Natural resource management methodology: Lessons for complex community settings

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Natural resource management (NRM) is being seen increasingly as involving complex ecological and social/political settings and thus requiring changes to the research and development (R&D) adopted in the past. NRM R&D has been characterised by predominately positivistic and reductionistic methodologies. Recent attempts to deal with complexity in NRM settings required input from many scientific disciplines including the social sciences. It also involved the use of contextual approaches the nature of the substantive domain is understood in the framing of questions. In using a substantive approach, the importance of considering NRM R&D as a human activity has been recognised and this offers opportunities for community psychologists. In dealing with complex ecological and social systems, there is also opportunity for a reciprocity between NRM methodologies and the development of applied methodologies in community psychology.

In this paper we explore methodological development in the arena of natural resource management (NRM). NRM is increasingly being seen as requiring an integrated methodological approach in which a number of environmental and social sciences are brought together (Syme, 2005). With the belated inclusion of social scientists has come the recognition that communities need to be consulted and directly involved in policy setting and program implementation. There has been considerable discussion of how this integration should be achieved invoking concepts of multidisciplinarity, interdisciplinarity and transdisciplinarity in applied research and development (R&D).

We approach this topic with two agendas. The first is to show that there is a role in NRM for community psychologists as broad integration necessarily involves community participation and people skills. The world is facing serious threats from global warming and environmental degradation. Given that these environmental changes have been contributed to by human activity, social scientists, and in particular, community psychologists, have a role to play in addressing sustainable behaviour. Secondly, the recognition that NRM research involves complex systems can provide methodological insights for community psychologists. The issue of complexity brings with it the need to examine our methodological roots and assumptions that are buried in modernistic positivism. The rise of postmodern thinking provides alternative ways to consider complexity, and NRM provides a forum in which these issues can be examined.

The management of natural resources (or the scarcity of these) has now been made more salient to politicians and the general community due to issues such as climate change, which is now recognised as a serious and potentially major threat to world stability (Jepma & Munasinghe, 1998). Environmental research on global warming has indicated that CO^2 atmospheric concentrations are estimated to rise 90% to 250% by 2100 over those of 1760 (Houghton et al., 2001). The average temperature in Australia has risen 0.7°C in the past century and may warm between 1.4°C to 5.8°C in this century (Pittock, 2003). Sea levels have been estimated to rise 9 cm to 88 cm over the same period (Pittock). In the west, Perth has seen a 50% drop in water reservoirs in the past 50 years and the general decline in rainfall in Australia is leading to the investigation of alternative water supplies such as desalination and water reuse (e.g., Leviston et al., 2006; Po, Kaercher & Nancarrow, 2004; Po et al., 2005). Awareness of water supply issues has increased significantly (as witnessed by the recent media coverage

regarding Toowoomba and Queensland water shortage, e.g., Turner, 2006). The full extent of the impact of the projected changes on humans and the ecology is difficult to predict, but substantial change to our lives and the lives of future generations must be expected. To this end, the Government of Australia has adopted a policy of sustainable NRM. In one example of this:

> In 2004, the Australian Government committed $20.5 million over four years to build the capacity of the agriculture and land management sectors to reduce greenhouse gas emissions. Effective greenhouse action can provide sustainability in regional Australia by focusing on economic and natural resource management benefits. (Department of Environment and Heritage, 2006).

A largely agreed upon definition of sustainability refers to a development path along which the maximisation of human well-being for today's generations that does not lead to declines in future well-being (Brundtland, 1987). One perspective of attaining this path highlights the requirement to eliminate those negative externalities that are responsible for natural resource depletion and environmental degradation. It also requires securing those public goods that are essential for economic development to last, such as those provided by well-functioning ecosystems, a healthy environment and a cohesive society. Sustainable development also stresses the importance of retaining the flexibility to respond to future shocks, even when their probability, and the size and location of their effects, cannot be assessed with certainty.

The centrality of human well-being in the concept of sustainability indicates the role that psychologists, particularly community psychologists, can play in addressing environmental change and NRM. An example of how community psychologists can play a role is seen in the following section from a R&D proposal by the Australian Research Centre for Water in Society (ARCWIS).

