Collaborative Approaches to Using Geographic Information Systems in Science Intensive Resource Management Planning: Implications for Practice from the Lesser Prairie-chicken Working Group

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Introduction

How can regulators, planners, citizens and conservation specialists manage technical and scientific data in ways that help resolve environmental controversies? What role can GIS technology play in making scientific information accessible, transparent and understandable? What reliable processes help to build trust in addressing technical and scientific issues and to collaborate in finding facts?

Planning regional conservation strategies involves consultation with wildlife biologists and habitat restoration experts as well as citizens, local officials, conservationists, mineral extraction and grazing interests. These parties debate technical approaches to assessing situations and proposing conservation strategies. Joint fact-finding engages participants in collaborating on filling gaps in information and addressing technical and scientific judgments. (Ehrmann and Stinson 1999) (McCreary et al., 2001)

This paper identifies key problems and opportunities encountered when citizens and experts confront disagreements about technical and scientific questions in managing land and natural resources. (Susskind and Dunlap 1981) (Sullivan et al. 1996) (Ozawa and Susskind 1985) The authors explore the forces that drive differing interpretations of scientific fact and argue for the role of citizen-based, non-objective judgments (Rittel and Webber 1973) (Fischer 1993) (Daniels and Walker 2001) In early 2002, a multi-party stakeholder Working Group, representing ranching and grazing interests, state and Federal regulatory agencies, sportsmen and recreational interests, oil and gas industries, conservation groups, and county and municipal governments, was formed to develop a Conservation Strategy for the Lesser Prairie-chicken and Sand Dune Lizard (LPC/SDL). Both species were listed as threatened species in southeastern New Mexico and the Fish and wildlife Service (FWS) was considering listing both.

The authors describe how a multi-layered GIS mapping system was developed and used by the negotiators to define and identify habitat qualities that were instrumental in establishing an innovative twelve-part conservation strategy. (Richardson and Herzlich 2002) In addition to providing insights from in-depth interviews with members of the Lesser Prairie-chicken Working Group, the authors argue that development of the Geographic Information System (GIS) was based on three key principles. First, the data were trustworthy (made up of layers of land

classifications, land ownership, grazing leases, and oil and gas development information that the stakeholders believed to be true). Second, the system was transparent (the graphic images were easy to read and the ways the data were combined and manipulated were understandable). Third, the system was accessible (the participants could debate and adjust key parameters including habitat quality boundaries and land classifications.[1]

More important, the mapping system was created jointly using federal, state and university databases. In cases where participants questioned data or their use, the negotiating process was sufficiently flexible to allow for joint fact-finding and the verification on-the-ground effects of different conservations strategies. Further, the system was designed to protect confidential information about bird nesting and lek[2] locations on private land.

The paper concludes with recommendations about using GIS technology to support and collaborative planning among scientists and non-scientists in making resource-based decisions and policy determinations. In-depth interviews with key participants after the Conservation Strategy was complete provide insights into how the negotiators used the GIS system to test options, judge outcomes and develop "negotiated conservation zones" and negotiated Plans of Development (POD) that led to proposing an innovative exchange system permitting reclaimed land to be exchanged for permission to use land in good and potentially suitable habitat areas.

[1] Early on, stakeholders expressed different perspectives about the causes of the decline in the habitat and the species. These perspectives were particularly related to the Prairie-chicken habitat characteristics, impacts from oil and gas development, and the natural and human caused reasons for decline in good habitat (e.g., drought vs. development and human encroachment). Some felt it particularly important to incorporate "on-the-ground" knowledge and cutting edge research, while others felt strongly that decision-making should include only the best scientific information already published. It was challenging to include non-science perspectives and to convince technical experts to value local perceptions in the decision-making process. The participants all agreed that the process should not rely on the generation of new scientific information.

[2] A lek is breeding and nesting ground for the Lesser Prairie-chicen.

