerations are never to be underrated because they are somewhat difficult to represent in financial terms. Anything real enough to encourage long term persistence with what is often a marginally viable activity is deserving of central consideration in an industry planning context. Indeed, lifestyle and other aesthetic considerations are part of the all important holistic goal that is an at least implicit directive to guide the activities of beekeepers and most other primary producers. The nature of holistic goals and their importance as a planning focus is covered elsewhere, including Savory (1988) and Gill (1995 and 1996). The explicit consideration of the so called soft system aspects of resource management (including lifestyle considerations) are a central feature of the recent ecological economics framework to be discussed more completely in Chapter 4.

The prevailing concerns of beekeepers with regard to the existing resource situation are, therefore, from two sources: financial and aesthetic. First, on the financial side, reduced access to what was once a major resource for continued apiary viability is a universal concern. The usually variable and often marginal nature of apiary financial viability will be threatened further with reduced access to conserved forested areas. In fact, with the ever increasing dedication of new conserved areas under national park authority management, the existing loss of access can only be exacerbated in the future. When considering the long term prospects for their operations, this anticipated long term reduction in access will be an important factor in determining any inclination for handing on the business to future generations or even persisting with the activity into the shorter term. The importance of existing leased apiary sites in conserved areas is no less important to overall financial viability than is leasehold land to farmers operating on crown land. Those farmers, however, are benefited by a far greater degree of resource security than beekeepers.

As has been discussed at length elsewhere (eg. Gill 1991), the contribution of beekeeping to the welfare of the more general community is large. It was estimated that the net impact of a declining commercial beekeeping industry would be in the area of $1billion per year. This result is largely the product of reduced pollination activity, a major contribution of the beekeeping industry. Managed pollination services can only be efficiently performed by commercial beekeepers. Pollination is a skilled task requiring a high degree of professionalism and knowledge. It requires the kind of equipment and infrastructure than only a commercial operator can apply. The list of crops which require intensively applied pollination is long, including many oilseeds, stone fruit, nut crops, a large array of horticultural crops and commercial seed production. Without the services of beekeepers, most of these crops could no longer be produced. And that is not considering the unknown impact of a reduced beekeeping industry on the long term productivity of clover-based grazing pastures. White clover in particular, needs honeybee pollination for proliferation (despite the observed participation of other insect visitors in clover pollination, honeybees are arguably the most effective and prolific at the task).

The existing resource security situation is of greatest concern to commercial beekeepers (that is, that minority of beekeepers who make a full time living from the industry and who are, in the main, fundamentally migratory in operational mode). Non-commercial beekeepers tend not to be major users of leased apiary sites in conserved areas. Indeed, most non commercial operators rarely move their hives over significantly long distances (ie. their operations are largely non-migratory). However, most of the commercial pollination activity that is a fundamental component of horticultural and other crop productivity is almost exclusively serviced by commercial beekeepers. A major implication of reduced access to conserved land is then, reduced crop pollination and consequently, an extended impact on the more general agricultural sector and, in turn, society in general.

The impact of resource security concerns on the non-financial side of beekeeping operations is no less important, though is more difficult to quantify. At the most concrete level, a reduced sense of security with regard to traditional forest access will be instrumental in reducing the prospects for the intergenerational transfer of beekeeping businesses. Many beekeepers interviewed as part of this research, particularly in NSW, are already contemplating the termination of their businesses with retirement. Some are contemplating an earlier retirement to accelerate the wind-down process. The welfare implications of this kind of thinking are significant. Particularly in NSW, the policies of the NPWS have effectively precipitated the write off of any accumulated business net worth. And these policies have, unusually, not been accompanied by any element of compensation from the public treasury. It would be unimaginable that a similar removal of farmer access to crown grazing lands would remain uncompensated.

There is an apparent view that beekeepers displaced from some conserved areas will simply move elsewhere. The logistics and practicality of this thinking are open to some question. Over a very long time, beekeepers have secured and maintained the best apiary sites available. Sites are closely maintained by their lessees as a core productive asset. When displaced from traditional sites, the prospects for finding alternative available sites of a similar productivity may be very slight. Indeed, some larger scale Tasmanian beekeepers have claimed that the quality of their particular sites are central to defining the overall productive character of their operations. Beekeepers need to develop familiarity with the specific characteristics of each site and, through a long term learning process, creatively manage them to their maximum productivity. Certainly, the ecological ‘microenvironment’ for each and every site will be different. Beekeepers need to invest a great deal of knowledge and learning in order to manage them to the full.

At a more abstract, though no less important level, the essentially non-consultative nature of National Parks policy, particularly in NSW, has reduced beekeeper self esteem. Beekeepers see themselves as ‘practical conservationists’. This research has revealed considerable anecdotal evidence of the conservation motivations of commercial beekeepers and of their services to the maintenance of core environmental values in conserved areas. These may range from the obvious inclination to orientate all actions towards to conservation of those native bee forage sources essential to the long term viability of their businesses. It is in the beekeeper’s interest to conserve natural forested areas. Beekeepers have frequently reported and in some cases, have taken action to prevent the injudicious actions of others in these areas. Indeed, following discussions with officers within the Tasmanian Department of Parks, Wildlife and Heritage, it would seem that beekeepers and parks officers have developed a harmonious and synergistic relationship towards the aim of conservation. Some beekeepers have become an adjunct to limited Parks personnel resources ‘on the ground’ in forest areas; monitoring the actions of other park users and events such as fire and other natural disasters.

3
Review of Ecological and Economic Implications of Beekeeper Access to Public Lands

Scientific Implications

A number of researchers have investigated the impact of honeybees on specific ecologies. The central concerns for most of this research is to do with the hypothesis or assumption that , through their concentrated activity surrounding mobile apiary sites, honeybees are able to favour some plant species over others through ‘unnatural’ selective pollination. In addition, honeybees are claimed to displace native bees and other animals from their habitats and or display a competitive advantage in accessing natural foraging/food sources. Most of this research has applied a less than clear distinction between the activities of managed honeybees and so called ‘feral’ honeybees.

Managed honeybees are restricted to a limited area around approved apiary sites when moved into public forest land. In addition, managed colonies are rarely left at specific sites for longer than a few weeks and may not return until the following season or after a period of several seasons depending on the floral resources at hand and season quality.

Feral honeybees, on the other hand, may inhabit a specific site perpetually. Although still *apis mellifera,* feral honeybees are not under the control of commercial beekeepers. Feral honeybee populations are self replacing and may be augmented/sustained by uncontrolled swarming from managed apiaries. The distinction between commercial apiaries and feral honeybee populations is small in the minds of many scientists. The claim is that feral populations may well die out with the exclusion of commercial apiary activity from conserved areas. It is also reasonable to claim that most of the perceived ecological damage to the natural ecology is attributable to feral, not managed bees in that the former are in closer and prolonged contact with the areas of concern. Feral bees may also have a wider domain than commercial bees (given that feral colonies themselves will reproduce and spread).

Following discussions with beekeepers in Tasmania, the link between feral bee populations and managed bee populations may be more tenuous. In fact, some beekeepers have claimed quite distinct physiological differences between managed and feral bees in many places. Commercial apiarists pay considerable attention to the genetic makeup of their bees, invariably pursuing a program of specific selection for one or more desired characteristics (such as temperament, foraging efficiency or capacity to withstand cold climates). If the link between feral and managed populations was as strong as claimed by some, fewer physiological differences could be observed. This is not to deny, however, that feral populations will, on occasion, be augmented by swarms from managed apiaries. It is in the beekeeper’s best interests, though, to prevent swarms at all cost. After all, a swarm is equivalent to the loss of ‘livestock’ or the key productive assets of the business. Good management is very much focused on the prevention of swarming. It is also a fact that apiary sites on public lands are invariably operated by commercial beekeepers; beekeepers who depend on beekeeping for a living.

An overview of scientific research on the impact of honeybees on natural ecosystems was undertaken by Seeman (1994). The detail of that review will not be repeated here. By way of summary, the major claims for ecological damage imposed by commercial beekeeping activity in conserved areas include:

- over zealous predation on limited nectar and pollen resources;
- displacement of native bees and other insects by honeybees;
- unnatural selection of some plants over others through selective pollination;
- competition between honeybees and native animals for natural cavities;
- hybridisation of native plant species;
- provide a vehicle for the spread of pests and pathogens; and
- vehicle movement spreading pathogens and damage to conserved land.

Despite considerable research on each of these claims, none have been supported by conclusive evidence. Ettershank and Ettershank (1993), for example, examined the distribution of native bees in Tasmanian wilderness areas and found little correlation between populations in 'beekeeping areas' and other areas. Similarly, Paton (1993), found no evidence to support the displacement of native animals by honeybees in banksia heathland areas. Similarly inconclusive results have been reported by Smith and Hume (1984), Pyke and Balzer (1985), Hamilton (1988), Wapshere (1988), Lawler and Oldroyd (1994) and Oldroyd et al (1994).

Even if conclusive evidence of detrimental ecological impact could be presented, those results could not realistically be extrapolated to areas other than the site of the specific research. Given the unique nature of each and every apiary site under consideration, it is unlikely that observations or documentary proof for one area could be directly relevant to any other. In all cases, the fundamental complexity of ecological relationships will continue to elude the derivation of conclusive scientific evidence to exclusively support a policy to terminate apiary site arrangements. A policy to exclude bees is more likely, therefore, be based on political sentiment rather than irrefutable scientific evidence.

Economic Implications

As was outlined in Chapter 1, there is more to an accounting of the implications of changed resource security arrangements than the simple money value of foregone apiary productivity. Clearly, the flow-on effects from any changes to access arrangements will have economic and socio cultural implications. And those, in turn, will feedback to stimulate a new evolutionary path for the industry. It is the integrated impact of a policy change that matters. To develop an understanding of this, an holistic accounting of effects needs to be undertaken. A recommended process for integrating ecological, economic and sociocultural impacts is presented later in this report.

Before turning to that more comprehensive analysis, it is relevant at this stage to mention the results from some more traditional or partial economic analyses. Both were undertaken in association with this research project. The first was an assessment of the social impact of a beekeeping industry disabled through the removal of access to all public lands (including state forests where access arrangements are not necessarily under threat). The ensuing financial impact comprises loss of honey production and reduced pollination contribution. By far the greatest impact would be from the latter, amounting to around $1.2billion every year. The market value of the national honey crop, by comparison, is only around $65million. For the State of Tasmania, a policy designed to remove existing access arrangements would generate a social loss of up to $28million assuming that 78 per cent of beekeepers currently involved in commercial pollination activity decide to leave the industry as a response (Butcher 1991).

The Need for a Fresh Approach to Resource Policy

The preceding partial economic assessments are subject to a large number of (often disguised) qualifications. Perhaps most importantly, as with the previously reviewed ecological investigations, many of the key facts are simply not known or are, in fact, unknowable. For example, no one knows how many beekeepers would retire their operations in response to adverse access policy changes. No one can ever determine the relative contribution of paid and unpaid (ie. feral bee) pollination to aggregate state or national crop yield. Many important effects simply cannot sensibly be reduced to the common denomination of money values. Things like the impact of a major change in desired lifestyle, reduced self esteem and so on are effectively ignored (better ignored than subjected to some kind of money equivalent valuation that only serves to demonstrate the artificiality of the economists' perception of reality). The economist's procedure for this kind of 'social valuation' is, like that of the traditional ecologist working with his or her artificially constrained selection from a bigger complex reality, based on theoretical assumptions that are often highly dubious or unrealistic. However, this kind of partial analysis remains the convention for traditional policy planning purposes. The results of partial analysis often take the focus of the empowered policy maker away from the real issues. In this case, the social dislocation ensuing from the removal of traditional access rights deserves as much attention as reduced 'economic surplus' (however crudely determined). Yet the black and white economist's and ecologist's summary will often bury the more agonising issues to the detriment of the social/ecological harmony that *is* the major responsibility of policy makers to uphold.

The preceding comments are not meant, however, to imply the worthlessness of economic and ecological assessments. It is the way the information from these sources is contexted or considered within the bigger picture of ecological economic and sociocultural reality that is the problem. The tradition is to undertake a scientific or economic investigation from within the narrow perspective of the specialist. Only those bits that matter to the scientist or economist concerned are considered in their respective investigations. There is no element of cross disciplinary learning or knowledge sharing. And there is invariably precious little involvement of the key stakeholders who are behind the problem and will be the key victims of poorly considered policy outcomes. The tradition is to leave the decisions to the policy makers. The role of the specialist or expert is to simply present a well documented accounting of his or her side of the picture. The problem with this is the fact that specialists can learn from other specialists working in different disciplines through bringing in fresh or unbiased insights. Cooperation from the outset can improve the relevance of scientific and economic investigation. And all specialists can learn from and develop the respect of the key beekeeper stakeholders.