> This project aims to help [Catchment Management Authorities, CMAs] prioritise and implement on-ground actions to meet the objectives of Catchment Action Plans [to develop sustainable agricultural practices].... This will underpin a targeted and evaluated community NRM change program in partnership with the catchment community. (ARCWIS, 2004, p. 1)

Already a few community psychologists are playing a role in understanding behavioural and environmental change. For example, the ARCWIS has been involved in a range of environmental research in areas such as resource allocation (Syme & Nancarrow, 2001), urban planning (Syme, Fenton & Coakes, 2001), urban water use (Syme, Shao, Po & Campbell, 2004) and community change in response to climate change (Dempsey & Fisher, 2005). It is also a burgeoning field of postgraduate research pursuit, as a number of students are beginning to address the links between community psychology, NRM and ecologically sustainable development (ESD; Browne, Bishop, Bellamy & Dzidic, 2004).

Traditional positivistic approaches in NRM have been characterised as linear models of R&D, particularly linear models of technology transfer of research results to non-scientific stakeholders (Allen, Bosch, Gibson & Jopp, 1998; Edwards & Farrington, 1992; Johnson & Walker, 2000; Roux et al., 2006). Addressing environmental problems has led to a broadening of the scope of science to include integrated approaches where social science compliments physical sciences (Syme, 2005). Recently, there has been a shift towards integrated R&D which has involves a wider range of stakeholders, including policy makers and local communities (e.g., Johnson & Walker, 2000; van Kerkhoff, 2002a). For example, Johnson and Walker looked at the use of participatory approaches. They wrote:

> …these shifts raise fundamental methodological and institutional questions as to how science is conducted, what constitutes an outcome, who controls the agenda and scientist's accountability to others. In particular, it also challenges the way in which scientists communicate both internally and externally, and the role of communication and communication research in NRM R&D [although] …

> they have only recently begun to understand the context of complex problem settings, multiple stakeholders, divergent interests and scales of relevance associated with integrated natural resource planning and management activities (p. 82).

When the concept of integration extends to include communities, the issues become even more apparent, although the inclusion of the community is often positive and with benefits. However, Buchy (2001) highlighted a number of assumptions of integration in NRM R&D that involves community, particularly "that better participation in natural resource management… will lead to better resource management; that communities are able and willing to engage voluntarily in NRM; that local communities are seeking increased power in decision-making processes; and that participation is a means to achieve and end OR that participation leads to empowerment and greater social practice (an end in itself)" (p. 1).

Participatory Integrated R&D

Other than discussions of specific participatory research methodologies within the natural resource and agricultural sciences (Black et al., 2000; Chambers, 1995), most participatory typologies (e.g., Arnstein, 1969; Ashby, 2003; Black et al., 2000; Buchy, 2001; Buchy, Ross & Proctor, 2000; Chambers, 1995; McDougall & Braun, 2003; Probst et al., 2003) and discussions of effective characteristics of successful participatory approaches (e.g., Aslin, Mazur & Curtis, 2002; Buchy & Race, 2001; Chess & Purcell, 1999; Schusler, Decker & Pfeffer, 2003) emerge from the natural resource policy domain. Although these policy perspectives may be useful in developing understanding about the nature and effective characteristics of participation in NRM R&D in Australia, it cannot be assumed that discussions and suggestions within this domain are directly transferable to the arena of R&D. Australian literature has begun to reflect the significance and importance of the development of understandings of 'integration' from a variety of policy and R&D perspectives, and has begun to address the paucity of discussions of integration as it applies to R&D (e.g., Bammer, Curtis, Mobbs, Lane & Dovers, 2005)

One example of this attempt to delineate the nature of integrated NRM research within Australia is Lorrae van Kerkhoff's (2002b) PhD thesis in which she discussed the different understandings of integrated research from the perspective of those involved in the research teams at two Australian Cooperative Research Centres (CRCs). Six models of integration emerged from her research (van Kerkhoff, 2002a, 2002b), with the different models highlighting that "people overwhelmingly thought of integration as a process of managing and manipulating information flows. The flows were integrated through various designs, and relied on the information being representative, rational, and above all, impersonal" (van Kerkhoff, 2002b, p. 147). She also identified a number of essential elements to effective relationships such as getting to know each other, trust, respect, trust and respect entwined, teamwork, communication, fairness and transparency, and being aware of diversity of expectations and visions (van Kerkhoff, 2002b). All of these concepts can be found in the community psychology literature in terms such as resource exchange (Sarason & Lorentz, 1998), liaison (Dokecki, 1977; Hobbs, 1966), empowerment (Rappaport, 1981), trust (Drew, Bishop & Syme, 2001), fairness and justice (Nelson & Prilleltensky, 2005; Syme & Nancarrow, 2001) and diversity and social justice (Watts, 2004). The role of active mediator (Bishop, Sonn, Drew & Contos, 2002; Throgmorton, 1991, 2000) in which the community psychologists acts as a facilitator of information flows between scientists and the community fits well in an integrated approach of NRM R&D. As was reflected earlier, as well as incorporating policy and research stakeholders in processes of integration in NRM R&D, there is an increased demand for community participation. Given the aspects of community psychological theory which reflect issues that are emerging within the integration literature, for example, trust which is an essential element in the interchange between community and science (Roux et al., 2006), community psychologists are well placed to begin addressing these issues in integrated NRM R&D settings,

