

Community Based Monitoring: Engaging and Empowering Alberta Ranchers

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Abstract—Community based monitoring (CBM), a form of citizen science, is presented as a potential contributor to ecosystem management and sustainable development. A conceptual model for CBM and lessons learned from a Canadian national pilot program, the Canadian Community Monitoring Network, are summarized along with a description of the European university-based “science shop” approach. Local knowledge can be legitimized and validated through CBM programs, and participants are empowered to engage in the adaptive policy, planning, and management processes that affect their communities. Ranchers in southwestern Alberta are working collaboratively with the academic community to develop their own CBM program.

Introduction

Successful approaches to ecosystem management are increasingly community-based – initiated by local people, and motivated by a “love of place.” In such cases, ecosystem management is in the local interest, and is a means to achieve the beneficial use of its “natural capital” (Sexton et al. 1999, p. 4).

Ecosystem based management (EBM) is a dominant emerging philosophy for natural resource management. For our purposes here, EBM is defined as “an approach to guiding human activity using collaborative, interdisciplinary, and adaptive methods with the long-term goal of sustaining desired future conditions of ecologically bounded areas that, in turn, support healthy sustainable communities” (Quinn 2002, p. 371). Whereas conventional natural resource management has relied more on (natural) scientific and economic information to drive decision making, it is a central tenet of EBM that socio-cultural, value-based input and community engagement are at least as important to effective understanding and management. Hence, one of the most significant challenges of EBM is to create interdisciplinary methods and approaches for framing and addressing problems that embrace traditionally disparate knowledge systems.

The purpose of this paper is to discuss one way, *community based monitoring* (CBM), in which local knowledge and expertise might be collected and integrated into understanding complex environments with the aim of achieving better policy, planning and management. CBM employs indicators so as to provide early warning signals for adaptive adjustments to management programs. We summarize the key lessons learned from Canadian experience with CBM and present a conceptual framework developed by the Ecological Monitoring and Assessment Network (EMAN) coordinated by Environment Canada. We then offer a brief description and approach for

applying these lessons and the framework to a CBM project for ranchers in southwestern Alberta. Our emphasis is on the processes and benefits of social learning and community capacity-building with the assumption that better informed citizens, planners, and managers will contribute to more informed and effective decision-making.

Community Based Environmental Monitoring

Monitoring and evaluation get a rhetorical nod from practically everyone in natural resource management. In practice, monitoring and evaluation have been frequently shunned, ignored, and underfunded by resource managers and policy makers alike.... Complex systems, incomplete data, and uncertainties about the effects of management actions mean that *monitoring and evaluation are not luxuries but essential components for any ecological approach to managing natural resources* [emphasis added] (Szaro, 1999, p. 223).

Monitoring is an essential, but often under-achieved, component of ecosystem based management (Vaughan et al. 2001). Community based monitoring (CBM) is an act of civil society whereby concerned citizens, government agencies, industry, academia, community groups, and local institutions collaborate to monitor, track, and respond to issues of common community concern (EMAN 2002). CBM is confluent with the pursuit of sustainable development and ecosystem based management. CBM derives from a holistic perspective, encourages an interdisciplinary approach, focuses on collaboration and cooperation, and is driven from the bottom up. Furthermore, CBM operates within ecological boundaries, incorporates flexibility and adaptability, recognizes the importance of socio-political and values frameworks, and contributes to achieving

sustainable communities (Bliss et al. 2001; Fleming and Henkel 2001; Whitelaw et al. 2003). Effective CBM should be collaboratively designed and implemented to address locally determined information needs and provide contextual data for more informed decision-making.

CBM is part of the much longer tradition of citizen science, which is in turn a product of amateur natural history pursuits (Noss 2002). Citizen science describes any process where various sectors of society engage in the development and practice of public-interest research in order to bridge gaps between science and the community and between scientific research and policy, and decision-making and planning (Fisher 2000; Heiman 1997; Irwin 1995). The process involves social learning through environmental research, public participation, adaptive management practices, and effective integration of knowledge into the decision-making process. Citizen science recognizes the divide between those who control specialized knowledge required for complex public decisions and those who want to influence policy decisions that affect their lives. In essence, citizen science is a process that democratizes expertise (Farkas 2002) and extends the notion of peer review (Functowicz and Ravetz 1994).