Challenges of Involving the Public in Science-intensive Decisions

Scientific information and public review shape environmental decision-making. In principle, public participation in the EIS scoping and review process is an important step in the decision-making process. (Richardson in Blackwell 1994) There are significant challenges in involving the public in highly technical discussions. Scientific studies can be hundreds of pages long, written in highly technical language and full of charts, graphs, maps, and other information. Sullivan et al. found an "atrocious" level of citizens' understanding of EIS material. (Sullivan et al, 1996)

While citizens and stakeholder groups may have a critical interest in the outcome of the decision-making process, they do not often have the expertise to participate in discussions about the technical aspects of environmental issues. Daniels and Walker describe this "fundamental paradox" between technical competence and public participation: "Citizens demand technically sound decisions, but as situations become more complex, fewer people have the technical background needed to either meaningfully contribute to, or critique, the decisions." (Daniels and Walker 1996)

Working group members could not agree on how to use new, unpublished research. However, the group was able to agree on a principle for deciding which information to use in their deliberations. By deciding to use published, peer-reviewed articles, working group members could proceed with analysis and discussions without becoming overly bogged down in getting new information and deep disagreements over validity of particular studies. Participants reflected that their agreement to peer-reviewed data allowed them to deal with science in a constructive and credible way:

> "I think we did work hard to apply science to it in deciding what and how far to go, what's reasonable and unreasonable. The more information we had, the more explicit we could be in our recommendations. We felt firmer about it."

Geographic Information Systems, Natural Resource Conservation Planning and Citizen Participation

Without settling the argument as to whether GIS is a science in itself or a technical tool used in making scientific and policy judgments (Wright, Goodchild, and Proctor 1997), theoreticians in the 1990s began to explore the impact that GIS and mapping systems would have on setting social and economic boundaries as well as using technical and scientific knowledge in a way that is accessible and transparent to both scientists and non-scientists. (Chrisman 1999) (Harvey 2001) (Harvey 2006) Harvey and Chrisman utilized the concept of "boundary objects" to emphasize this dynamic, stating that "much like geographic boundaries, boundary objects separate different social groups at the same time that they delineate important points of reference between them. Boundary objects and documents such as tables, maps, or text, stabilize relationships through the negotiation of flexible and dynamic coherences [and] the negotiation of differences between groups is fundamental to the construction of GIS technology." (Harvey and Christian 1998)

There has been skepticism since the emergence of GIS technology (Abbott et al 1998) and questions about the power relationships involved in the informational transactions that occur when GIS is used in a collaborative framework. However, researchers have also recognized the ability of GIS technology to empower groups of citizens. According to Pickles, new technologies like GIS are calling into question the truth and reality of digital and numerical representations, and the use of GIS by marginalized groups has allowed a kind of "counter hegemonic social action," in which information is power and effective visual representation of that information is potentially liberating (Pickles 1995, p.10). Meaningful and deliberate citizen influence in making scientific judgments in environmental conservation and resource management decisions has been important since the passage of NEPA in the early 1970s, and GIS is allowing for new ways to enable effective citizen participation in these collaborative processes. (Schmodlt and Peterson 2000) (Alcorn 2000) (Alcorn 2000) (Richardson 1981)

In the last decade, geographic information systems and other mapping techniques have been debated, developed and increasingly used to involve citizens and experts in making technical judgments in developing conservation strategies and setting priorities. (Abbot et al1998) (MacEachren 2000) (Fall, Daust and Morgan 2000) (Tapia-Bojórquez, Diaz-Mondragón and

Ezcurra 2001) (Gonzales 2002) (Balram et al 2004) While it is increasingly clear that scientific information alone is insufficient in making sound environmental and conservations policies (Karl and Turner 2002), it is clear that GIS technology is profoundly influential in structuring power relationships among the participants and empowering non-experts to influence scientist and technical experts. (Puri and Sahay 2003) (Chambers 2006)

GIS technology has also been effectively used to enhance communication among technical and non-technical participants. (Schmodlt and Peterson 2000) (Shanley and Gaia 2002) Kwaku argues this has been structured so that… "the links between value systems, opinions, and actions and how a GIS application might influence such human attributes [induce] changes that promote cooperation." (Kyem 2004) GIS technology has also been used to enable citizens in rural areas to participate in identifying and collecting data, assessing management options and developing conservation strategies as well as and resolving conflicting points of view. (Quan et. al. 2001) (Al-Kodmany 2001)

Integration of social and natural science information using spatial databases in natural science resources is increasing in sophistication, and the use of maps and overlays brings in local groups and citizens into decision-making. At the heart of this dynamic, maps may be viewed as having become "powerful political tools in ecological and governance discussions." (Alcorn 2000) (Allen and Goers 2002) (Elwood 2006) In sum, experience has shown that computer-based GIS systems and local insights can be integrated to improve scientific decisions, especially in contexts where the social and political relations bring the participants together rather than divide them. (Jankowski and Nyerges 2001)

Adversarial and Advocacy Science

Failing a clear procedure for soliciting and incorporating scientific advice, adversarial and advocacy science often dominates the policy-making process. Scientists in government agencies, academia, environmental advocacy organizations, and industry associations conduct their research in isolation from each other, and often publish studies with very different outcomes. Susskind and Ozawa note that scientists often disagree because of miscommunication,

differences in the design and interpretation of inquiries, and errors (Ozawa and Susskind 1985). For these reasons, experts studying similar questions can arrive at different conclusions, which are then used by opposing interest groups in an adversarial manner.