R&D in a complex world

There are implications for integrating applied research approaches of environmental sciences and community psychology. The issues

of complexity and community participation that are being wrestled within NRM are comparable to the emergence of contextualism and postmodernism in community psychology, albeit it emerged rather slowly (e.g., Biglan, 1993; Biglan & Hayes, 1996; Bishop et al., 2002; Hess, 2005; Kingry-Westergaard & Kelly, 1990, 2000; Newbrough, 1992; Tebes, 2005). One of the implications of a contextual and postmodern approach is that the concepts of reality become more complex. This is reflected in the emergence of complexity thinking within natural science understandings of environmental problems (Gunderson & Holling, 2002). It is being recognised that NRM research is embedded in a range of social, legal, economic, political and ecological settings. For example, globalisation has changed the way environmental problems are conceptualised (e.g., Mol, 2001). Contextualism and postmodernism are useful frameworks for exploring the integrated and interrelated elements of these diverse systems which reflect in NRM settings. These notions of layered systems parallel Bronfenbrenner (1979) concept of nested social levels of varying breadth from the macro-social to the micro. In adopting a layered approach, the complexity of issues is recognised.

Kastenberg, Hauser-Kastenberg, and Norris (2005) made the distinction between complicated and complex systems:

> … **complicated** systems that are characterised as atomistic (reductionism), deterministic (cause and effect) and dualistic (subject/object dualism). In other words, the properties of these systems: (1) are understandable by studying the behaviour of their component parts, (2) exist independent of the observer, and (3) are only deduced from "objective" empirical observations….
>
> The context within which Post-Industrial Age are understood is based on a non-linear worldview where second order effects are important and/ or the boundaries are permeable. This worldview gives rise to **complex** systems that are characterised by at least one of the following: (1) holistic/ emergent – the system has properties that are exhibited only by the whole and hence cannot be described in terms of its parts, (2) chaotic – small changes in input often lead to large changes in output and/or there may be many possible outputs for a given input, and (3) subjective – some aspects of the system may not be describable by any objective means alone; that is, objectivity is considered to be only one possible way of describing systems properties. (p. 88)

Current conceptualisations of the interaction between the environment and social, economic and political systems as 'complex' are based in disciplinary derived definitions of complexity, and the resultant research questions, methodologies, and research solutions that these conceptualisations suggest (Browne, 2006). Therefore, the idea of complexity itself is underpinned by a number of disciplinary and philosophical positions and perspectives that shape the nature of the solutions suggested by that perspective (Browne). For example, engineers and ecologists have very different ways of conceptualising the complexity of environmental problems and their solutions (e.g., Wilderer & Wilderer, 2005), than do social scientists or community psychologists. As Voisey and O'Riordan (2001) have stated "political, ecological, economic, anthropological, legal and sociological angles on sustainability … varies both with disciplinary perspective and style of democracy" (p. 26).

In NRM, the interrelated nature of the many factors involved in ecological systems forces complex conceptualisation (e.g., Pinet, McCleenen & Moore, 1998). This conceptualisation is reflected in the diverse range of disciplines which now focus on environmental/social problems and their solutions. Current moves within the natural sciences have seen a shift from the perspective of *complicated* natural systems to *complex* environmental and social systems. Many of these disciplines cite complexity as a frame of reference, but as in the example above, this represents a funnelled complexity of disciplines looking at singular issues, but from a incredibly detailed perspective (Browne). This has led to

two notions of complexity. One is based in modernism in that complexity is seen in terms of increasing numbers of variables as a single issue is examined more and more closely. Natural sciences have begun to recognise the dynamic, integrated, complex, unpredictable and unbounded openness of environmental systems (McDougall & Braun, 2003) in which the second notion of complexity arises from the recognition that more and more factors are involved in dynamic systems, and at different nested levels.