A particularly rich form of citizen science transcends the engagement of local non-specialists in conventional scientific protocols by facilitating the incorporation of local knowledge, wisdom, and other ways of knowing. In other words, the full potential of citizen science is approached when it encompasses more than just having non-scientists participate in science (i.e., conventional science by non-scientists), and expands the realm of what *kind* of information is included in policy, planning, and management (i.e., conventional science and local knowledge in a mutual process of social learning). This expansion of participation, process, and epistemology is well established in the theories and practice of communicative and collaborative planning (Cheng and Daniels 2003; Healy 2003), post-normal science (Functowicz and Ravetz 1994), and integrated adaptive management (Kusel et al. 1996). The significance of the challenges associated with integrating knowledge types cannot be underestimated, for as Irwin (1995, p. 161) points out: “science citizen relations founder not simply because of the lack of appropriate mediating structures but because of a deeper incongruity (or structural incompatibility) between the needs of citizens and the cognitive and institutional structure of contemporary science.” CBM can provide a gateway for the advancement of our understanding and technique in the field of developing new social and knowledge relations as well as demonstrating the relevance of monitoring.

The European model of university-based “science shops” (*wetenschapswinkels*), founded in Holland in the 1970s, embraces the value of local knowledge and expertise and considers these inputs across the whole spectrum of research, from problem identification to application of the results. Today, a network of science shops across Europe cooperatively engages citizens with scientists to combine contextual and technical information for more comprehensive knowledge creation (Farkas 2002; Heiman 1997; Sclove 1995; Sclove and Scammell 1999). At the core of the science shop approach is the desire to advance university research that is socially relevant and in the public interest.

Although the science shop model has some presence in North America, citizen science is more often associated with organized volunteer monitoring, especially by amateur naturalists. The National Weather Service was one of the first such programs and in 1890 began training volunteers to report daily measurements of air temperature and rainfall. Early in the 20th century the Audubon Society launched its annual Christmas Bird Count, another program that, along with breeding bird surveys, butterfly and wildflower watches, and fossil collecting, contributes valuable data that are commonly relied on by professionals (Noss 2002; Heiman 1997). Today there are a growing number of volunteer monitoring programs engaging local citizens in everything from monitoring water quality to community health. The Internet has been a notable boon to citizen engagement in a wide variety of projects (see for example: www.naturewatch.ca and <http://birds.cornell.edu/LabPrograms/CitSci/>).

The benefits of CBM as citizen science are many and include, but are not limited to: (1) enhancement of community capacity and social capital; (2) development and improvement of social networks; (3) more proactive public participation in policy, planning, and management initiatives; (4) developing community based definitions of sustainability and desired future conditions; (5) increased understanding of local contexts by external “experts”; (6) more inclusive decision-making processes that lead to better decisions; (7) proactive identification of environmental change for continuous improvement and active adaptive management; (8) more and better data for long-term research and monitoring; (9) development of better working relationships between the public and land managers; (10) the development of a sense of empowerment and ownership over local conditions; and (11) the advancement of theory and practice of sustainable development (EMAN 2002; Merrifield 1989; Pollock et al. 2003). CBM should be seen as a valuable addition to be developed along side of more technical and expert-driven environmental monitoring programs. The promulgation of CBM initiatives must not be used as an abrogation of government/agency responsibility (Sharpe et al. 2000).

Lessons Learned From Canadian Community Based Monitoring

In 2001, the Ecological Monitoring and Assessment Network (EMAN), in partnership with the Canadian Nature Federation, initiated a nation-wide pilot program to test approaches and identify critical factors in community engagement and environmental monitoring. Based on a review of past experiences, it initiated community-based environmental monitoring initiatives in 31 communities. Twelve regional coordinators were hired by EMAN to facilitate and learn from the individual community efforts (for more information see: <http://www.ccmn.ca>). A comprehensive review of the results was conducted to articulate key lessons learned and to develop a conceptual model for CBM (Pollock et al. 2003; Whitelaw et al. 2003). In addition, a community of practice, the

Canadian Community Monitoring Network (CCMN), emerged from the 31 “experiments” to assist in broader application of the results. A central aim of the program was to “provide a valuable resource to other communities interested in starting a CBM program” (EMAN 2002, p. 22), and it is in this spirit that we adopt the lessons and model for our own research and practice reported in this paper. The key lessons learned through the EMAN study are summarized here under the following broad themes: community context, community engagement, organizational structure, and creating change.

