# CHAPTER 20: DEALING WITH THE SCIENTIFIC DIMENSIONS OF ISSUES

## I. INTRODUCTION

### Overview

Many environmental or resource management issues can be both scientifically complex and involve high degrees of risk or uncertainty. In some cases, the issue may be purely scientific, such as deciding which species of riparian vegetation is best for a stream bank restoration project. Many issues however, involve a mix of social, economic and scientific concerns. A policy decision, like prioritizing actions for endangered species habitat protection, also relies on an understanding of the scientific dimensions of the issue.

Involving citizens, who may have insufficient scientific or technical expertise, in deliberation or decision-making on these issues also raises a number of concerns. Indeed, critics argue that collaborative partnerships may result in recommendations or decisions that are not scientifically sound, and may signify devolution from scientifically based management or protection strategies.

Part of our research explored the challenges faced by collaborative partnerships in dealing with science. We asked members and outside observers to describe how the group dealt with the scientific dimensions of the issues addressed by the partnership. In inquiring about those challenges, we learned what strategies groups had employed to confront challenges. Those interviewed were asked to reflect on those strategies and offer suggestions for how they would have improved the partnership's approach. Finally, participants had the opportunity to offer advice on how to deal with issues in a way that would result in credible and sound decisions.

Both the challenges groups encounter and the strategies they use vary according to many other factors affecting the partnership. By analyzing the way partnerships dealt with technical and scientific issues, we hope to provide insight on some common barriers and approaches to creating a credible collaborative process that results in scientifically sound solutions.

### *Issues*

The partnerships chosen for case studies dealt with a wide range of scientific issues. Some of those issues include: impacts of industrial processes, development, forestry, and grazing on water quality, protection or restoration of fish and wildlife habitat, riparian area management, maintenance of rangeland health, and elimination of noxious weeds.

## Summary of Core Findings

Most of the challenges associated with the scientific and technical side of natural resource management are not unique to collaborative processes. In fact, uncertainty, lack of information, complex issues, divergent public perceptions, and the blending of science and politics are common barriers to environmental decision-making. Whether agencies are exclusively managing the resource, or a group uses collaborative problem-solving to provide solutions or advice, the path is not simple. Although some of the challenges encountered by collaborative partnerships are unique to multi-stakeholder processes, in some cases the nature of the process can shed light on issues that might otherwise remain unexplored. Having different perspectives at the table can force participants, and ultimately the decision-makers, to confront the problems associated with natural resource planning, monitoring and restoration.

Since our research focused on the challenges faced by partnerships and the strategies they used to address those challenges, this analysis is heavily weighted towards describing the "boulders in the road," rather than the opportunities incurred by collaborative approaches. These findings are not meant to represent an all-inclusive picture of collaborative partnerships, nor do they attempt to evaluate the success of strategies used. They are merely a report of some of the challenges, strategies and advice encountered in our exploration of ten cases.

Most partnerships employed a series of strategies to address the scientific dimensions of issues. Science was a dominant concern of some groups, while others dealt more with social, economic or political matters. Groups varied according to their inclusion or access to scientific and technical expertise. One of the top approaches employed by all of the groups was to involve scientific or technical experts in the process, either as members of the partnership or related task forces, or as invited speakers. Some strategies influenced partnerships' abilities to deal with a range of stumbling blocks, yet specifically addressed a set of challenges.

### *Core Issues and Strategies*

### 1. Ensuring understanding

Partnerships dealt with how to accommodate limited expertise by educating participants and balancing the level of discussion around technical topics. They also worked on how to clarify public perceptions about the nature of the problem.

**Strategies**

- Provided presentations and workshops
- Went on field trips
- Avoided acronyms / jargon
- Conducted community outreach

**2. Uncertainty**

Partnerships grappled with how to make scientifically sound decisions given unclear impacts incomplete information and new methods.

**Strategies**
- Practiced adaptive management
- Avoided premature conclusions from data
- Compared most likely outcomes

**3. Obtaining information**

Partnerships in some cases grappled with how to obtain information given lack of baseline data, limited access to expertise, and resistance to data collection on private land.