Complexity in NRM is often based on the definition of the environment as complex (e.g., Pinet et al., 1998), and the consideration of social issues as integrated but separate to environmental issues, speaks again to the philosophy and worldviews that exist behind disciplinary conceptualisations of NRM complexity. For example, Luke (1995) suggested that the "separation of organisms from their environments is the primary epistemological divide cutting through reality in the rhetorics of ecology" (p. 63). This issue of the interrelatedness but separateness of the social and the environmental has its parallel in psychology where the discipline has developed theory and research based on the assumption that people are individuals separate from their context (Bishop, Johnson & Browne, 2006; Sampson, 1989; Sarason, 1981). The application of solutions in this definition is usually by complex, expert disciplines that focus on environmentally complex problems and their solutions (e.g., Arthur, 1999; Costanza et al., 1993; Glass, 2001; Werner, 1999), with social, political and economic issues being considered as secondary, or as separate from these environmentally complex solutions.

There has been a significant tradition of approaching research and policy for NRM through singular problem focused and linear approaches to research and the transfer to policy and community through models of extension. These have been criticised as inappropriate for NRM due to what is considered to be their inherent failure to address the complex interaction of *environmental and human problems* that need multiple perspectives to derive solutions. The extension model, that is, the linear model of technology transfer, generally failed to promote change (Allen, Kilvington, & Horn, 2002), particularly in the agricultural sciences, as new technologies were slow in being adopted, and social inequalities were occurring because of the different rates of adoption of technologies across communities (Vanclay, 1995). There is emergent realisation that 'good NRM R&D' which focuses on defining one area of environmental complexity does not necessarily result in changes to NRM policies, agricultural practices, water allocation/use and other practices which impact upon the environment (Johnson & Walker, 2000; Shulman & Price, 2000; Vanclay). NRM R&D based on an appreciation of complexity is more likely to have policy impacts, partially because the involvement of local communities, is in itself, a political action and helps determine that action with eventuate.

NRM R&D and Community Psychology

In community psychology, the slow move to more complex understandings requires that the philosophical underpinnings of its methodologies need to be addressed. Although community psychology emerged as a reaction to the limitations of clinical psychological treatments and the impacts of large social change occurring in the 1960s, it maintained mainstream psychology's embrace of positivism. Thus even though those at the Swampscott conference were advocating analysis and intervention at other levels than the individual, and thus invoking visions of complexity thinking, the methodology continued to be operationalised at the individual level in reductionistic positivism (e.g., Hayes, 2002; Speer et al., 1992).

Just as in NRM complex research, community psychological research requires complexity methodology. Pepper (1942) in his typologies of research described four world theories. He categorised each with its own root metaphor. The first was formism, in which the root metaphor was similarities and differences. Personality traits and types are examples of formism. Mechanism (or positivism) has the root metaphor of the machine. It is the basis of experimental research in psychology and is based on Humean notions of 'cause and effect'. Organicism has the root metaphor of 'harmonious unity'. In psychology, it is the basis of 'complicated' systems theory, where organisations or groups are conceptualised as living, holistic entities. The final world theory is

contextualism and the root metaphor is 'the act in context'.

Mechanism is the dominant approach in psychology, and formism is also well understood. Organicism has become more common with the rise of systems thinking in areas like organisational psychology, and this perspective could also be said to have its parallel in complex systems thinking within the natural and related environmental/social sciences. In contextualism, there are different assumptions about the nature of reality, and cause and effect. One reality is not assumed to necessarily be the case. Cultural differences, for example, may not be simply variations on a theme, but real cosmological and physical differences in the way in which we observe and act in the world. The notion of multiple realities is difficult in psychology as in its theories and practice it reflect modernist notions of positivistim (mechanism) (Tuffin, 2005) in which a single physical reality is used as a metaphor for the social world. As such, the notion that there is one psychological reality denies the complexity of culture (Hayes, 2002; Sarason, 1981) and understandings of social and political systems.