Community Context

Complexity, both ecological and social, dictates that CBM be adaptable and specific to a particular local context. Allowing for considerable flexibility in how coordinators engage the community, and employing monitoring protocols that are appropriate for the given community capacity, are critical in creating a CBM program that is socially acceptable and scientifically meaningful. However, concerns for such things as clean air and water as well as healthy wetlands and forests are common and offer the opportunity to implement standardized monitoring protocols across the country. The CCMN experience validated that CBM is a powerful tool for building social capital. CBM can activate individuals who do not normally engage in volunteer activities and build reserves of social capital that will be valuable to not only future CBM, but also to other local governance issues (Pollock et al. 2003).

Community Engagement

Engaging the community in meaningful public participation is a cornerstone of CBM. It is critical the participants understand the benefits and values of long-term ecological monitoring and the importance of their contribution (Bens 1994; Fleming and Henkel 2001; Wilson 2002). In particular, participants should see the value in informing local decision-making through the collection and communication of timely information. Monitoring activities should be appropriate to the available time and energy of volunteers, with accessible protocols that employ equipment and data analysis accessible to the existing community capacity (Cuthill 2000; Fleming and Henkel 2001). Public participation should use transparent, inclusive, constructive, efficient, and meaningful processes. These include forums such as roundtables, workshops, and visioning sessions that bring together multi-stakeholders and favor consensus-based decision-making focusing on the development of creative solutions to complex problems. The participatory processes should be facilitated and guided with the philosophy that scientific expertise in CBM is more to inform the process than it is to dictate the results. Finally, public participation is most effective when the results and uses of monitoring activities are presented to the broader community (Pollock et al. 2003).

Organizational Structure

The goals of the group or network, their vision, and available capacity and resources will determine at what scale and

organizational structure CBM will occur. The scale of monitoring may vary from the neighborhood to the landscape level, defined by ecosystem boundaries such as watersheds. When starting CBM, groups should consider their objectives and community capacity, possibly starting at a smaller scale and expanding as capacity develops (Pollock et al. 2003). CBM at the landscape scale can be appealing for a number of reasons. It may provide access to greater resources, the larger area may include more historical monitoring data, and there will likely be an increased number of government agencies, NGOs, and private sector actors with which to network and partner. CBM at the landscape scale also facilitates the integration of monitoring efforts, avoids duplication, and has the potential to influence decisions on a broader scale (Pollock et al. 2003). However, it is at the local scale that CBM is most effective and can most directly influence decision-making. Larger scale issues might be best approached through the aggregation of local efforts.

Two key lessons relating to organizational structures emerged from the CBM initiative. First, top-down support, including financial resources for hiring coordinators at both the national and regional level, is essential. A community coordinator significantly advances CBM through such activities as networking, partnership development, fundraising, and skills training. A second lesson relates to the institutional affiliation of the coordinator. Those who had such an affiliation made considerable progress on CBM through their ability to tap into existing organizational structures (Pollock et al. 2003). Again, the most important function here is to create an enabling environment rather than an attempt at heavy-handed control or management. The long-term sustainability of CBM initiatives will also be influenced by how well they are institutionalized and supported within the host communities.

Creating Change

CBM can help create change by increasing local governance and achieving influence with decision-makers. Local governance refers to a broader involvement of civil society and the private sector in the formulation of policy and influence on decision-making through networks and partnerships. CBM can contribute to the development of this governance through the creation of new networks and partnerships in pursuit of sustainability. CBM is appealing to government, NGOs, and the private sector, as it is neutral, allows for discussion of issues in a generally non-confrontational arena, and results in mutually beneficial partnerships and activities. The development of long-term networks may enhance governance structures and provide valuable input into difficult issues ranging from resource and land use to community development (Pollock et al. 2003).