Under traditional policy decision making arrangements, the policy maker's role is to be an 'end of the line' dispassionate integrator of facts. The individuals concerned are expected to integrate reality from a piecemeal series of artificially bounded investigations and lobbying efforts. This process is flawed from the outset. The reintegrated picture will simply miss out on that system detail that binds ecological, economic and sociocultural influences together to describe observed reality. Without that detail at hand, policies will be developed on the basis of an at best abstract understanding of the situation to be managed. Ensuing policies will only be approximately appropriate.

One of the most important outcomes of any collective stakeholder driven process are the shared insights or group learning developed through cooperation. These cannot be completely ‘passed on’ to a remote decision maker. That is why the group itself must be empowered to make the relevant decisions. Otherwise, the ensuing policies will earn the empathy of only some stakeholders and the permanent exasperation of others. This describes the existing NSW situation well.

Policy should be a collective, stakeholder driven process, from start to finish. Every task should be integrated within the overall resource decision making framework. Policy is a process for dealing with facts and impressions. Policy should be about the integration of ecological reality with economic imperative; all set within the context of the prevailing sociocultural environment. It must be assumed at the outset that some of the facts pertaining to any situation will never be known, those that are will change through time and are likely to be assessed, measured and appreciated quite differently across relevant stakeholder groups. There really is no good point for the experts and stakeholders to ‘hand over’ to an artificially isolated policy maker; all should be involved collectively throughout and following implementation. What is missing from conventional policy analysis and certainly from this beekeeping resource security debate, is a structured approach to ensure the holistic consideration of everything that matters to the situation at hand. A recommended approach is outlined in the following chapters.

4
Developing an Understanding of the Players Involved in the Beekeeping Resource Security Debate

The Need for an Holistic Transdisciplinary Perspective

One very fundamental distinction that characterises and separates the alternative environmental policy frameworks, and certainly the actions of individuals and organisations involved in the beekeeping resource security debate, derives from a philosophical belief. This distinction is between an anthropocentric and an ecocentric view of the world. Eckersley (1992), considered the substance of these philosophical positions. Anthropocentricism refers to the belief that the environment should be managed in accordance with human desires and aspirations. Human welfare is paramount and all resource allocations should be aimed at the improvement, or at least the facilitation, of human welfare goals.

The ecocentric position involves an holistic appreciation of the environment where the promotion of human welfare must fit within a broader set of goals to do with ecological sustainability. This position ‘asserts the standing of the non-human world’ (Eckersley, 1992). This means that human welfare is considered on an equal footing with the welfare of other species and of the global ecology in general. Such a perspective is not the same thing as asserting that human welfare can only be improved or maintained through taking care of the global ecology. The latter is still an anthropocentric view (though a considerably more holistic perspective than that followed by some environmental policy makers and their advisers). The ecocentric view genuinely asserts the welfare of the non-human world. Preservation benefits are not translated back into human value terms. Policies orientated to the management of sustainable ecosystems do not need to be justified in terms of net impacts on human welfare. The Pareto model is rejected as are its attendant valuation instruments such as traditional benefit cost analysis.

These two extreme ecophilosophical positions imply quite different approaches to environmental policy making. Following Eckersley (1992, p. 29), the ecocentric position for example, is

noted for its greater willingness to advocate not simply a lessening in the growth rate of the human population, but also a long-term reduction in human numbers. Rather than directly address the matter of absolute numbers, the anthropocentric stream tends to direct attention to the social causes of population growth and argue the case for a more equitable distribution of resources between the rich and poor.

Another test for the differences between ecophilosophical standpoints is associated with the goal of wilderness preservation. Again, from Eckersley (1992, p. 29):

The ecocentric stream is noted for its greater readiness to advocate the setting aside of large tracts of wilderness, regardless of whether such preservation can be shown to be useful in some way to humankind. The anthropocentric stream, in context, tends to be more preoccupied with the urban and agricultural human environment. Large scale wilderness preservation tends not to be supported unless a strong human-centred justification can be demonstrated.

In practice, the distinction between these ecophilosophical standpoints is not as clear cut. Real-world environmental/resource management policies often involve various shades between these polar positions. The distinction is, however, sufficient to serve as the basis for a general classification of environmental policy positions or frameworks.

A classification of environmental policy frameworks

The following classification will serve as a general introduction to the various positions in contemporary environmentalism. Following Eckersley (1992), The principal schools of ecophilosophical thought are:

- Anthropocentricism;
- Resource Conservation;
- Human Welfare Ecology;
- Preservatism; and
- Ecocentricism.

The central features of each school of thought are represented in Figure 4.1.

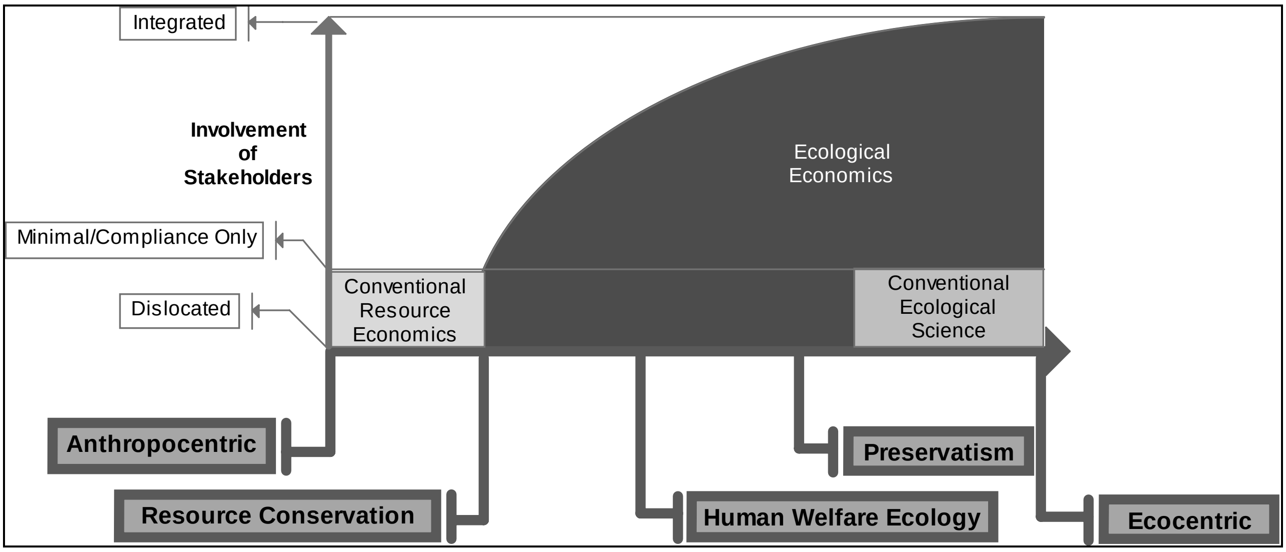


Figure 4.1. A classification of ecophilosophical schools

Unreserved anthropocentricism

This school or philosophy implies a completely human-centred approach to environmental management. There is no notion of conservation or preservation. Policies are defined in accordance with notions of pure ‘economic efficiency’. Resource allocations are determined only in accordance with money value weighted net social benefits. Such a philosophy involves an *instrumental* approach to policy decision making. This means that decisions are based only on the measurable facts as determined through the mechanical application of tools such as benefit cost analysis. This kind of philosophy is, fortunately, not a practical option for real economic systems (and would certainly not be sustainable over time). Even the most ardently anthropocentric resource economist would add some shades of grey to the preceding bleakly black and white policy prospect.

A feature of this school is that human material satisfaction is the only major goal of environmental policy analysis and resource management. Such an approach

...leads to the dwarfing of soft variables such as the aesthetic, recreational, psychological and spiritual needs of humans and the different needs of other life forms. (Eckersley, 1992, p. 36).

Resource conservation

This school is orientated to the maximisation of the output of economic goods per unit of human labour. It is one step removed from the preceding unreserved or unrestrained development approach to resource management. The human world continues to be regarded exclusively in human use-value terms. Resource use is expanded until all 'waste' or unused resources are eliminated. The overall aim is full-capacity utilisation of resources. Underutilised resources are regarded as evidence of inefficient resource management.

Sustainable development is interpreted as the maintenance of the natural resource base for human use. Resources are conserved or 'husbanded' to facilitate sustained human use.

Technological development is perceived to hold the promise of containing and even reversing the current global ecological 'crisis'. In Figure 4.1, this position is presented as the stopping point for conventional resource economics along the ecocentric scale.

Human welfare ecology

Human Welfare Ecology is a late 20th century perspective. It explicitly recognises that human welfare is contingent on the containment of ecological problems such as toxicity, global warming, and the diminution of non-renewable resources. The goal is for a cleaner, safer and more pleasing human environment. Such a view may be regarded as a case of enlightened self-interest. For the first time, environmental quality is considered as a goal for policy makers. The perspective places importance on sustainable development, which is defined as the maintenance of the natural resource base for human production. Sustainable development also extends to the maintenance of biological support systems necessary for human reproduction.

Unlike the preceding schools, Human Welfare Ecology includes some 'soft' variables such as health, amenity, recreational and psychological needs of human communities. It is recognised that technology alone cannot deliver humans from the ecological crisis. A theme is the search for more ecologically benign lifestyles. Though conventional resource economists might feel some empathy with the insights from this perspective, the persistence of a valuation focus will preclude any sensible consideration of the important 'soft' variables that are a feature of the position. The 'market focus' or economic efficiency foundations of conventional resource economics prevent its extension this far along the ecocentric scale.

Despite all the preceding concerns for the environment, this perspective retains a fundamental human-centred orientation. As suggested previously, the key description is 'enlightened self-interest'. This implies little attention to protection for those species or resources that are of no present or potential use or interest to mankind. Human kind is still regarded as a species essentially removed from the global ecosystem. Such a viewpoint supports the notion that environmental management can take the form of a direct-and-control process. The implication of such a viewpoint is that human-ecology feedback processes can be corrected 'down the track' if needs be. The reality is that human-ecology interactions are dynamic and complex. The associated level of complexity is often beyond the capacity for any precise understanding. The dynamic aspect implies that control mechanisms become redundant or produce secondary effects that must in turn, become the subject of later correction efforts. The implied direct-and-control approach to resource management is, at best, a more arbitrary and involved process than seems to be recognised by practitioners operating within this particular ecophilosophical school. The complexity of environmental management and policy control would be better understood if the human system was considered as an integral part of the global ecology (as is the case with the truly ecocentric perspective).

Preservation

Adherents of this school of thought are characterised by a general reverence for the environment. Such sentiments are a feature of much of the current 'green movement'. Wilderness preservation campaigns and environmental lobbying are a feature of Preservation school environmental policies. The moral standing of the non-human world is questioned and asserted. Non-human species are considered to be valuable in their own right. Such a definition, presumably, applies equally to living and non–living 'resources'.

Despite its environmental orientation, the preservation school is still a human–centred perspective. Preservation is justified from a human welfare orientation. The objects of preservation are often selected through returns to human welfare. Wilderness tends to be preserved for its 'scenic beauty' benefits or human aesthetic returns. Such an orientation may prejudice against other genuine ecological imperatives such as the preservation of 'unattractive' natural deserts or 'non-cuddly' animals. Again, this perspective is non-holistic in orientation. A genuinely holistic perspective would consider all non-human resources and species as potential candidates for preservation. In addition, the holistic view would focus on the interactions between those resources and species (including humans). Some more sophisticated elements of the contemporary 'green movement' are evidencing holistic considerations of this nature.

The preservatism perspective is not well serviced by either conventional resource economics or ecological science. This could explain why practitioners in both these conventional professional circles seem to have considerable difficulty dealing with 'environmentalists' or, more precisely, in treating their concerns as legitimate. Economists, for example, seem to be incapable of recommending preservation for preservation's sake. There has to be an economic efficiency justification. From the perspective of the ecological scientist working towards ecological preservation, humans have no place in the natural ecosystem. Ecological economics, on the other hand, unencumbered by an inflexible economic efficiency foundation and recognising the place of humans and their aspirations in the natural world, is an appropriately accommodating perspective.

Ecocentricism

Ecocentricism is the polar opposite to anthropocentricism. This is the perspective of the ecological scientist, where the integrity of the natural ecosystem is all important. Humans enter the equation only through the necessity to consider the impact of their activities on ecological balance. Policies generated through this perspective are aimed, first and foremost, at the preservation of the natural environment. Policy recommendations seek to minimise or control human impact.