**Strategies**
- Enlisted expert members and staff
- Created technical task forces
- Brought in outside experts
- Accessed outside resources

**4. Managing information**

Partnerships had to learn how to manage information given the need for agency coordination in assimilating and verifying data.

**Strategies**
- Obtained a well-matched coordinator
- Utilized GIS technology to present data

**5. Legitimizing information**

Partnerships grappled with how to legitimize information given the often-inextricable nature of science and politics. Issues included: lack of trust, agency integrity and consistency, defining "good science," and interpreting data.

**Strategies**
- Developed public outreach and education strategies
- Engaged in joint fact finding

*Advice*

- **Tap into resources**
  - Establish network of technical experts
  - Include experts in the group
  - Access resources in the community
  - Maximize information sharing
  - Choose a coordinator versed in science

- **Be inclusive**
  - Include all stakeholders in discussion of scientific issues including question development, data collection, and inference
  - Ensure understanding of research / monitoring
  - Keep the language at a simple level
  - Use broad variety of expertise, not just one field
  - Use diverse sources

- **Separate Tasks**
  - Start with small projects
  - Develop subcommittees
  - Focus on adaptive management

- **Other Insights**
  - Focus scientific questions
  - Find experts with holistic perspectives
  - Consider alternatives and act, despite lack of complete information
  - Have reliable data to support your assumptions

## II. SPECIFIC CHALLENGES

### 1. Ensuring Understanding

*Challenges*

With diverse representation comes the challenge of managing varying levels of knowledge and understanding of the scientific and technical dimensions of the issues on the table. Groups mentioned three main aspects of this challenge: educating participants, balancing the level of discussion around scientific or technical issues, and dealing with differing perceptions of the issue within the community.

**Educating participants**
Participants in both the McKenzie Watershed Council (MWC) and the Nanticoke Watershed Alliance (NWA) mentioned the need to address the fact that some members do not have the education or experience to keep up with the science involved. A landowner from the MWC noted, "Nobody knows everything" (Grier, 1999). Educating participants and keeping them

up to speed was a challenge, especially for those groups that had member turnover. Education is vital, participants say, but it takes time. Groups sometimes feel pressure to jump into projects without asking all the necessary questions or ensuring understanding. In the Nanticoke River watershed, biology professor Judith Stribling found that some members did not recognize their need for more knowledge about science: "They [the farmers] are nutrient experts in one respect but in another respect, they are not getting the good science so they do not know what they need to know. They know enough of what they are doing but they often do not know what are the implications. There are too many people in our group to be in a situation where they are feeding off each other's ignorance" (1999).

**Balancing the discussion**

A second aspect of this challenge is how to manage the process and the language used in order to create an accessible environment for participants with less scientific background without detracting from a commitment to sound science. On the MWC for example, some members were described as "out of it" (Anderson, 1999) during presentations or discussion that dealt with complex science, because of the high number of knowledgeable members. The Clark County Habitat Conservation Plan (HCP) process had to deal with the intricacies of habitat protection for multiple endangered species in a way that did not alienate rural participants with "confusing technical language" (Schreiber, 1999*).* Both the Darby Partnership and Animas River Stakeholders Group are aware of the impact of jargon on limiting open dialogue around the issues of water quality. Yetty Alley, a former member of the Darby Partners from the Ohio Natural Resources Department, noted that "Most of the folks at least from the government side had more of a scientific or technical background, so it was not very difficult for most people to pick up. But when you start to include members of the general public it becomes more of an issue." Some non-agency members felt intimidated by the level of scientific analysis discussed at meetings. Mary Ann Core*,* of the Natural Resource Conservation Service, stated, "I sat through several meetings where I did not understand one half of what the researchers were saying."