Achieving influence should be a priority for CBM groups and networks. A series of methods can be used to achieve influence within the community at large and with those who can affect change. Actively pursuing partnerships with government staff at all levels from municipal to Federal, and engaging politicians and planners to influence policy development is a key step towards achieving influence. Increasing awareness and transforming public values by engaging people

in monitoring and stewardship activities is an equally critical pursuit particularly when the results of their efforts can be seen to make a difference. Business should also be brought into the fold, by building partnerships to collaborate and influence. Finally, enhancing the capacity of decision-makers and governance institutions will go a long way towards achieving influence and moving the community towards a sustainable path (Pollock et al. 2003).

A Conceptual Framework For Community-Based Monitoring

EMAN's conceptual framework recognizes three core principles for how to approach CBM. First the approach must meet the challenge of diversity with flexibility. In other words, it should be suitable to the community context, considerate of local cultures, and represent an attempt to find "best practices." Second, the approach must be iterative in nature. The approach should not be constrained to a linear process, but rather should encourage the dynamic interaction between phases, goals, and outcomes in an ongoing cycle, enabling synergistic activities that build capacity at all stages of CBM. Finally, the approach must be flexible, opportunistic, and adaptive to change. In a continuous feedback loop, the approach should incorporate new information, assess capacity needs, and fulfill them to build social capital (Pollock et al. 2003). Based on these three principles the conceptual framework encompasses four dynamic phases: community mapping, participation assessment, capacity building, and information delivery.

The phases are iterative, synergistic, and ongoing in a cyclical fashion and can be undertaken in sequence or concurrently. Each phase consists of a series of steps and desired outcomes. Presented in a linear fashion, the steps build from one to the next; however, they do not necessarily represent a rigid format. Depending on the existing capacity of the community, not all components will be necessary, and in some cases certain tasks can be skipped (Pollock et al. 2003). Communication is a critical component that runs throughout each phase of the framework. We have modified the original EMAN model in minor ways to fit our context (figure 1), but we have retained all of the essential components as described below.

Community Mapping

Community mapping is composed of four steps: reconnaissance, governance analysis, consultation and outreach, and visioning. This phase focuses on gathering information about the community to inform the design of a CBM program that is unique to the community and its values, vision, and interests. It also provides the opportunity for decision makers to articulate their information needs and the chance to develop meaningful partnerships. Goals in this phase include: assess community readiness and concerns, identify existing groups and activities, establish trust, build contact network, conduct consultation and outreach, and inventory existing monitoring programs (Pollock et al. 2003). This phase establishes the context and relationships for the on-going

development of the CBM from knowledge assessment through to community vision.

Participant Assessment

Participant assessment, the second phase of the conceptual framework, is composed of two steps: membership assessment and champion identification. This phase shifts its attention to understanding the groups and people involved in CBM, and thereby generating knowledge about how to engage them, enlist their skills, and satisfy their needs. Participation assessment is designed to identify the best approaches for building capacity. Goals include: assess public understanding of CBM, identify participants' motivations and expectations, understand membership skills, assess capacity and training needs, identify champions and leadership roles, and engage decision-makers (Pollock et al. 2003). Once participants have been identified, key groups and organizations engaged, and initial relationships formed in the community mapping phase, a membership skills assessment is undertaken. Another important component of participant assessment is identification of champion(s). Experience suggests that a champion(s) within the community is essential to drive the creation of community-based initiatives (Pollock et al. 2003; Curtin 2002). A cautionary note with respect to champions is that they likely have competing demands on their time and should be protected from "burn out" as much as possible.

Capacity Building

The four components of the capacity building phase are: partnership development, organizational structure, capacity building, and fundraising. CBM requires resources and skills, both social and technical. Capacity building enhances the community's ability to carry out monitoring through good coordination, training, technological access, and knowledge and skill development. Goals of this phase include: create or expand partnerships and networks (including the formation of agency partners and funding mechanisms), develop organizational structures, use good communication mechanisms, select appropriate monitoring protocols and make data management operational (Pollock et al. 2003).