Despite the uncompromising ecology first attitude, the ecocentric perspective does not need to be anywhere near as partial as its anthropocentric counterpart. In fact, given the finite nature of ecologically derived resources available for human use (and ultimately, human survival is totally dependent on these), it can be claimed that attention to ecological integrity will inherently imply the best prospects for long term human survival. That humans still enter the equation is a function of the unavoidable fact that the practitioners of ecological science are themselves representatives of that race. In other words, human survival is implied, as would be the case for any other animal or plant species. Ecocentricism is still a human perspective. The implementation of ecocentric philosophy involves the activities of human resource managers, even if that is only to exclude mankind from specific natural areas.

Ecocentric policy practitioners should recognise the interactions between humans and the non–human ecology. They also should recognise the interests of future generations of humans and non-humans. There is no unique attribution of intrinsic value to the human world. All species and other environmental resources have value only as connections in the global ecology network. All organisms are not simply interrelated with their environment, but are also constituted by those relationships. In other words, species are a product of their interaction within the global ecology. To understand those relationships, an exclusively holistic perspective needs to be applied. Systems are more than the sum of their parts. The behaviour of system components is described by more than the sum of the behaviours of the constituent species. The system imparts its own influence on behaviours and performance. The global ecology is considered to be an intrinsically dynamic, interconnected web of relations in which there are no absolutely discrete entities and no absolute dividing lines between the living and the non-living, the animate and the inanimate or the human and the non-human.

Ecological Economics As an All Encompassing Perspective

The failings of resource economics

As will be noted from Figure 4.1, ecological economics covers a much broader range of ecophilosophical positions than either conventional resource economics or ecological science. It is proposed in that figure that ecological economics takes off from that point where the inadequacies of conventional resource economics become most apparent. It is also implied in Figure 4.1 that the ecological economics domain does not include the territory between unreserved anthropocentricism and the resource conservation position. This is a reasonable proposition as the latter represents the absolute minimal degree of holism necessary for sensible environmental policy making. Anything less is simply too destructive in terms of accommodating a sensible consideration of human impact on the finite natural resource base. That the human first, develop at all costs focus implied by these highly anthropocentric positions is destructive is easy to verify when the history of human resource policy making and its impact is considered. It is not a good record.

Practitioners of conventional resource economics would be likely to claim that their efforts are no where near as uncompromising or inflexible as implied above. They will claim an understanding of the subtleties of human ecology interaction and will also recognise the sensitivities of human cultural considerations in devising their recommendations. All these sentiments may well be true, but the tool box used by those practitioners does not service these 'soft' considerations. Favoured tools like benefit cost analysis, contingent valuation etc., are ruthlessly anthropocentric in orientation. As a personal observation, there is usually more substance in the subjective qualifiers presented at the tail end the more insightful reports of resource economists than can be derived from their hard quantitative pronouncements. In other words, the tendency is for conventional policy making to always struggle against the tools that tend to be so revered. The fixation on valuation, which implies the need to be continually subservient to all pervading economic efficiency rules, always restricts the capacity of conventional resource economics to travel far up the ecocentric scale. At least partly because of the specialised and often arcane nature of their tools, conventional resource economists rarely engage in anything other than a minimal level of interaction with environmental stakeholders. The tradition is to limit stakeholder interaction through the mechanism of 'public inquiries'.

The fallacy of the public inquiry process

As an effective mechanism for managing stakeholder involvement in resource policy making, the public inquiry process is fallacious from the outset. For a start, the policy agenda is set by the relevant policy making officials, not by the relevant stakeholder community. As will be outlined later, the most valuable resource for the consideration of resource policy issues are the insights of interested stakeholders. Given the inherent complexity of all resource management situations, the very best that any policy process can achieve is a higher level of shared learning about the problem at hand. More effective management ensues from a more thorough understanding of the underlying processes of cause and effect. In a dynamic complex world, this understanding will never be complete and, with time, must be free to evolve. The public inquiry process is a very expensive and ineffective mechanism for the facilitation of learning. Most of the capacity for learning is derived through the spontaneous interaction of stakeholders collectively considering the relevant issues. The public inquiry process involves an absolute minimum of stakeholder interaction. In fact, public inquiries almost seem purpose designed to ensure that stakeholder interaction is avoided at all costs. Individuals are encouraged to consider their positions in isolation. The capacity for the evolution of ideas through sharing is restricted to that select group of policy bureaucrats empowered with the collation of individually prepared submissions. The public inquiry process asserts the hegemony of the centralised bureaucratic resource policy establishment. It also asserts the hegemony of conventional resource economists and ecological scientists as practitioners of non-holistic thinking. A less qualified group to observe and interpret the 'hybrid learning vigour' that should ensue from the conjunction of separately conceived insights would be hard to imagine.

As individual stakeholders are effectively dislocated from a healthy interactivity, little shared empathy with ensuing policy pronouncements will be generated. Those pronouncements will be the product of centralised deliberation. An important ingredient for the success of any practical resource policy must be a shared empathy with the need for control and with the specific control/management mechanisms proposed. There is no substitute for stakeholder involvement from start to finish. Not only that, stakeholders should be empowered with the development and specification of management solutions. The most sensible role for the policy bureaucracy is policy implementation and stakeholder group facilitation. Specialist economists and ecological scientists would then be *invited* to contribute to and share in the development of group learning. The specifics of this recommended process and some details about relevant planning/assessment procedures are provided through the remainder of this report.

The capacities of ecological economics

As legitimacy is provided to an increasing number of positions, the degree of holism implied for a policy investigation will increase. To make collective sense of the human welfare, preservatism and ecocentric ecophilosophical positions, more considerations and views need to be taken into account than would be the case for an exclusively anthropocentric focus. To further support the holistic cause, a movement from the anthropocentric to ecocentric positions is generally accompanied by an increase in holistic breadth. For example, to make sense of and interpret the thinking of those holding the preservatism position, a fertile mix of economics, ecological science and sociocultural awareness is required.

With the opening up of the policy domain to transdisciplinary cooperation, interactions between stakeholders and specialists will be facilitated to generate accelerated individual and collective learning. The final consequence will be a new resource policy perspective equal to more than the sum of its constituent disciplinary components. This is the nature of transdisciplinariasm. As suggested in Figure 4.2, transdisciplinariasm involves the harnessing of synergies from the conjunction of once artificially separated disciplines. It does not imply the merging of disciplines: there will still be resource economists, sociologists and ecological scientists. All that is implied is that these individuals will now be working together from the stage of problem specification through to the development of management plans.

It is necessary to distinguish the transdisciplinary focus from its more common multi-disciplinary counterpart. Multi disciplinary (or cross disciplinary) usually implies a simple element of cooperation between disciplines. Teams representing the different disciplines involved undertake specific tasks which are integrated by a project manager. A resemblance to the public inquiry process is no coincidence. Conventional resource economists would ordinarily be involved in multi disciplinary work. They use scientifically derived data in their modelling. Similarly, scientists may be inclined to input a few economics variables into their project reports. A ‘friendly’ economist may be

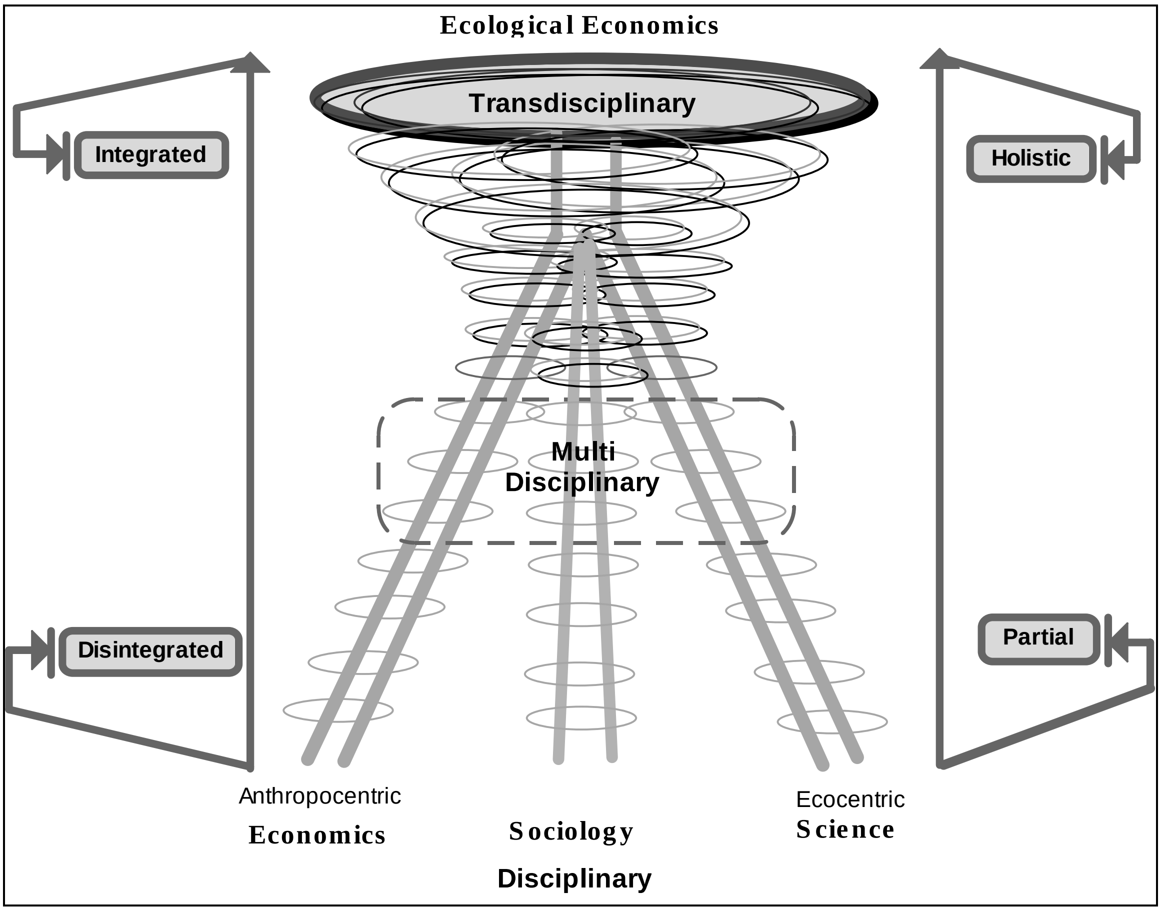


Figure 4.2 The Nature of Ecological Economics

consulted to do the necessaries. Any more profound degree of cooperation is usually outside the realm of multi disciplinary work. By definition, there is no element of methodological evolution specifically ensuing from that process of cooperation. The multi disciplinary participants stick with their familiar tools and processes; with the respective cross-disciplinary information needs being determined by the requirements of traditional established disciplinary tools and procedures.

Transdisciplinary cooperation, on the other hand, involves a far more integrated process for resource policy investigation. Problems are defined through the sharing of disciplinary insights. Processes for assessing problems are pragmatically developed through a similar cooperative process. Assessments are a joint venture. Results are a jointly derived product. All parties learn through cooperation. The relevant resource policy investigation is enhanced through a more than additive pooling of specialist resources. As a final claim, transdisciplinary work should not be possible without the integrated cooperation of relevant environmental stakeholders. The information needs and learning focus of transdisciplinary work cannot proceed without that degree of stakeholder cooperation.

The overriding fundamentally distinguishing feature of ecological economics is its transdisciplinary focus. Ecological economics is not defined by a particular set of analytical tools. Nor is it defined by the qualifications of its practitioners. It is not a support infrastructure for a single ecophilosophical position. It is defined first and foremost by its transdisciplinary focus.

The lack of a specific tool set is very confusing for some with an outsider's interest in ecological economics. Ecological economics writings appear to be often little different from those that might appear in the 'conventional academic literature'. Indeed, the surface level familiarity of ecological economics research reports has led some more conventionally located individuals to claim membership. That, however, will always be denied until the import of the transdisciplinary focus is understood.