Attempts to simplify contextualism (e.g., Payne, 1996) leads to incomplete descriptions of social, political, economic, cultural and environmental phenomenon. Alternatives that retain more complexity such as those suggested by Linney (2000), Shinn and Toohey (2003) and Tebes (2005) involve an encapsulated context in which aspects of the context can be treated as variables. This is not contextualism, but is complicated systems of organicism in Pepper's terms. We would argue that this lacks what Kelly (2003) referred to as 'adventurous methodologies'; that is, it is a contextualism that is at once incomplete and incoherent, and not reflective of complexities that are expressed in community or regional contexts (Browne, 2006). In allowing people and aspects of context to be treated as variables, as discrete entities, the world becomes fixed as snapshots of local realities and does not allow for dynamism of transaction (Altman & Rogoff, 1984; Dewey & Bentley, 1946). Involvement in NRM directs community psychology's attention to the nature of our methodologies, in both the benefits that we can have in complex settings such as NRM, but also the limitations of our methodologies in addressing such settings. In applying community psychological processes to the arena of NRM, the philosophies underlying our conceptualisations of complexity must be dealt with and not ignored or approached through modelling reductionism, even if it is the partial reduction of organicism. These issues will be addressed in relation to a specific NRM setting in which the authors were involved below.

Northern NRM R&D example

CSIRO and Land and Water Australia (LWA) had recognised the lack of biophysical and environmental, and social research that had been done in the north of Australia to inform development of the region. They sought to address this by undertaking a large scale NRM project in a major catchment in remote northern Australia. Part of this project involved evaluating the impacts of large scale R&D at local and regional levels; this is where we came in (see Bellamy, Bishop & Browne, 2003; Browne, 2006). The project was negotiated with many local and national stakeholders, including local farmers and industry representatives. The initial project was to be a $30 million program involving cash and in kind support from state and federal governments, and from LWA and CSIRO. With a change of state government and policy, much of the initial expected support did not eventuate. The program was pared down to 5 years and a budget of $7.5M and involved 13 major partners such as CSIRO, LWA, WA Agriculture, WA Waters and Rivers and Kimberley Land Council. The project included 5 sub-programs, namely:

1. Regional resource futures.
2. Sustainable rangeland systems.
3. Integrated water resource management and planning.
4. Sustainable coastal and marine systems.
5. Aboriginal management and planning for 'country'.

The aim of the research was to understand and develop biophysical and social data to model of ESD in the large region through a partnership arrangement with industry, governments, NGOs, Indigenous groups and community groups. The research model adopted was participatory, integrative and had aims such as stimulating

sharing of knowledge, providing local learning and increasing capacity, providing a sense of client/stakeholder ownership, to improve the usefulness of research products and to foster the development of change skill for both R&D providers and the clients/stakeholders. We were involved in sub-program 1.3 which was to evaluate progress of the research program, assess the process and involvement of community and stakeholders, and to assess the regional impacts of large scale R&D.

The research process involved a number of phases such as archival research of all relevant documents, observations of research and management, interviews with stakeholders and clients, interviews with the researchers and interviews with people from the local Indigenous and non-Indigenous communities. An iterative-generative-reflective process (IRG, Bishop et al., 2002) was used to analyse the data in which abductive reasoning is used as a means of uncovering the obvious and not-so-obvious themes in the data. Abductive reasoning involves making speculative conclusions from less than certain premises as a means of expanding knowledge and producing what Polkinghorne (1983) called assertoric knowledge, or knowledge claims to be tested (Bishop et al.).

The research program was externally evaluated after three years. Although considerable time and resources had been devoted to the project and there was extensive scientific and local investments in the study, it was terminated two years prematurely. The main reasons suggested for this termination was that the research was reported to not be addressing the high level strategic science that CSIRO and LWA expected and that management costs were disproportionably high and unsustainable, particularly compared to the financial investment for 'on the ground' research.

A number of major issues arose from the implementation and early termination of this program. The first was the failure to integrate the research into the local communities. Although there were some success stories, generally, the research program did not make much headway into incorporating itself into the local community and the cessation of the research reflected the mismatch between high level, strategic research and community understandings. There was a failure to recognise the broader political climate of the region, in which researchers from the south of Australia (especially those from bureaucratic and administrative centres) were viewed with suspicion, and while the program attempted to address local concerns and to involve people, this was never really successful, as the research agendas were viewed by locals as being driven by the researchers and strategic needs, and not reflecting the complexity and significance of local issues.