Information Delivery

The final phase of the conceptual framework, information delivery, is composed of three steps: ecological monitoring, project management, and achieving influence. This is the phase where CBM becomes operational. Communication plays a major role throughout all aspects of CBM, and at this phase is critical to identifying local priorities and reporting the results of monitoring activity. CBM should be demand-driven, where information needs are identified and monitoring then informs the development of more effective tools and solutions for local environmental issues. Decision makers should weigh this knowledge and skill to make appropriate local choices that are adaptive. Given the preliminary nature of the information, adaptive choices might include verification, investigation of cause, research into mechanisms, or development of

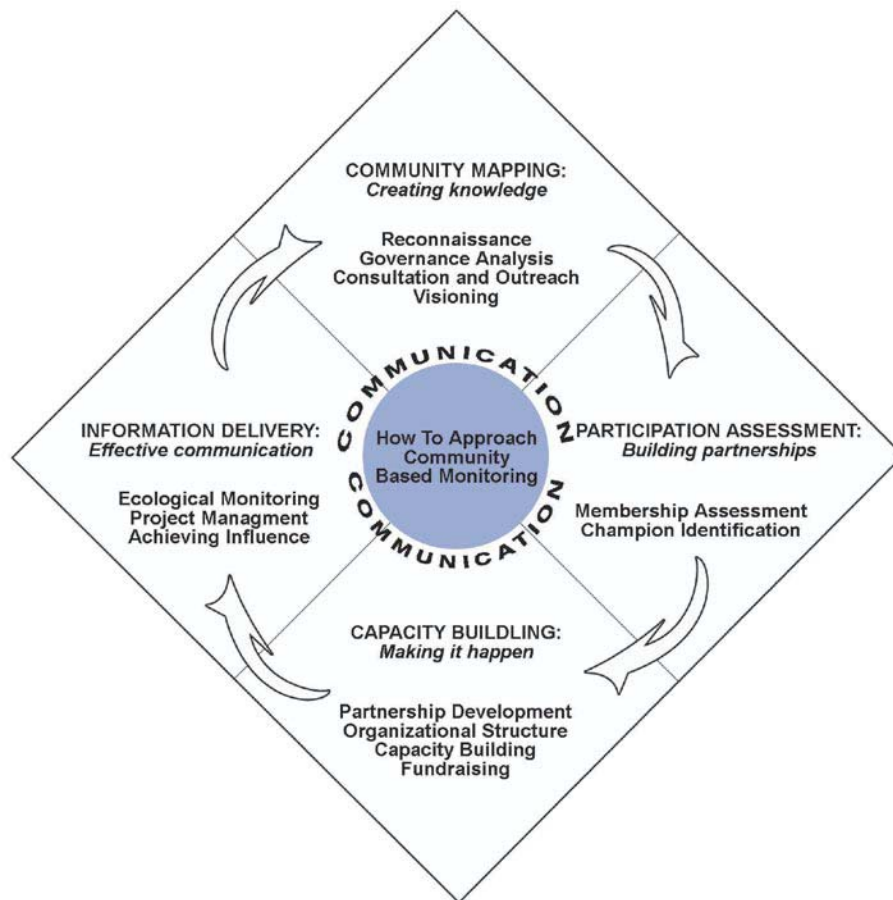


Figure 1—A conceptual model for community-based monitoring (adapted from Pollock et al. 2003; Whitelaw 2002).

options. Goals include: articulate information needs, translate data into meaningful information, provide and integrate new information into decisions, and institutionalize ecological monitoring (Pollock et al. 2003).

Monitoring indicators and protocols are developed at this stage with particular attention to existing monitoring in the community. Indicators should be based on the vision and issues identified, informing a picture of present conditions and future trends. It is also important to use existing and tested ecological monitoring protocols to ensure the quality and usability of the data. The nature of information collected in CBM should be: useable in form and for a specific context; targeted, accessible, and understandable to its audience; integrated, and suggest a course of action; timely; allow decision-makers to weigh choices, trade-offs and consequences; and ensure those involved continue to be in control of the problem. Project management follows as CBM becomes operational. This allows for monitoring to be carried out in an efficient and effective manner and ensures that all participants have full knowledge of the particular project underway and the overall direction the group is moving (Pollock et al. 2003).