As implied in Figure 4.1, ecological economics is encompassing of a wide array of ecophilosophical positions. It does, however, lean more toward the ecocentric end of the scale where the inherent requirements for holistic thinking are at their greatest. As a widely encompassing territory, ecological economics is well placed to handle environmental stakeholders embodying all reasonable ecophilosophical positions. No one ecophilosophical position is considered to be more important or relevant than another. Each is legitimate to its adherents. This self-perceived intra position legitimacy is, in effect, at the root of much contemporary environmental controversy. The anthropocentrically inclined feel little need to justify their human first, development orientated outlook. Similarly, more ecocentrically inclined 'environmentalists' assess the activities of others from their own ecology first philosophy. Nothing is more fundamental to the thoughts and actions of individuals than their own ecophilosophical position. And nothing is harder for those representing other positions to change. Ecophilosophical positions can evolve over time; but can at best be only indirectly changed by concerted policy.

Much of conventional resource policy is implicitly aimed at isolating non-compliant positions through regulation. Development first policies seek to isolate or remove the influence of anti development interests through the offer of resource rights invested through statute. Conservation first policies similarly seek to isolate or placate their ensuing anthropocentric 'victims'. The only possibility for working across ecophilosophical positions is the assumption of a transdisciplinary, stakeholder empowered cooperative policy process. Ecological economics was developed to facilitate this laterally different approach to resource policy planning.

Ecocentricity and sustainability

Unlike the more anthropocentric positions where the maximisation of human welfare is the ultimate goal for environmental policy, ecocentricity asserts sustainability goals above all others. Integrated ecological economic and sociocultural sustainability is also the major goal of ecological economics (Costanza et al. 1991).

Ecological economics shares with the ecocentric philosophy the notion that ecological integrity is on an at least equal footing with human welfare. The moral rights of non–human species are asserted. Such a perspective adds even greater responsibility to the activities of human resource managers. The fact that humans can 'make a difference' to the functioning of the holistic ecology means, in effect, that resource policy makers work as trustees for more than the welfare of their own kind. Such a philosophy predicates against the conventional resource policy approach of weighing the benefits and costs of planned actions in exclusively human value terms. Human welfare maximisation along the lines of the Pareto net social benefit model is replaced by a less precise and nebulous notion of ecological–economic or total system sustainability.

From an operational point of view, human resource management decisions must take account of general ecological impacts and not just those that 'feedback' in some way from a somehow separate ecology to impact on human welfare. Such an orientation would imply the application of systems thinking methods for policy analysis as opposed to traditional partial analytical techniques. The systems context is, by definition, orientated to the consideration of whole–system interactions. The behaviour of any system is at least partly described by the nature of the feedback processes linking individual system components. The disintegrated/reductionist approach of traditional resource economists tends to ignore many of these links (particularly in the area of ecology–market interactions) which may yield an incomplete or even fallacious assessment of policy instrument opportunities and outcomes.

Ecological economics is still a very new area. The underlying philosophies are appealing to many in the resource policy and conventional ecological science areas. The transdisciplinary orientation is accommodating of a larger array of environmental stakeholders. The substance of ecological economics will, however, only become apparent when the ideas of transdisciplinariasm are understood by all those who profess to belong. This report is an attempt to present a process for reconciling a heated and divisive environmental debate through a practical application of the ecological economics transdisciplinary philosophy. The remaining sections will be devoted to this aim.

The 'Ecophilosophical' Positions of the Participants in the Tasmanian Beekeeping Access Debate

The key players in the Tasmanian debate include:

- commercial beekeepers with sites in the WHA
- commercial beekeepers without sites in the WHA
- non commercial beekeepers
- the Tasmanian Dept. Parks, Wildlife and Heritage
- Forestry Commission Tasmania
- tourists
- the conservation lobby
- the natural ecology
- users of commercial pollination services
- users of non-commercial pollination services
- the general Tasmanian economy

All those groups listed above can be regarded as 'stakeholders' in the debate; ie. all groups with at least a pecuniary interest in the debate's outcome. Not all need to be directly represented in a 'round table' stakeholders' group (eg. the 'general Tasmanian economy' group could reasonably be represented through the political system and the natural ecology's interests are presumably represented by those various organisations empowered for its preservation. Beekeepers without a direct interest in continued access to sites in the WHA can express their concerns through their appropriate beekeeping organisations.

On the basis of discussions with all the preceding (human) groups, an attempt is made in Figure 4.3 to locate each on the anthropocentric–ecocentric scale. This allocation is, of course, subjective and is based only on the author's close questioning and observation of those involved.

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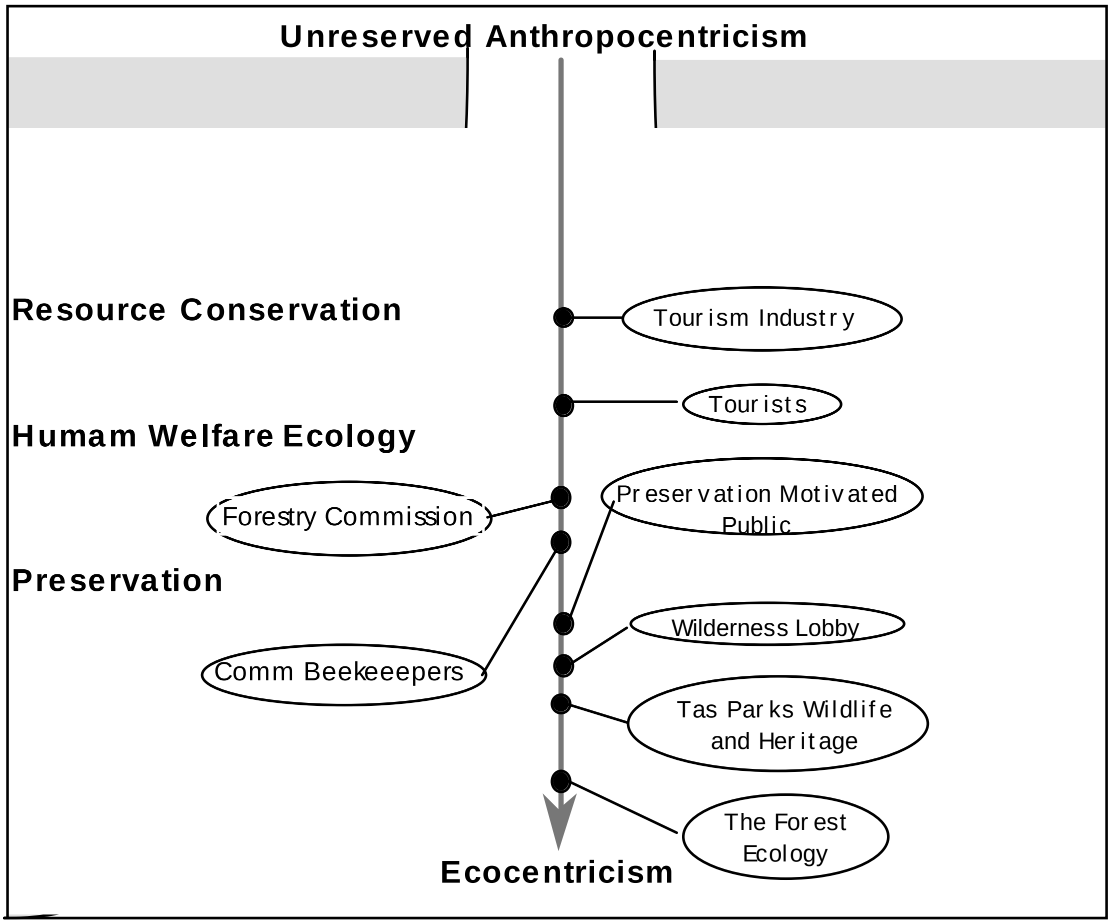

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Figure 4.3 Ecophilosophical Positions Relevant to the Tasmanian Beekeeping Access Debate

Discussion

The subjectively assessed degree of ecocentricism inherent in the public pronouncements and activities of the key players in the Tasmanian access debate is proposed in Figure 4.3. From this, it is suggested, at the very least, that the debate encompasses individuals and groups with a considerably varying degree of ecocentric inclination. This automatically calls into question any policy process which restricts itself to one position or stance over another. The guiding rule for policy making is to adopt as broad a perspective (ie., transdisciplinary) as possible. This follows the advice that the more transdisciplinary the policy stance, the more all–encompassing of the individual stakeholder positions the ensuing process will be. In other words, if a policy maker (ie., the final decision maker) were to adopt a relatively anthropocentric perspective, decisions would be made with only a limited or no accommodation of the concerns of those groups positioned further towards the ecocentric end of the scale. Similarly, a decision made from within the exclusive domain of the ecocentric perspective will not earn the empathy of those with more anthropocentric inclinations. It is important, therefore, for the actual ***policy process*** to be conducted in an holistic and interactively orientated manner. This will involve the recognition that that other positions exist in the debate and will encourage a more accommodating or carefully negotiated approach to decision making.

Another major aspect of the recommended holistic, transdisciplinary orientation for policy decision making is the need to consider the positions of the various stakeholders as ‘evolutionary’. A usual outcome from a well facilitated stakeholder driven policy negotiation process is some degree of evolution in ecophilosophical position. As the parties to the debate learn about each other’s positions or perspectives, the ensuing higher degree of understanding may well promote the voluntary or spontaneous movement of all participants further toward the ecocentric end of the scale. It is a challenge, but not impossible for a skilled facilitator to convince a particularly anthropocentrically inclined individual or group that their move towards a ‘resource conservation’ or ‘human welfare ecology’ position is actually in their best long term interests. It is very difficult, however, for any negotiation process to be so accommodating if the policy decision maker is not prepared to recognise the diversity of positions represented in the situation to be managed.

From all appearances, the debate in Tasmania seemed to have followed the recommendations presented above. The various stakeholders were party to a facilitated stakeholder driven process of negotiation where all participants learned at least some things from each other. Those scientists interviewed as part of this research, indicated some surprise in finding some very common interests with their beekeeper colleagues. In other words, these two groups came to learn about each other’s ecophilosophical outlook and found themselves to be rather closer together than might have seemed the case at the outset of negotiations.

The same cannot be said about the debate in New South Wales where a decision to close off access to beekeepers from conserved lands under NPWS control seems to have been made with little negotiation and certainly no element of stakeholder empowerment. The relevant decision making process seems to have ignored that fact that the various parties involved have quite different world views or ecophilosophical positions. There has been no attempt to negotiate across those positions or to develop management solutions acceptable to the majority. The ensuing closed access decision seems to have been the outcome of a bureaucratically exclusive planning process. That a decision with such obvious social and economic dimensions could be based almost solely on the grounds of (very inconclusive) scientific information is a particularly pointed example of the failings of disciplinary (ie., non transdisciplinary) resource policy processes.

It could conversely be claimed that a decision to retain open access based on exclusively economic grounds would be just as inappropriate as a closed access policy based on exclusively scientific considerations. In each case, the decision would be the product of narrow disciplinary thinking rather than the recommended process of holistic transdisciplinary stakeholder empowered negotiation and learning.

For the claim to be made that an holistically orientated outcome has been determined for any resource security situation, all relevant stakeholders should have been guided through a process of objective negotiation. The transdisciplinary solution is the consequence of interchange between those representing differing degrees of ecocentric inclination and the collective movement towards a manageable solution that most closely satisfies revealed ecological, economic and sociocultural goals.

5
A Systematic Procedure for Evaluating Resource Policy Options

Introduction

The discussion in the preceding chapter emphasised the importance of understanding the motivations and 'world views' of relevant stakeholders. It was suggested that the expressed concerns of individuals from all sides of the debate are founded on some very entrenched philosophical foundations. These foundations need to be understood in order to progress towards negotiated resource management solutions. It is the task of the policy maker to facilitate shared awareness of the depth of conviction stakeholders have in their own positions. Another major task is to facilitate mutual learning to progress towards a more informed understanding about the problem at hand. All parties can learn, even 'experts'. A transdisciplinary orientated policy perspective provides a suitably broad based forum to accommodate the objective consideration of all relevant ecophilosophical positions.

The primary task of the policy facilitator is to harness the dynamics of stakeholder group interaction towards the identification of management solutions or opportunities for policy control. Through the fertile territory of informed stakeholder system familiarity, these opportunities can be at least subjectively assessed by that same group which will have to live with the final recommendations. The group discussion process will often present questions that require the application of special skills to solve. The group will identify appropriate data needs and may specify a relevant scientific and/or economic research agenda. It is important that this agenda is a consequence of preliminary stakeholder discussions; far too often, research agendas are conceived, top down, by scientists and economists wishing to impose their own special perceptions and world views on a poorly consulted resource management community.