The response to the scaling back of the finances at the beginning of the project resulted in a reduction of the integrative elements of the project, which was one of the broad aims of the original research. The reduction in scale led to the selection of a set of discrete research aims centred around disciplinary lines. This did not help those remaining integrative aspects as the nature of these scientifically based projects highlighted the reductionistic nature of science, and supported community suspicions of the ability of the project to address community and regional issues, rather than strategic science based learnings.

While the Indigenous sub-program was successful, there were problems with Indigenous issues that beset the other sub-programs. This region has a high proportion of Indigenous people (approximately 37%, ABS, 2006) and there had been little recognition of their cultural issues in the past. The 'frontier' mentality of the region also did not discourage open racism among some in the community, and the increased power of Indigenous groups in the initiation of native title issues over what was seen to be highly arable and developable land in the region, fuelled the animosity felt by some of the non-Indigenous people. These social and political issues can be seen to increase the complexity of the issues surrounding the implementation of the R&D program, however, these issues were not reflected upon directly within the program plans or literature. The significance and impact of these broader social and political issues has been captured elsewhere (e.g., Browne, 2006).

In terms of the complexity of the natural ecology, the change in funding did not allow the full development of an integrated research program and the issue of complexity could not be effectively addressed, especially where human

issues were concerned. For example, ground water research was demonstrating that the water table was rising significantly and that this posed a major problem for local agriculture, particularly in relation to how this rising ground water impacted upon salinity in the region. The failure to develop an integrated research process meant the concerns of local farmers were not incorporated into the research process, and thus the research aims were not framed in such a way as to address environmental issues in terms of local farming practice and development.

The relevance of this NRM example to community psychology is strong. In dealing with 'social ecology' we need to recognise the importance of dealing with complex systems. Framing research methodology in terms of complex systems has a number of implications. The first is that the breadth of the research needs to be made broad and flexible. We cannot afford to create artificial demarcations on the scope of the research. The research 'boundary' needs to be permeable and allow for changes as the research progresses. The context should create the specifications of the research boundaries and questions that we deal with. The research needs methods that are flexible and reflexive in that the nature of the research issues must to be able to change as the understanding of the context develops. The research requires long time frames. Working with communities requires the development, or reestablishment of trust (Roux et al., 2006), and this requires time. More, we need to recognise that researchers may define research in terms of a specific and ahistorically located project, yet communities do not; such projects are embedded in other community and regional experiences of research and policy (Browne, 2006). What we need to recognise is that our research is in fact one part of a cumulative history of research interventions with communities, particularly with Indigenous communities (Browne & Bishop, 2006). If the history of research practice has been disempowering, our new research is implemented in this context, and therefore, has to address these issues of disempowerment and researchers should expect to spend considerable time (re) developing trust.

A final issue relates to how we report complex systems. Working with local communities means that we become aware of local concerns and viewpoints, and we must reflect those viewpoints in the research. Our desire to reduce complexity down to its 'bare essentials' is something we have to challenge. Complexity needs to be reported in detail. For example, Contos (2003) and Browne (2006) recognised the need to address complexity by not reducing social systems to elemental themes as these leads to increasing levels of abstraction and diminishes the power of contextual analysis.

Conclusion

In summary, we argue that NRM methodology is changing in terms that community psychologists would recognise. The recognition of ecological and environmental complexity, and the realisation that human participation in integrated NRM also involves complex social systems, has provided the opportunity for community psychologists to be engaged in R&D. The emergence of complex science theory and community participation offers parallels for community psychology and its methodology, especially since community psychology has integrated notions of nested social levels as part of its fundamental theoretical and applied conceptualisations. As much as community psychology can offer benefits for the complex settings of integrated NRM R&D, our fundamental philosophical, ontological and epistemological traditions are also challenged by this involvement. Previous attempts by psychologists to be involved in NRM and environmental issues has tended to be focussed on single issues with a single disciplinary approach (e.g., Castro, 2006; Chess, Johnson & Gibson, 2005, Forrant & Silka, 2006; Kim & Kaplan, 2004), as is the hallmark of positivistic, reductionistic and modernistic thinking. The complexity of NRM R&D now being integrated across bio-physical, social, political and community domains requires broad contextual research. The complex nature of NRM issues has conceptual parallels with contextual praxis of community psychology. Community psychological theory and methods can be applied to NRM as it is now being addressed. Moreover, the methodological and conceptual developments in NRM R&D in dealing with complexity, have lessons from which community psychology can benefit.

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