**Perceptions about the nature of the problem**

In some cases, due to conflicting information, the community at large either did not recognize the problem the collaborative group was attempting to address, or had a different understanding of the nature of the problem. In the Animas River Valley, some residents refused to believe a water quality problem existed. Carol Russell of the EPA remarked, "I find it difficult to argue with those at the table who simply say, 'there are fish there and you people from Washington can't tell me there aren't.' In this case, no matter what the data say, they are not going to believe you." In the McKenzie River basin, the watershed council has had to deal with conflict between public perception and scientific data. Coordinator John Runyon explained, "There's a public perception that most of sedimentation and turbidity in the water comes from forestry operations. We have scientific evidence that shows that it does not, it actually comes from agriculture and growing urban areas."

*Strategies*

**Internal education**
Particularly in dealing with the challenge of ensuring participant understanding of the technical issues, interviewees emphasized the importance of presentations and workshops. For example, the McKenzie Watershed Council held a series of "primers" on watershed management issues when the council first formed, with invited guest experts. They also continue to dedicate a substantial amount of the monthly meeting time to educational presentations. The Nanticoke Watershed Alliance is very active in bringing in outside experts as needed to make presentations or critique other presentations.

The BLM set up a weekend training workshop for members of the NW Colorado RAC. Participants spent a weekend at a local college where they attended sessions on basic ecology, ecosystem management, rangeland science as well as discussions about their role in the RAC. Visiting professors from throughout the state taught the workshop, which was well received by all who attended. On member commented, "We needed an educational course to begin with to kind of try to bring everyone up to the same level of knowledge. At least the basics so they could talk to each other" (Dickinson).

**Field trips**
Many groups find that field trips help people understand the scientific issues by talking about problems in the landscape context. In both Scott River and McKenzie, workshops and fieldtrips facilitated information sharing by bringing landowners, agencies and other representatives shoulder to shoulder.

**Avoidance of jargon or acronyms**
Partnerships with substantial expert representation also avoided the use of jargon or acronyms in order not to alienate the non-experts. On the McKenzie, one member joked about the group's internal acronym police that enforces the "no acronyms" policy. The Animas River Stakeholders Group is making steps in to decreasing the use of technical language and acronyms although some frustrated participants feel that jargon and acronyms are still widely used in meetings.

**Outreach**
To address the need for more community education, the McKenzie Council recently hired an education coordinator to work in schools and communities within the watershed. Both the McKenzie, and the Scott River CRMP groups have used educational workshops and forums as a way to bring information to the public.

## 2. Uncertainty

Environmental science and natural resource management are fields that involve inherently uncertain, and difficult to predict relationships between human actions and tangible outcomes on the ground. Management decisions may be based on incomplete information or may involve untested methods. Cutting edge management or restoration methods, while they may

promise better resource protection in the long run, also involve a high level of uncertainty. While agencies also deal with the issue of uncertainty in their management decisions by bringing diverse perspectives to bear, collaborative partnerships shed light on different angles of the problem and force recognition of the uncertainty surrounding many decisions. They may in fact provide a better forum for addressing these challenges.

***Challenges***

**Uncertainty of causal relationships**

In the case of the desert tortoise in the Clark County HCP case, exact impacts of development, ranching and ORV use on loss of tortoise habitat are unknown. Nevada Division of Wildlife representative Brad Hardenbrook summarized Clark County's scientific dilemma: "Going out and actually proving a negative relationship would take years and probably millions of dollars. Moreover the nature of the Mojave Desert, long life of the tortoise and climatic variation year to year all make it difficult to produce reliable studies" (1999). With Multi-Species HCPs, complexity increases, requiring more information and further complicating understanding of the causal relationships.

In the Animas River basin, the relationship between mining and water contamination is uncertain despite years of research. Likewise, in the McKenzie River basin in Oregon, watershed council members encountered a similar challenge. Previous water quality data did not pinpoint the sources of sedimentation and turbidity in streams after storm events. Popular belief attributed water quality problems to forestry practices in the upper basin. Only after several years of coordinated water monitoring has the council begun to understand the exact impacts of development, agriculture, and old and new forestry operations throughout the watershed.