It is at this stage, that many problems arise. The hand over of important questions for the attention of specialist inquiry is often unfortunately dislocated from the group dynamics through which they were generated. Specialists are often inclined to impose their own perceptions and world views and in so doing distort their relevance or load the more grass roots policy negotiation process with unwanted uncertainty. It is important for the process of specialist inquiry to be as transdisciplinary in orientation as the stakeholder interests being serviced. It is important that the process of scientific/economic investigation remains 'attached' to the stakeholder group from start to finish. The group should be a resource to service the continuing information needs of the research process.

All this suggests the need for specialised investigation which is transparent to the diverse stakeholder group. If important to an investigation, all relevant assumptions or axioms, no matter how deeply buried, should be placed on the table for all to see and understand. If the specialist investigator cannot extend his or her methods in this way, the methods must be called into question. The risk otherwise is for the ascendancy of a disciplinary solution.

The preceding requirements are very much against the convention in scientific and economics circles. The prevailing culture for resource policy investigations is for a process of communication that works through language understood only by other specialist colleagues; the inner circles of the respective economics and scientific fraternities. As a virtual afterthought, the results of these peer reviewed endeavours are 'translated' for later stakeholder consumption, often by someone other than the investigator. As may be observed with the policy procedures of some public land managers, stakeholders may only be informed of the final decisions. So entrenched is this exclusive process, that policy makers are required to train in the territory of the specialist researchers in order to interpret results. Sometimes, the policy makers and specialists have merged; a particularly dangerous arrangement if disciplinary/partial solutions are to be avoided. The empowerment of specialist economists and scientists to make actual policy decisions may be the ultimate expression of the non holistic approach. There are, however, a few good signs of an opening up of specialist activity to the participation and empowerment of stakeholder groups. Some key resource management agencies now actively pursuing this approach to policy making to good effect. The Tasmanian Department of Parks Wildlife and Heritage is a case in point of an organisation moving in that direction. It is always important, though, that words match actions in this regard. It is easy to claim a high degree of stakeholder participation (particularly through the dubious mechanism of 'public inquiries'), it is entirely another to genuinely address a stakeholder driven policy agenda.

How, then, should the specialist economist/scientific investigator address the special information needs that come out of a stakeholder driven policy inquiry process? A basic condition is for a procedure that is transparent to all. Another is that the procedure should involve the group (or the more general interested community) as much as possible. The methods should involve a harnessing of rather than dislocation from the dynamic interaction created through preliminary group discussions.

The conventional war horse used by economists to address resource use issues has always been benefit cost analysis. The basic mechanism of this, and related procedures is to render all that is declared to matter to a decision into money value terms. In the case of beekeeper access to conserved lands, the benefit cost ledger would include some attempt at the human value of a 'maintained' ecology on the one hand (assuming the damage claimed for honeybee access is real rather than imagined) and the losses from beekeeping production on the other. 'Socially weighted' benefits are weighed up against 'socially weighted' costs and a project or action is recommended as being in society's best interests if the benefits outweigh the costs. The assumptions underlying all these valuation procedures are extremely heroic, and are rarely discussed in the full. The interested reader is referred to any good benefit cost analysis text to appreciate the magnitude of the artificiality involved in an investigation of this nature (eg., Schmid 1989, Just et al. 1982 and, for a more light weight readable account, Hamilton 1994).

As was found in Chapter 2, a formal benefit cost analysis really was not much help to the resource security issue at hand. More is left out of the economist's balance sheet than included. Some very important effects resist all attempts at valuation. In addition, the 'hard' scientific evidence is simply lacking to enable some easy assessment of ecological damage.

The idea, though, of stacking benefits up against costs is relevant. The problems come when an attempt is made to reduce all to a common money denomination. Valuation seems to be a key sacred cow in economics. If this prejudice can be put aside, some real progress can be made. (In fact, the proclivity to valuation is evidence of an almost extreme anthropocentric position on the ecophilosophical scale; so extreme that most real thinking resource managers – or anyone interested in long term ecological survival – would be thankful that the advice of benefit cost analysts is sometimes ignored).

The Reality of Complexity

A most unfortunate incapacity of the conventional economist/scientist tool box is ability to trace the influence of feedback through a system. Feedback is everywhere. Feedback drives the behaviour of any natural or human managed system. It certainly drives the interaction between humans and the environment. Feedback is positive and negative. Positive feedback describes growth and negative feedback describes stability. As is now well agreed, all natural and human systems are complex, and complexity is the foundation for chaos. The search for order in a chaotic world is the primary objective of business managers and parks managers alike. The implications of complexity for economic planning and control are enormous (key references on the economics side include Senge 1992 and Stacey 1993 and on the science side, Coveney and Highfield 1995, Lewin 1993 and Waldrop 1992). Complex system behaviour is the product of the interaction between positive and negative feedback. In order to manage a system (economic or ecological, or more realistically, an integrated ecological–economic system), the manager needs to come to terms with the underlying complexity. It takes only a passing familiarity with 'complexity theory' to understand the ultimate futility of attempting to control natural or economic systems. Some detail will always escape from formal inclusion in the economist's model or the scientist's experimentation. And that missing detail is as much a source of chaos as the detail included.

As we can never really control chaos, we need to manage systems in such a way that the consequences of unforseen outcomes are most freely evident and capable of accommodation. Chaos is also a source of opportunity. Management systems need to be sufficiently flexible to take advantage of opportunities as they arise, not stifle them with over controlled target driven routines. The best we can ever do with our formal investigation routines is to learn as much as possible from informed system players (ie., stakeholders) and in so doing, keep abstraction to a minimum. Because complex reality is a product of interaction between positive and negative feedback, operating within and across the usually artificially separated territories of ecological and economic reality, all resource policy analysis should be holistic in perspective. In ecological economics terms, investigations should be undertaken from within a transdisciplinary perspective.

Complex reality works against disciplinary resource policy assessment procedures such as benefit cost analysis. More is lost through unnecessary abstraction than is gained in useful policy insight. Ensuing decisions tend to be blinkered and appropriate only to the artificial welfare goals of the economist's formal theory.

System Dynamics: a Complexity Aware Procedure for Considering Resource Management Issues

Fortunately, a procedure for systematically exploring policy options is at hand. A procedure which does not depend on valuation for a living and which can easily integrate the thoughts, impressions or hypotheses of any interested stakeholder, economist, scientist or otherwise. The language is universal and understood by all. Though computer orientated, no special skills are need to understand what is going on. Invented by scientists (engineers), adopted by some economists, fast becoming the foundation of a new generation of business managers and now relished by an increasing population of ecologists, system dynamics is a universal tool for systematically exploring the questions that matter to the resolution of resource management issues. System dynamics may be described as 'impressions modelling'. This emphasises its capacity to represent the thoughts of stakeholders (rather than specialist 'experts') into a form amenable to scenario or 'what if' testing. System dynamics plugs straight into the stakeholder round table discussion circle. It is a procedure which, with a little guidance from a knowledgable practitioner, can be managed by anyone with an inclination to explore questions involving a degree of complexity outside the comfort zone of intuition to address.

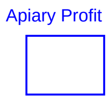
The System Dynamics Procedure

it is far too simplistic to claim that system dynamics is simply a unique approach to computer modelling. While it is true that computers may be involved, and that the approach involves ‘modelling’, there is far more to it than that. System dynamics is really just a very ordered or systematic process to guide stakeholder learning about a management/policy situation. As indicated above, the complexity of usual ecological economic policy problems is usually beyond the unassisted human brain to handle. There is too much to take in. Also, it is usually the case that a group discussion will generate ideas about different ways to control or manage a situation. These need to be tested or subjected to some fairly intense scrutiny in some way. System dynamics is ideal for this. The important point here is that system dynamics is essentially a good way of ‘empowering’ or harnessing shared group intuition. This is an important point. The relevant path is from intuition or the group’s understanding of reality through to assisting with the development of management/policy solutions. It does not start from the basis of theory or some specialist’s ideas about how reality *should* work.

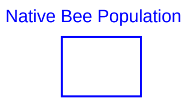
System dynamics can be used at two levels. The first is known as ‘qualitative’ system dynamics (Wolstenholme 1990). The second level involves computer based ‘quantitative’ system dynamics.

Qualitative system dynamics

Qualitative system dynamics is about the ‘mapping’ of those various influences that describe the problem or situation under investigation. Here, the idea is to map or trace the patterns of influence that describe observed system behaviour. More specifically, the mapping will involve the tracing of feedback effects. The process is reasonably straight forward. A skilled system dynamics facilitator will draw a picture of the system on a board through the questioning of participating stakeholders. A special picture language is used to assist the task. The problem under review can be represented in terms of ‘stocks’ and ‘flows’. To illustrate, some relevant stocks that might be created to describe the beekeeping access problem in Tasmania might include:

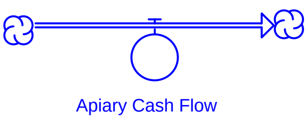


and



Some relevant flows might include:

and



The cloud like structures at the end of these flow pictographs merely indicate that the source and/or destination of the relevant flow is not specified. We are not, for example, strictly interested in where cash comes from to help our understanding of the beekeeping access situation. The role of money presses and such like as the source of the money supply belongs to someone else's investigation, so we surround the left hand side or source end of the apiary cash flow pictograph with a cloud.

The next step is to 'connect' the various stocks and flows with arrows to show how one influences the other. The various 'paths of causation' might include some 'auxiliary' factors to represent the influence of seasonal variability, pollination fees and so on. It is not so important to outline how these auxiliary factors are determined in the model at hand; we are not really interested in tracking how these things change through time (though they could easily be subject to later more thorough investigation as the group proceeds with its learning). Auxiliaries and connectors are indicated in Figure 5.1. Here, the relevant auxiliaries describe honey income from the Tasmanian World Heritage Area or WHA ('WHA Leatherwood Value'), other leatherwood sources ('Other Leatherwood Value') and from non leatherwood sources ('White Honey Value').

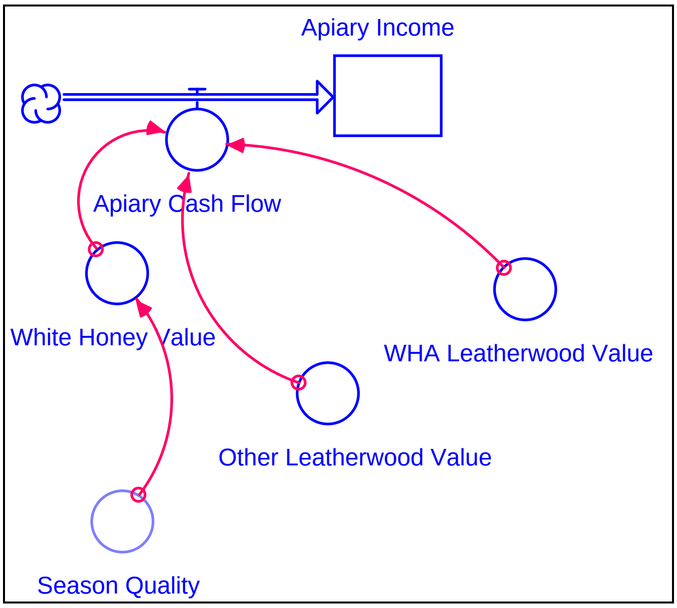


Figure 5.1 Connectors and Auxiliaries

A likely final 'qualitative map' to describe the honeybee access situation is presented in Figure 5.2. Two major sets of influences are traced: the economic or financial impact of different access policy options and the link between beekeeping activity and native bee population (as an ecological indicator of beekeeping activity impact). Maps of this nature are highly personalised by the participating group. Differently constituted groups might produce quite different maps; though the general paths of influence would remain the same. The other universal similarity should be the enhanced degree of learning that all participants derive through undertaking such an exercise.