Finally, achieving influence is one of the ultimate goals of CBM. Strategies should be developed to influence decision-making through setting agendas, negotiating outcomes, conferring legitimacy, and implementing solutions. Strategies should be incorporated into all aspects of the CBM framework

and play a major role in the communication plan, data reporting methods, outreach, and organizational structure (Pollock et al. 2003).

Ranchers and Local Knowledge

Over the last two decades it has been demonstrated that local knowledge, while different from Western scientific knowledge, is nevertheless systematic, based on observation and analysis, very extensive, imminently practical, and relevant to the management of resources (Feit 1998, p. 126).

The ranching community of southwestern Alberta makes its home along the interface between the eastern slopes of the Rocky Mountains and the western edge of the Great Plains. Many of the families trace their roots to the first European settlers on this part of the continent and have managed the health of their rangelands for generations. Native grasslands and parklands characterized by foothills rough fescue (*Festuca campestris*) and a diverse ecotonal faunal assemblage contribute to the international significance of the area. Of particular importance is the fact that much of the region remains relatively intact compared to the fragmented landscape in which it is

embedded. This area of high environmental significance is the focus of increasing oil and gas exploration and development, as well as rural residential and urban expansion (the city of Calgary, with a regional population exceeding one million is less than an hour drive away). In response to mounting land-use change pressures, a group of ranchers and other local interests recently coalesced around their opposition to a proposed series of gas wells. The "Pekisko Group," comprised of over 50 ranch families, is dedicated to maintaining the ecological integrity of the native rangelands as well as their regional agrarian culture and livelihood. The group came to the realization that understanding baseline conditions and creating protocols for assessing change are critical to achieving their objectives.

At the invitation of the Pekisko Group, the Miistakis Institute for the Rockies (an affiliated research institute of the University of Calgary dedicated to facilitating ecosystem based management, see: www.rockies.ca) and the Faculty of Environmental Design at the University of Calgary have agreed to work with the ranchers and other local interests to develop and implement a long-term environmental monitoring program. The program is being developed to be consistent with the EMAN framework presented above and will examine the approaches and lessons derived from the European experience with science shops. The program will develop from the strong local knowledge foundation that exists in the community and will also consider the lessons learned from similar initiatives—such as those in the Malpai Borderlands (Curtin 2002). Many of the ranchers already participate in some form of formalized monitoring for rangeland condition and/or riparian area health. Wherever possible, the existing protocols will be adopted by the new monitoring program (see for example, www.cowsandfish.org). The aim of the CBM program is to validate existing forms of knowledge and to standardize data collection, storage, and analysis so as to improve the present and future utility of the information for land-use planning and management.

Through a collaborative, participatory approach, we will first identify the values of the community and their vision for the future of the landscape. We will then work with the community and ecological monitoring specialists to identify a suite of appropriate indicators to map and monitor ecological condition over time. It is expected that the implementation of monitoring will employ a three-tiered approach: (1) indicators that derive from local capacity and knowledge of the landscape (e.g., rangeland condition, weeds, riparian condition, water quantity, location, etc.) will be monitored by ranchers using standardized protocols developed by the project; (2) indicators and measures requiring specialized skills available in the voluntary sector will be monitored in collaboration with selected interest groups (e.g., regional natural history groups could participate in breeding bird surveys, amphibian counts, etc.), and (3) indicators requiring specialized skills, equipment, or analysis will be monitored by specialized sources through funding partnerships with government and industry interests (e.g., water and air quality monitoring that require laboratory analysis).

The CBM program is in the formative stages and is being developed with the ranching community of southwestern Alberta. The program will provide a valuable test of the conceptual framework developed through EMAN and the

Canadian Community Monitoring Network. After two years, we intend to provide a thorough critical reflective analysis of our work to both contribute to the adaptive management approach advocated and to advance the theory and practice of CBM and collaborative ecosystem management in general.

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