**New Methods**

Not only can data on impacts be uncertain and inference difficult, but the methods that agencies or collaborative groups use to solve resource problems may be new and untried with results that are difficult to predict. In the case of the desert tortoise, participants had to negotiate management strategies even without complete information. Often evaluation of the success of those strategies involves a comparison with the most likely alternatives. According to Chris Robinson of Clark County, "We have improved the science through our process, but sometimes the information is just not there. On the other hand, if you just wait and wait for that better science, you miss the opportunity to do hands-on conservation…look at the alternative. Is what we did better than what would have happened otherwise? Absolutely, no question. The desert tortoise is better off today than when it was listed with or without the full body of evidence."

Most collaborative efforts deal with holistic, landscape or ecosystem scale management practices, rather than the piece by piece approach that has been traditionally used by agencies. In the McKenzie, participants observed that much of the science behind watershed management or habitat restoration is new and "is going to take many years for us to actually figure out if that approach was the right one or not" (Grier, 1999). The uncertainty of

rangeland management provides another example of this challenge. In the Three-Quarter Circle Ranch case, Bob Trebelcock of the WY Department of Fish and Game stated, "What we are doing is not an exact science by any stretch of the imagination." Partnerships, while they provide a useful forum for the practice of new more holistic management, must also deal with the uncertainty surrounding those methods.

### *Strategies*

Dealing with the uncertain nature of natural resource management is not a challenge limited to collaborative partnerships. Agencies also have to make decisions without complete information, a stumbling block they may or may not recognize and/or address. Yet the uncertainty of either data or management methods can compound the difficulty of reaching a decision in a group with diverse perspectives on the problem and its severity. Partnerships used three primary approaches to confront the problem of uncertainty: adaptive management**,** avoidance of premature conclusions from data, and comparison of likely alternatives.

**Practiced adaptive management**
Adaptive management refers to the process of implementing small-scale experimental projects combined with research and monitoring to assess results and provide information on how to adapt management strategies to the current state of the resource. Of the cases included in the in-depth survey, only the McKenzie has the structure in place to provide ongoing monitoring for an adaptive management approach. Participants in the Clark County HCP consider it an appropriate strategy, yet lament the high costs involved. In the Three-Quarter Circle Ranch CRM, experimentation and monitoring are the primary strategies for handling issues of biodiversity and endangered species.

**Avoided Premature Conclusions**
The McKenzie Council, which collects its own water quality data through a coordinated monitoring project, is extremely cautious about making premature conclusions from preliminary data. John Runyon stated, "We made that very clear to the public. Five or six years into data, from a scientific standpoint, we have much more confidence in our data and we can speak more clearly about what this data means and about what kinds of questions it raises."

**Compared likely alternatives**
When no data was available, as in the Clark County HCP case, participants made decisions for tortoise habitat protection by comparing the management strategies proposed by the group to what would likely have happened otherwise. Moving forward despite incomplete knowledge is a strategy employed by partnerships, as it is by agencies.

## 3. Obtaining information and expertise

### *Challenges*

Several partnerships included in the case study interviews reported difficulty with availability of and access to scientific information and technical expertise. In some cases relevant data was non-existent or inaccessible. Neither partnerships nor agencies had the necessary information on which to base management recommendations or decisions. Particular to partnerships, however, was a challenge linked to the small community size and rural location of some groups. Community isolation limited partnerships' access to external information and expertise. Small communities often had few local resources on which to rely.

**Lack of information**
Participants from Darby Creek, Clark County, and Scott River remarked that a lack of data made dealing with scientific issues much more challenging. Melissa Horton, a Natural Resource Conservation Service representative from the Darby Partnership stated, "We always wish we had more baseline data to begin with." Often, the issues of concern have not been studied, least of all on an ecosystem or watershed scale. In Clark County, even nine years after the initiation of the HCP, an exact population count of the desert tortoise is still unknown.

**Few sources of information**
In one case, even when data were available, the partnership had to rely heavily on one source of information. In Clark County, The Nature Conservancy's representative Jim Moore noted "We relied heavily on the USFWS as a source of expertise." Some participants considered the lack of a peer review mechanism a weakness of the process.