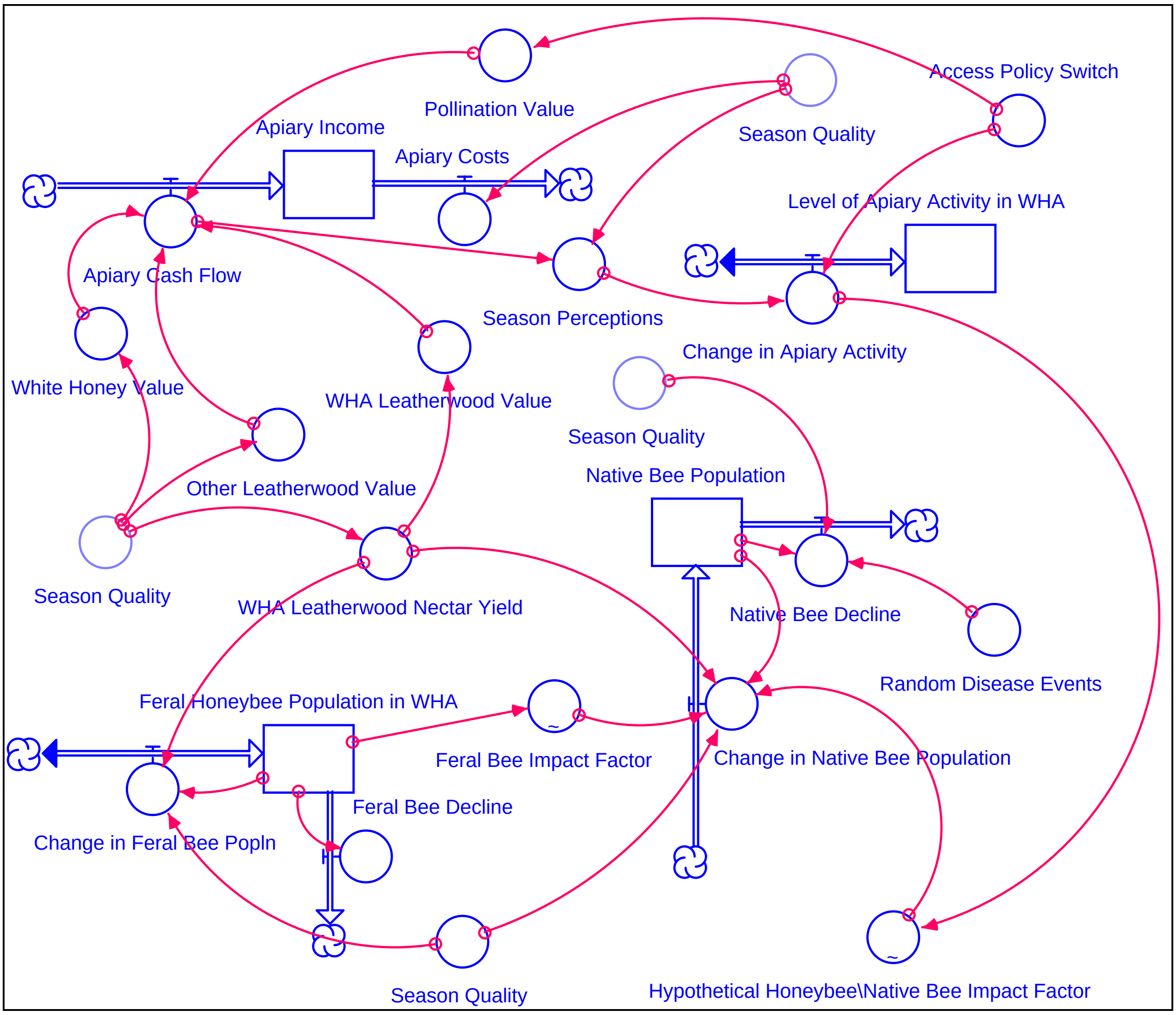


Figure 5.2 Qualitative System Dynamics Map of the Honeybee WHA Access Problem

The relationships represented in Figure 5.2 are simplified. The relevant stakeholders may add additional detail to that point where the map satisfies the collective wisdom of the group. A key feature is that the mapping process guides discussion and group interaction. All those present 'have a go' at adding or modifying the relationships specified until all agree with the sense of the map created. If some confusion persists, the relevant contentious relationships need to be explained or modified until all concede the reality of the proposer's viewpoint. No individual is empowered to confuse the rest of the group. All individuals, 'expert' or otherwise, are required to extend their viewpoints until the validity of a proposal is consistent with each stakeholder's own particular perspective on reality. Those relationships that make it into the final map are, in effect, the end result of a concerted process of negotiated consensus. As individual stakeholders are likely to represent quite different perspectives (not the least formed on different ecophilosophical positions), this last task is the most fertile of all in terms of facilitating group wide shared understandings and learning.

When done, the next step for the group is to isolate key feedback relationships from their map. In Figure 5.2, some key feedback 'loops' exist between apiary profit, level of apiary activity in the WHA, Leatherwood nectar yield and apiary profit. Another exists between apiary activity and feral and native bee populations. These feedback loops are the main driving forces behind the resource management problem at hand. Once the basic loops are identified, extra care needs to be exercised to ensure they are adequately specified. Most controversy will surround this specification process and a great deal can be learned through this kind of systematically guided discussion process. It is usual for a qualitative mapping process of this nature to reveal specific strategic questions from the group to constitute an appropriate research agenda for more thorough investigation. The main point here is that the key research questions arise from the stakeholder discussion group; they are not imposed from outside. What is more, the priority of the key revealed research questions is unanimously asserted and most carefully specified through this process. The research agenda is now driven by the relevant stakeholders, and not by outside research interests or bureaucratically imposed policy agendas.

In summary, the main outcomes from a qualitative system dynamics exercise include:

- serves as a 'language' with which to describe a problem that can be understood by all stakeholders;
- a process to facilitate stakeholder learning and sharing of insights;
- facilitates stakeholder identification and 'ownership' of a relevant research agenda;
- a systematic way of identifying the most important relationships driving the observed problem or situation;
- a process that harnesses the intuitive capacities of the stakeholder group (ie., harnesses the 'system awareness' of the key players);
- problems are defined from the observations of informed system players, not theory;
- a practical way to develop a genuinely holistic view of a problem or situation; and
- systematic process for learning about a problem that transcends conventional disciplinary thinking (ie., a practical transdisciplinary approach to problem solving).

Quantitative system dynamics

As a normal component of qualitative system dynamics mapping, a participating group will articulate key questions and/or opportunities for management control that might need some more thorough consideration. These questions are usually of the 'what if' form. At this point, it is useful to 'translate' (or 'datafie') a qualitative system dynamics map into a 'hard' computer model to address these questions. Again, the stakeholders involved in the preliminary mapping phase will be the primary source of data needed to accomplish that translation. A skilled system dynamics modeller can facilitate the appropriate articulation of the necessary data requirements. The actual computerised modelling phase will take some time and would usually be completed between stakeholder group meetings. A most important feature of this kind of modelling is the capacity to represent any kind of data in a model. There is absolutely no need to convert the relevant relationships into the exclusive units of money or precisely measured biophysical data. System dynamics modelling can accommodate both 'hard' (ie., measured) and 'soft' (or abstract) information in the one model.

Of great significance to the beekeeping access debate, if hard scientific or financial information is lacking or unproven, the relevant information can be inputted in the form of an 'hypothesis to be tested'. In other words, the model will incorporate any and all information considered to be relevant to explaining observed system behaviour, not just that which is scientifically verified. The key validation test is if the ensuing results approximate reality as perceived by at least a majority of the stakeholder group members. If the stakeholder group is appropriately representative, there can be no stronger validation test than the uniform agreement of a diverse group of informed system players. If the group is not unanimous, the model can be modified until a higher level of agreement is achieved. Given the diverse background of the group, each member will apply validation criteria from his or her own area of expertise. This is very much in the interests of securing broad based support for formal research results. Something that is not easily achieved through more traditional disciplinary peer reviewed research processes.

Dealing with difficult to measure relationships

Quantitative system dynamics has some very lateral and effective capacity for dealing with controversial or difficult to verify scientific and economic relationships. For example, conventional scientific experimentation has been very unsuccessful in validating the impact of commercial beekeeping activity in the Tasmanian WHA on native bee populations. Lack of progress here has precluded conventional objective policy decision making, particularly in the mainland states, only to ultimately inspire some very politically orientated policy responses as a consequence.

As discussed previously, the odds against the unequivocal validation of a complex ecological interaction such as that between honeybees and native bees are long. What is more, even if the results of one particular trial are generally accepted, their relevance to other locations and/or under different climatic circumstances would be questionable. To develop a policy position from the results of a single or small number of field trials is contrary to open minded reason. As a lateral alternative, experimental scientific (and economic) information can be integrated into formal policy analysis in the form of propositions, not expressions of fact. This less arrogant attitude to scientific research may be contra to conventional research culture, but it is in keeping with the open minded pragmatism of genuine transdisciplinary procedure. Humility in the face of complex reality is, in the context of quantitative system dynamics modelling, a desired philosophy for ‘expert’ stakeholders. Humility is also a prerequisite to effective transdisciplinary communication and is, therefore, the desired foundation for an ecological economics research culture.

The scientifically derived proposition to describe honeybee/native bee interactions is incorporated in the ‘Hypothetical Honeybee\Native Bee Impact Factor’ converter illustrated in Figure 5.2. A similarly derived proposition for feral bee/native bee interaction is incorporated in the ‘Feral Bee Impact Factor’ converter. In each case, the relevant data is inputted as a ‘table function’ in a quantitative system dynamics model. One specific proposition to describe commercial honeybee/native bee interactions is illustrated in Figure 5.3.

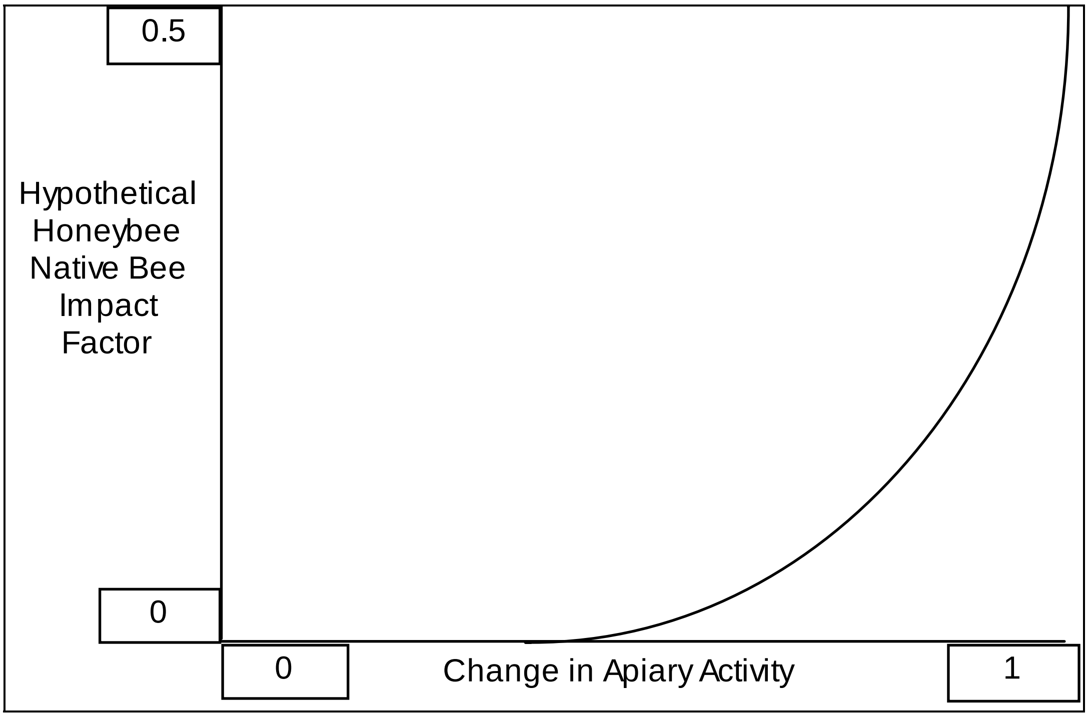


Figure 5.3 System Dynamics 'Table Function' to Describe Impact of Commercial Beekeeping Activity on Native Bee Populations

The proposed relationship illustrated in Figure 5.3 indicates an increasing impact on native bee populations at higher levels of commercial beekeeping activity. A 50 per cent reduction in 'natural' native bee populations is proposed when commercial apicultural activity is at its greatest (all apiary sites in the specific research area are occupied). At lower levels of commercial beekeeping activity, there will be no impact at all. For this particular 'table function', impact and activity level is measured by simple index values ranging from zero to one. Of course, these index values may be replaced by any other scale considered relevant by the researcher. The shape of the curve (which for this exercise was drawn in accordance with the perceptions of various scientists consulted during the course of this research) may be changed to suite any stakeholder's perceptions or can be redrawn to test a range of possible impact scenarios.

It is very important to note that this particular relationship (like any others represented through table functions), is non linear. The system dynamics modelling procedure can handle non linear dynamics with ease (feedback relationships cannot realistically be considered any other way). This capacity puts the procedure at the very cutting edge of modelling technology. There is no need for artificial non-linear approximations and the cumbersome mathematics that accompanies them. There are also no predetermined 'functional forms' involved. Theory and procedure driven requirements do not drive a system dynamics modelling effort. This is a very important factor to support the transdisciplinary relevance and utility of the approach.

The relationship between 'feral' honeybees and native bees in Figure 5.2 is also quantitatively represented by a table function of a similar shape. Season Quality and Random Disease Events are represented as 'smoothed' random events. To test the realism of these random events, their time paths over a twenty year period are plotted and presented to the stakeholder group to assess. If the indicated relationships are less than in accordance with stakeholder perceptions, they are modified until some consensus is achieved. The key financial levels in Figure 5.2 incorporate the results of a detailed economic investigation carried out as part of this research. As a first round effort, biophysical levels such as Native Bee Population and Feral Honeybee Population in the WHA can be represented as simple indices ranging from 0 for no animals at all to 1 for maximum populations. Any more precise measures for bee demographics can be inputted depending on availability.

Modelling efforts should not be forestalled through the unavailability of precise scientific or economic information if the stakeholder group has at least an intuitive feel for the shape of the relationships involved. As has been noted, intuitively considered relationships can be quantitatively represented through system dynamics table functions. This recommended procedure may go against the conventional research culture for some, but it is a pragmatic approach to researching complex problems. As indicated previously, all relationships specified in this kind of modelling are presented as 'hypotheses to be tested through confirmation with the perceptions of informed system observers'. So, if a particular relationship is central to explaining overall system behaviour, a challenge is presented to the relevant specialists to provide more definitive research results. An important side benefit is that research agendas become more customised to the reality of the problem at hand and are more easily prioritised by a wider and more involved stakeholder group. An important tendency is the reorientation of scientific and economic research efforts towards a more realistic inductive (or learning) focus.

The capacity for any relationship to be represented to the degree of precision available is, therefore, a major advantage of quantitative system dynamics modelling. If only intuitive information is available, a curve can be drawn as a pure qualitative construct (as was the case for the relationship illustrated in Figure 5.3). At the other end of the spectrum, it is possible to plot a curve from precisely measured data points. The different relationships in a single model can be measured through any mixture of units. Money values can coincide with biophysical data and sociocultural indices of well being. Again, the modelling procedure imposes no limits on the realistic representation of observed systems. As a decision making framework, system dynamics modelling shifts conventional analytical procedure into a new dimension. Decisions (public or private) can simultaneously address monetary, biophysical and other more abstract measures of 'system performance'. If it matters to the holistic decision at hand, it can be realistically included in the model. As the convention in resource policy is for biophysical experimentation in scientific circles and value based modelling in economics, system dynamics facilitates transdisciplinary work through providing a mechanism for analytical integration.

At the end of this modelling phase, the group will have access to a very powerful tool for the consideration of formal policy options. What is more, the group will have developed some confidence in the procedure used to evaluate those options through their involvement. There will be little that is mysterious about the nature of and motivations for the ensuing recommendations. This kind of unanimity and empathy is certainly lacking in the general beekeeper access debate. Instead, the traditional research infrastructure has adopted an exclusive non-participatory approach to generate recommendations with which a significant proportion of relevant stakeholders have little empathy and considerable suspicion.

Once developed, a formal quantitative system dynamics model can generate time plots for any key variable, such as apiary profit under various proposed access management arrangements and 'best guess' trends in the populations of native bee species and other ecological indicators. These plots are not to be treated in any way as being predictive.

Rather, they indicate the general movement in the key variables from different courses of action. More importantly, the time plots for key variables can be compared across different identified policy scenarios. The comparative shape or direction of results across these simulated scenario runs will help to rank policy options in order of overall acceptability to the stakeholders involved. The underlying inductive philosophy at work here is designed to stimulate and facilitate collective learning. The simple and powerful notion is that a system can be better managed in the light of improved understandings about how it works. A problem can be more realistically solved if it is better understood.

Illustrative system dynamics holistic modelling outputs

To illustrate the kind of outputs possible from an holistic system dynamics modelling exercise, some time plots for apiary profitability and native bee populations for alternative Tasmanian WHA access arrangements are presented in Figures 5.4 and 5.5. These results are presented here as a mere illustration of the power of this kind of modelling. Though not based on the input of a formally constituted Tasmanian stakeholder group (that would be the task of a separate dedicated study), the results are based on impressions and information collected during the author's discussions with key Tasmanian stakeholders during 1995.

Time plots for four key relationships are presented in the figures. Apiary Cash Flow is measured in money value terms; Season Quality is measured as an index ranging from zero to one (zero is a disastrous season and 1 is the best); Feral Honeybee Population in the WHA and Native Bee Population are also measured through zero to one indices. Apiary Cash Flow incorporates the results of a formal economic analysis and reflects the major contribution of managed pollination services throughout Tasmania. The vertical axis of each figure presents the unit scales for each relationship. There are, in effect, four separate scales involved. The Apiary Cash Flow scale ranges from a minimum value of $35 700 000 to $36 000 000 in the best season under existing WHA access arrangements. The best results occur, from this particular simulation run, between years 13 to 15 to coincide with the best results for the Season Quality Index (which peaks at 77 per cent in the same period). The correlation between these two variables can be confirmed through reference to Figure 5.2 where the link between the two is illustrated graphically.

In Figure 5.4 (open access policy) Native Bee Population declines over the twenty year run, severely impacted by a very poor opening season and through the continuing hypothesised impact of commercial beekeeping activities in the conserved area. The population declines, for this particular run, by 46 per cent over 20 years. Feral Honeybee Population in the WHA follows a path reflecting the influence of both season quality and the impact of random disease events. This population is severely reduced by a major disease outbreak in year 3. Feral honeybee and native bee populations are assumed to suffer different incidences of disease.

As has been suggested before, the magnitude and precise shape of these results is less important than the overall patterns. Through the influence of the various random events incorporated in the model, another run of the model would produce a different set of numbers (as a comparison of Figures 5.5 and 5.6 would suggest), though a similar overall pattern of correlations between the key variables. No more confidence can be placed in one run over another. What matters is the learning the group derives through its experimentation with the model.

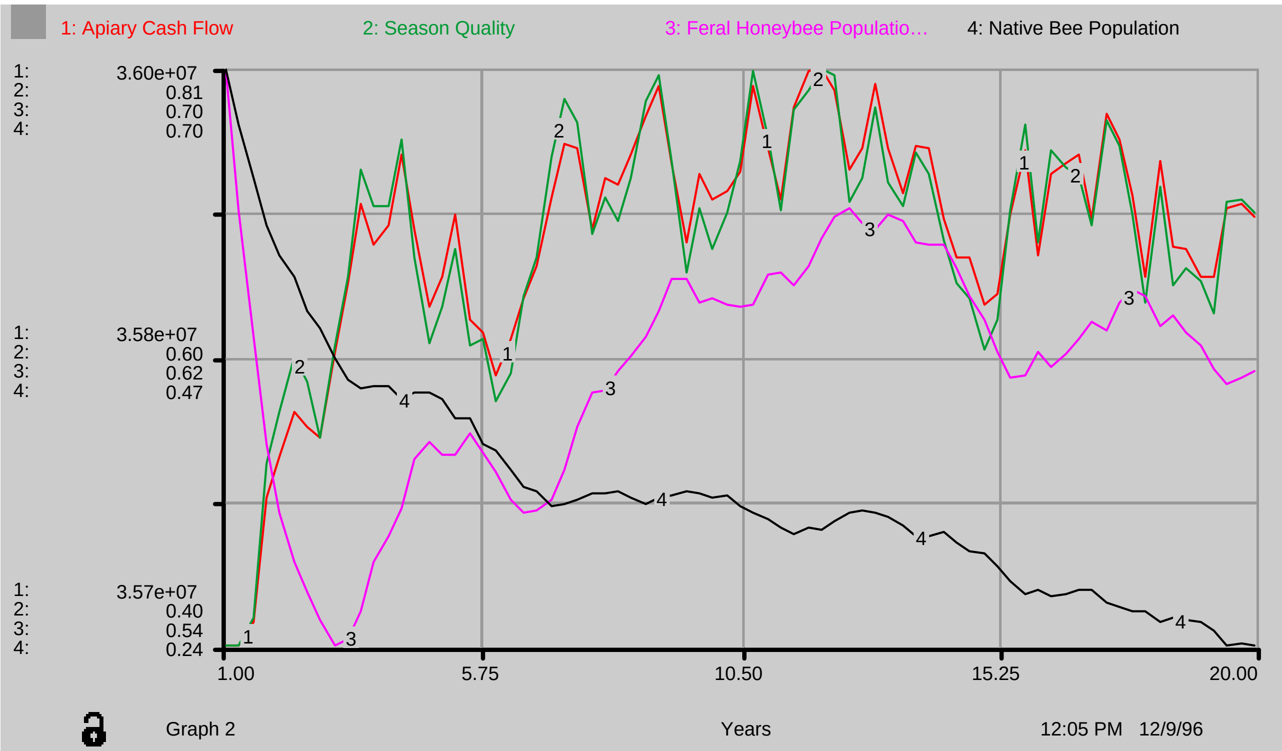


Figure 5.4 Open Access Policy Results

The results from a closed access policy are presented in Figure 5.5. To generate these results, the various observations and expectations of stakeholders consulted during the course of this research were reflected though modifications to the standard model. In effect, a simple on-off switch was incorporated to reflect an open versus closed access policy for the Tasmanian WHA. The impact of this switch was channelled through the Level of Apiary Activity in the WHA flow which, in turn, was linked to apiary financial performance and native bee populations. The simulated net financial impact of a closed access policy was a decline in best case apiary net social benefit from $36 000 000 to $14 800 000. The net social loss was $21 200 000, a significant reduction by any account.

In accordance with the informed judgements of consulted scientists, the impact on native bee populations from a closed access policy is a more sustained population over the 20 year period. Following an initial seasonally induced decline, the native bee population recovers to become relatively stable for the remainder of the simulation. This result must, of course, be subject to considerable caution. The reported underlying population dynamics have not been based on anything like a concerted process of scientific investigation.

Cause for further caution is the fact that other ecological impacts from commercial honeybee activity have not been incorporated in this demonstration model. Any link between feral and commercially managed honeybee populations, adverse selection impacts on other plant and animal species etc., have not been considered due to a significant lack of information. A more definitive version of this model would probably incorporate some of these additional concerns at least in the form of best guess informed scientific opinion.

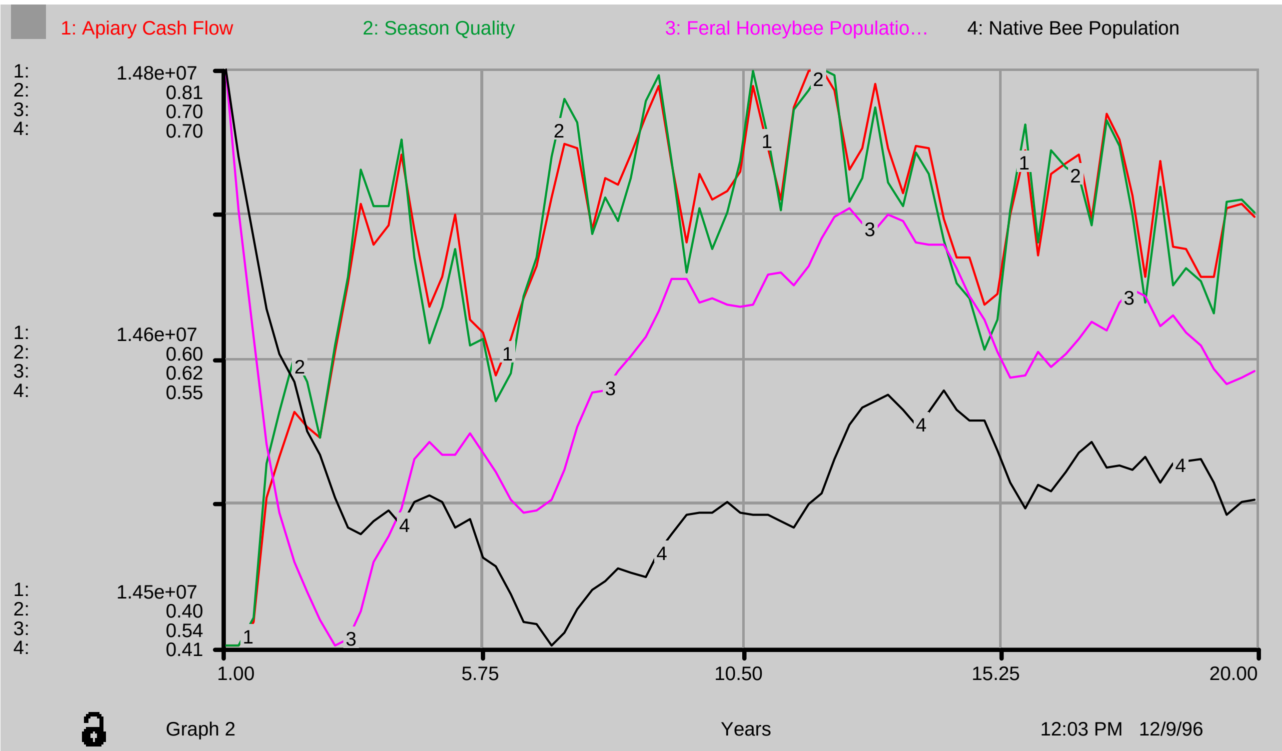


Figure 5.5 Closed Access Policy Results

To indicate the variability of the specific results across different simulation runs, an alternative plot for the same closed access policy arrangements is presented in Figure 5.6. The most significant difference applies to feral and native bee populations as expected given the strong dependence of both on variable season quality. The financial plot has a similar spread to that in Figure 5.5. The most important thing to note from a comparison of Figures 5.5 and 5.6 is the consistent general pattern of correlations between the indicated variables. The numbers might be different, but the general pattern of relationships is consistent.