**Limited access to expertise**
The Three Quarter Circle Ranch CRM group, and the Scott River CRMP recognized that their location in small, remote places restricted access to external expertise. Unlike the McKenzie River Valley, which is near both the University of Oregon and Oregon State, the Scott River Valley is four hours from the nearest university. In rural Wyoming, Three Quarter Circle Ranch CRM members noted that the cost in time and money required to access new knowledge prohibits a regimented pursuit of hard science. Furthermore, a cultural breach between residents of rural communities and academics who lack the ability to empathize with rural concerns sometimes makes bringing in outside experts difficult. This challenge was especially evident in the Scott River CRMP.

### *Strategies*

**Experts at the table**
In order to obtain credible information and expertise, partnerships enlisted members with expertise on the issues of concern. Many relied heavily on agency experts, industry scientists, private consultants and research professionals. All of the cases studied included agency representatives as group members. The Owl Mountain Partnership, for example, relies on the

expertise of the BLM project manager to deal with scientific issues. The Darby Partnership and the McKenzie Watershed Council also include many experts at the table. The composition of the group, while it has raised other problems, has provided a ready source of information, as well as access to further data and expertise.

**Task forces**
Some groups also pull in other agency expertise by forming task forces to concentrate on specific or short-term issues. Task forces often included other outside expertise, such as local consultants or university researchers. For example, the McKenzie council convenes technical teams and working groups for specific issues. Different task forces worked on developing action plans for the council's primary program areas: fish and wildlife habitat, water quality, recreation and human habitat.

**Guest speakers and outside resources**
When groups didn't feel that the need for information warranted the formation of a task group, outside experts were invited to speak to the group on a particular issue. Executive Director Lisa Jo Frech of the Nanticoke Watershed Alliance described this process of identifying and accessing expertise as "a spider web that is always growing, we are always evolving, we are always looking to catch someone else in our net." Outside resources that partnerships tapped into also included data and research done by agencies or university researchers.

## 4. Managing information

### *Challenges*

Even when information and expertise was available, partnerships experienced problems managing that information. With multiple agencies and organizations involved, information coordination, and verification challenged participants in the Scott River CRMP, the Blackfoot Challenge and the Animas River Stakeholders Group.

**Utility of existing data**
The McKenzie Watershed Council found that baseline data were based on different parameters making it difficult for the groups to compare information across a watershed scale. George Grier described the situation. "The State of Oregon had been maintaining water quality data for almost 100 years, but it was in 16 different formats, no one could access it and no one knew what was going on. [Data] was all scattered around, there was absolutely zero communication and it was ludicrous. There was data that someone was spending hundreds of thousands of dollars to collect and it was just sitting gathering dust someplace. We had all the stuff we needed to be making more informed decisions about the health of the river, but no one was talking about it or could even view it." This was a challenge not even recognized by the agencies that had been collecting the data. The creation of the watershed council brought the problem to light, opening doors to possible solutions.

**Verification of information**
Verifying scientific information can be another challenge for collaborative partnerships. In the Blackfoot Challenge, data conflicts arose over the listing of the bull trout when wildlife biologists from the Plum Creek Timber Company disagreed with some of the data of federal and state biologists. Participants in the McKenzie Watershed Council observed the need to recognize that even scientists have opinions. Industrial timberlands representative Barb Blackmore commented, "You can get two scientists together and they can tell you two different things…they have opinions, they also come at it with a bias." Collaborative groups must deal with the challenge of balancing different perspectives, even among the "neutral" technical experts. In the Animas River Valley, for example, some residents believe that the EPA will not acknowledge initial water quality studies done by the USGS. Data conflicts among technical experts are certainly a common pattern in litigation processes. Partnerships, while not immune to this challenge, can provide opportunities for bringing differing views and sets of information into a common forum.

***Strategies***

**Coordination**
In order to adequately manage an increased flow of information from different sources, and ensure efficient processing of data, partnerships stressed the importance of having a coordinator. Particularly, coordinators who not only had strong people skills, but were also proficient in the relevant science, helped partnerships progress. The NW Colorado RAC BLM district manager Mark Morse not only knows the ins and outs of rangeland science, but also is personally dedicated to the success of the RAC. In the McKenzie basin, coordinator John Runyon has a technical background in water quality. Conversely, Jeffy Marx, coordinator of the Scott River CRMP said, "I came to this process as an ex-schoolteacher with little understanding of the science involved. I've learned my way, but I think these processes could benefit from coordinators who have both the time and expertise to manage the scientific information." Although the scientific background of the coordinator was stressed, one member of the MWC also mentioned the value of having a coordinator skilled in conflict management. Before Runyon was hired by the MWC, the Lane Council of Governments (LCOG) acted as coordinator. LCOG's strength lay in a strong background in group process, skills some technical experts may lack.

**GIS**
Geographic Information Systems have changed the possibilities for organization and presentation of natural resource data. In order to improve the compatibility and accessibility of data on water quality, the MWC is compiling a GIS database for the basin. Before the council, "everyone had their own data layer and they were different"(Runyon). Mapping information helps scientists and non-scientists alike understand the resource problems and their relationships.

## 5. Legitimization of Science

Since collaborative partnerships as we define them inherently include diverse interests, most groups deal with a mix of scientific, economic, social and political concerns. It is often difficult if not impossible to extricate science from other interests. Proving the legitimacy of the information is often a part of any management decision, whether by agencies or by a partnership. By laying all of those issues on the table, collaborative groups may actually depoliticize the insular "scientific" decision-making of agencies. As in the case of uncertainty, partnerships illuminate the inextricability of science and politics. In the Scott River CRMP, the McKenzie Watershed Council, and the Animas River Stakeholders Group two main obstacles emerged in dealing with this challenge: forging new relationships between agencies and landowners, and dealing with questionable motives and integrity on the part of agencies.

### *Challenges*

**Forging relationships**

Landowner distrust of agencies' regulatory authority can pose challenges to collaborative groups. For instance, landowners in the McKenzie basin are often afraid to collaborate with the DEQ on water quality monitoring projects. Barb Blackmore of the Weyerhaeuser Corporation explained, "Even if people may want to get some help from them, they would never ask them, because they're just begging for a water quality listing." An outside observer and critic of the McKenzie Watershed Council recounted one meeting where members discussed how to keep water quality data collected on private land from the state DEQ in order to protect cooperative landowners (Heiken, 1999). The Scott River CRMP encountered similar barriers to data collection on private land. Landowners interested in maintaining property rights have impeded agencies from conducting scientific tests on their property. The Natural Resource Conservation District's pro-farming bias has also slowed the transfer of information essential to watershed conservation (Sommarstrom, 1999).

**Agency motives and integrity**

In the Animas River Stakeholders Group, participants voiced concerns about the motives and integrity of the involved agencies with regards to research on the effects of mining on water quality. One concerned citizen commented, "We have found that when some of the studies done have not been politically correct, we just do not hear from them and we find someone else has taken their job. It is obvious that the agencies feel that they have to find something that is wrong in order to justify their work." Agencies have cut budgets for researchers who find data that contradict other studies, and invalidated or refused to recognize the findings of other agencies. Chris George, another participant, observed, " I do not see anything sinister, but I have seen a certain unwillingness of people at certain levels to not be happy with data."

Agencies often have a difficult time learning to collaborate with each other. In the Scott River Valley, agency members exhibited proprietary behavior over information or data they had collected (Marx, 1999). Each agency needs to justify its existence by providing concrete

measurements of their impacts, and that can be difficult if credit goes to the collaborative group.

***Strategies***

Both from a scientific as well as a political perspective, partnerships must work to legitimize the collaborative process. Strategies to deal with the inextricability of science and politics include public outreach and education and joint fact finding.

**Public Outreach and Education**
Public outreach and education can take several forms depending on the issues and needs of the community. When information is in question or the motives of the group are unclear, partnerships have convened public forums or workshops to shed light on particular concerns. For example, in the McKenzie basin, severe flooding in 1996 led to conflict over the cause of sedimentation in Eugene's drinking water. The MWC held a public water quality forum with guest experts. Over 200 people attended and many misconceptions were cleared up. Other forms of outreach include agencies working one on one with landowners as in the Blackfoot Challenge case.