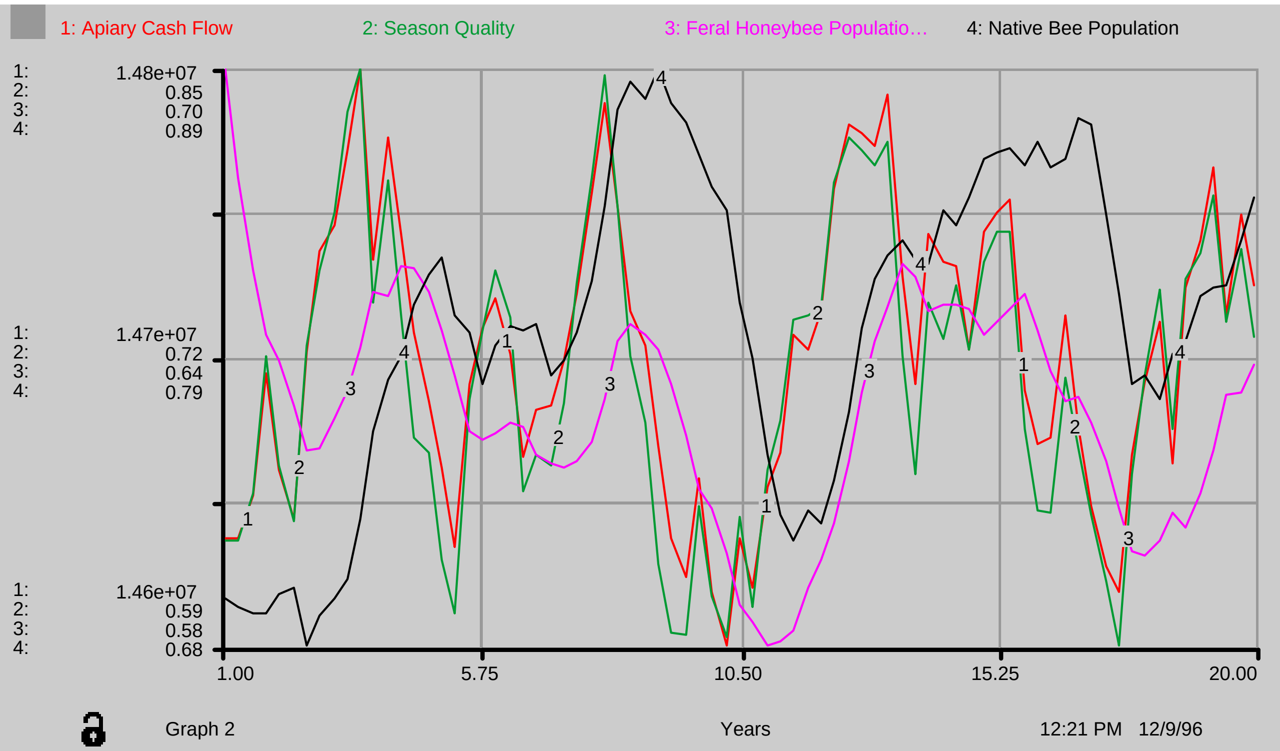


Figure 5.6 Closed Access Policy Results from another Simulation Run

The reality of the beekeeper access debate is the need to consider information expressed in a variety of units and degrees of confidence. The economic needs to be considered alongside the scientific. No attempt has been made in the preceding modelling exercise to develop an all encompassing single decision variable upon which a decision can be 'objectively based'. Instead, the results approximate the diversity of the real situation. The various effects under consideration are measured as they are observed. This contrasts dramatically with the convention of resource economics where benefit cost analysts recommend one course of action over another on the basis of a single money value synthetically created from a collage of effects only some of which lend themselves sensibly to valuation.

In accordance with the new, more holistically orientated arrangements proposed above, the formal modelling exercise leaves the decision where it belongs: with the stakeholders. From the mass of learning generated through such a systematically executed transdisciplinary procedure, it remains to swap insights as to an appropriate course of action. The group, not the model or some set of theories about human welfare maximisation, will decide on the relative ranking of native bee impact against economic losses, all set within a healthy context of explicitly recognised limited knowledge and dynamic uncertainty. A major outcome has been a general shedding of disciplinary arrogance. There are no 'experts', only specialists. Every course of action will stimulate an array of consequences, some more obvious and capable of representation in a shared model, and others more subtle, possibly below the resolution of any modelling effort; but all with the potential to destabilise plans. Some effects will be positive, some negative, and always in combination. The complexity of policy decisions is highlighted by formal system dynamics quantitative modelling. A positive outcome of great ecological economic consequence is the assumption of a perpetually vigilant, cautious approach to the management of natural resources in danger of irreversible damage. It is easier now to recommend cautious, flexible policy arrangements and easier still to dismiss the old style optimised target driven programmed planning approach responsible for so much ecological damage in the past.

As a final observation, the system dynamics, stakeholder learning process is more likely than any other to suggest lateral solutions to resource management. Given the higher degree of stakeholder empowerment facilitated through the recommended approach, it is unlikely that one group of interests can dominate another. Instead, more elaborate compromises will ensue that earn the cautious support of a wider cross section of stakeholders. It is unlikely, if the results presented in this report are realistic, that an exclusive closed access policy could ever be justified or implemented. For a start, the obvious impact of feral bees on native bee populations and on other aspects of ecological integrity cannot be effectively controlled through such a policy. Nor can a recommendation be made to allow beekeepers free reign in conserved lands. Instead, all stakeholders need to become custodians of both the ecology and the continued sustainability of beekeeping as a business. A more likely recommendation would be cautious access with continuous monitoring by the collective stakeholder group. A policy very much along the lines (though more stakeholder inclusive still) of the final arrangements governing access to the Tasmanian WHA; and very far from those that govern access in NSW.

General observations about the procedure

As an exercise in holistic modelling, system dynamics avoids the usual problems of artificial reductionism or partial analysis. It will soon become apparent from any exercise of this nature that much of the observed behaviour of any system is the product of interaction between system components that are usually isolated in conventional research methods. This interaction cannot be observed through the application of partial procedures; that interaction may be central to explaining the observed behaviour of the system under review.

The system dynamics procedure will not initially appeal to those firmly rooted in the deductive mindset. Deduction implies a capacity for prediction and a management philosophy focused on moving a system towards analytically resolved ‘optimal’ targets. What really matters is where the system is headed rather than the experience of getting there. This philosophy implicitly ‘justifies’ the often highly abstract and invariably partial methods traditionally employed by economists to evaluate policy/management options. If we are merely interested in selecting an artificial theory based optimum position for a system, and have some confidence that intractable reality will not get in our way, the implied command and control approach to management can be appealing to some. It takes very little unblinkered introspection, however, to see the various holes in this philosophy. For starters, reality is always more complex than we can ever perceive let alone model. No matter how precise we imagine our management targets to be, the detail of the system left below the resolution of conventional planning procedures can always throw plans off track, no matter how well manicured by scrupulous mathematical rigour. Reality just keeps on getting in the way. Rather than change reality to fit our plans, we should instead attempt a more thorough appraisal of what we see rather than what we imagine. This is the essence of the inductive philosophy for resource policy and management. Induction is also the underlying philosophy of ecological economics and the surprisingly senior field of institutional economics with which it is closely related.

System dynamics modelling is, therefore, fundamentally inductive. Systems are managed through developing a more thoroughly holistic appreciation for how they work. At the same time, humility decrees that complex reality will always impose surprises and suggests flexibility in planning rather than the ruthless pursuit of artificially imposed targets. In accordance with inductive thinking, resource policy becomes a process for addressing multiple societal and ecological goals and pragmatism with regard to those institutional arrangements developed to achieve them. The complexity that underlies all ecological human interactions always suggests humility on the part of resource managers. Planning needs to be regarded as a flexible process; management arrangements or institutional structures need to be sufficiently flexible to accommodate mid stream change as 'reality unfolds'. In an inductive setting, a system dynamics modelling effort along the lines reported here becomes a powerful tool for systematic learning and the facilitation of transdisciplinary cooperation.

6
Summary: The Recommended Procedure for Considering Beekeeping Resource Security Arrangements

At this point in time, those various unresolved conflicts and anxieties surrounding the beekeeper resource security policy debate are unlikely to be effectively addressed by further conventional scientific and economic research inputs. Conventional policy processes have clearly broken down with the adoption of regulatory rather than negotiated solutions in at least New South Wales. The debate is an outstanding example of the ineffectiveness and inappropriateness of conventional disciplinary based approaches to resource policy decision making. Economic ecological and sociocultural concerns are mixed together in a test case for transdisciplinary sorting. Little doubt can be evidenced that anything other than a transdisciplinary approach is needed. There are two clear options: a stakeholder driven process to negotiate a policy solution or an autocratically imposed policy that will achieve little other than the permanent antagonism of a very significant agricultural sector. The respective policy making activities of the Tasmanian and New South Wales National Parks authorities has highlighted this distinction in approach; and created considerable disaffection on the mainland.

This study has provided some additional economic information to add to the debate. That, however, is of secondary importance. What really matters is the need for a different ***process*** to guide the resolution of the relevant policy issues. The key elements of the recommended process are listed below.

1. Constitution and empowerment of a diverse stakeholder group to consider and decide on policy options.
2. Provision of careful and skilled group facilitation to ensure the application of a transdisciplinary perspective.
3. The facilitation process will involve the development of a ‘common language’ through which the relevant relationships can be explored in a way that is meaningful to the diverse group. The recommended language is a qualitative system dynamics causal loop diagram.
4. Articulation of key research questions through the qualitative system dynamics exploration process.
5. Group management of quantitative research agenda.
6. Testing of key questions through quantitative system dynamics modelling and the reformulation of the relevant research agenda in the light of new learning.
7. Negotiation of resource policy arrangements consistent with the needs and empathy of the group.
8. Implementation of negotiated policy arrangements.
9. Stakeholder group controlled monitoring of policy arrangements.
10. Reformulation of policy arrangements in response to changing ecological economic circumstances and new research information and stakeholder observation.

The recommended approach presents a challenge to conventional resource policy making processes and institutions. On the institutional side, the greatest challenge involves an acceptance by vested bureaucratic interests of the need for decentralising authority to the more general stakeholder community. Pragmatically, this should be accomplished through voluntary agency agreement. Otherwise, the onus is on far more cumbersome legislative change.

Fortunately, the activities of some agencies throughout Australia suggest a movement in this direction. Once a key agency makes a concerted movement in this direction, the capacity of others to retain centralised authority will decline through public pressure. Beekeeping Industry lobbying efforts should be strategically aimed at the isolation of intractable land management authorities through political pressure and orchestrated public debate.

On the process side, the recommended approach is contrary to conventional practice. The prevailing resource policy culture is disciplinary, quantitatively deductive and partial. The recent and increasingly influential ecological economics movement is aimed at re formulating that culture towards one that is holistic, transdisciplinary and inductive. An industry initiative to seek more flexible resource security arrangements should seek a strategic alliance with that movement. The mutual benefits would be significant. Beekeepers would benefit through gaining a powerful and influential partner and the ecological economics movement will be enhanced through its involvement in a highly topical and important resource policy test case. One thing is certain, without strategically applied industry pressure of the kind outlined in this report, access arrangements will gravitate towards exclusion as an easy option for those agencies which have lost touch with their mission to service the combined needs of community and ecology.

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