**Joint Fact Finding**
In the Scott River CRMP, the group used a process of joint fact finding to ensure the credibility of the information obtained for all involved. For instance, ranchers, agencies and university experts visited sites in the watershed to jointly assess the conditions of streambanks or salmon habitat.

## IV. REFLECTIONS AND ADVICE

Reflecting on their own experiences dealing with the scientific dimensions of issues, participants offered a range of advice for others using collaborative approaches for natural resource management.

### 1. <u>Tap into resources</u>

- ***Establish network of technical experts***
- ***Include experts in the group***
- ***Access resources in the community***
- ***Maximize information sharing***
- ***Choose a coordinator versed in science***

"Identify expertise in your watershed. Foster relationships with those experts. Create a list of folks that you can call upon when issues come up" (Runyon, McKenzie Watershed Council, 1999)

"Use agency expertise so that sideboards are created as to what is and is not feasible" (Neudecker, Blackfoot Challenge, 1999).

"You need to instill as much information sharing as possible to sift out the facts…it's not just that people need to be educated. They need mutual education to take place" (Sommarstrom, Scott River CRMP, 1999).

**2. <u>Be inclusive</u>**

- ***Include all stakeholders in discussion of scientific issues including question development, data collection, and inference***

"Get that good mix of people in there that are working for different agencies and make sure that they are there. But also make sure the end group is there. Farmers for example. They are talking about their own concerns and bringing their own expertise on scientific issues to the table" (Stribling, Nanticoke Watershed Alliance, 1999)

"Make a conscious effort to get everyone involved when obtaining scientific information. Get everyone in on the ground floor as terms of how you are going to conduct the study, collect the data, and what it is going to represent" (Butler, Animas River Stakeholders Group, 1999).

"Some parts of science are just straight math but most of the stuff in the natural resources area can't be quantified very easily and it's important to listen to the people who are involved locally because they might have an important role to play either by helping to design the thing properly or in making sure that's it s implemented appropriately" (Grier, McKenzie Watershed Council, 1999).

- ***Use broad variety of expertise, not just one field or source***

"You go out and get as many sources of information as you can" (Core, Darby Partnership, 1999).

"Be willing to present all sides of whatever science you are trying to present" (Smith, Darby Partnership, 1999).

Commenting on the CRM's dependence on rangeland specialists to focus the scientific approaches on the ranch, Ron Cunningham said, "We need to diversify our expertise by bringing on a botany or a wildlife specialist" (Cunningham, Three-Quarter Circle Ranch, 1999).

- ***Make sure entire group understands the basis of research / monitoring***

"Make sure that the entire group understands what the studies are about so that actions taken can be justified" (Clark, Animas River Stakeholders Group, 1999).

"Try to keep everything at like a 6th grade level, so everyone can understand (Thompson, McKenzie Watershed Council, 1999).

**3. <u>Separate Tasks</u>**

- ***Start with small projects***
- ***Develop sub-committees***
- ***Focus on adaptive management***

**4. <u>Other</u>**

- ***Focus scientific questions***

"It's so critical that you know before you start exactly what question you want to answer, or you may be buried in data and not have a clue what to do with it" (Blackmore, McKenzie Watershed Council, 1999).

- ***Find experts with holistic perspectives***

"Look for the holistic guys…people who understand watershed functions such as 1.4 million acre lands…some of the landscape ecologists who are thinking of the big picture and they can probably help you with the decision-making element" (Hirschenberger, Blackfoot Challenge, 1999).

- ***Consider alternatives and act, despite lack of complete information***

"Sometimes you're just going to have to make do. There's a lot of uncertainty in our scientific approach, but what are our options? The most we can do is bring in as many voices on the issues and trust the agencies to work with the best information we can find" (Trebelcock, Three-Quarter Circle Ranch, 1999).

- ***Have reliable data to support your assumptions***