Thus, even before discussing what to do about an environmental problem, party's debate whose science is better and which data should be used in the decision-making process. Rather than helping to inform the decision, experts are left to walk the line between explaining their findings and defending their credibility. Adversarial and advocacy science also casts doubt on all research and findings, leaving decisions-makers with no commonly accepted scientific information on which to base their environmental plans and policies. Even experts with the best of intentions may not be trusted by members of the public because of current or former affiliations, funding sources, or past research.

Why Involve the Public in Scientific Questions?

Many researchers and practitioners recognize that citizens can inform the decision-making process by providing expertise that grows from their connection to the land. "Local knowledge," as distinct from "expert research," relies on knowledge based on continued observation over a long time period. Local knowledge typically involves interpretation of the observations emphasizing common sense. As Fischer explains, long-time local residents have the unique ability to ground expert knowledge in the local context and therefore increase its relevance to policy decisions. (Fischer, 2000)

While scientific inquiry requires technical knowledge and training, many aspects of research design and analysis involve nonobjective decisions. Susskind and Dunlap (1981) outline several decision points in EIS processes that are influenced by nonobjective criteria; these include choosing professional team members; organizing the work plan; coping with uncertainty; initiating strategies for mitigating impacts; approaching and designing public participation; and

using data for forecasting rather than "fact." (Susskind and Dunlap 1981) Each of these choices depends on judgment.[3]

When scientific and non-objective judgments are used in scientific inquiry, experts should be clear about assumptions as well as discuss the way the data are collected, analyzed, and displayed. (Susskind, Richardson and Hildebrand, 1978) Further, they should recognize the importance of involving the public in discussions of the underlying values and setting criteria for decision-making.

Consensus-based Approaches to Environmental Decision-making

Joint fact finding is a consensus-based approach to addressing these processes by bringing together stakeholders, scientists, and decision-makers to scope, review, and incorporate scientific information into policy decisions. It involves stakeholders in helping planners frame the research questions, choose objective and credible experts, monitor the research, interpret the results, decide on a course of action, and revisit the plan after implementation to consider whether modifications are needed. This process is particularly suited to resource and environmental management and has been used for many environmental issues, including coastal zone management, watershed management, and facility siting (McCreary et al, 2001), and has been successfully tailored to a number of process needs. (McCreary, Gamon, Brooks, 2001, p. 18)

One goal of joint fact finding in difficult multi-party decisions is to gather information that is credible to all parties. As illustrated by Ozawa and Susskind (1985), joint fact finding reduces parties' abilities to use technical analysis as a "deceptive shield" to serve their interests in a policy-making process. Rather, it makes transparent the scientific and technical issues and requires a joint selection of experts, rather than dueling scientists, to work on these questions.

[3] Susskind and Dunlap suggest practitioners recognize that, environmental impact practitioners often give advice and make judgments that are not based solely on technical training; all technical judgments have a range of value judgments embedded in them; and some technical judgments are more constrained by value choices than others.

Joint fact finding also promotes the use of boundary objects that allow experts to work with stakeholders and decision-makers to build a shared understanding, negotiate agreements around scientific issues, and apply technical information to policy questions in a transparent manner. (Cash et al 2003) The use of GIS systems allow participants, representing different interests and different technical disciplines, to jointly create models that all parties found credible and agreed could best inform their choice of an appropriate protocol.

Joint fact finding can also lead to increased credibility through an explicit management of the relationship between technical and local knowledge. Adler and Birkhoff outline several basic principles for managing the interplay between expert and local knowledge, or "knowledge from here and knowledge from away." (Adler and Birkhoff, 2002) They note a number of principles shared by the best stakeholder processes, each of which can be accomplished through joint fact finding:

- No one type of knowledge or "way of knowing" is privileged above others – all modes of inquiry and analysis are welcomed;
- Both technical and local information are accessible to everyone involved;
- Stakeholders drive the framing of questions, information gathering, analysis, and its application to decision-making;
- All information, regardless of its source, is subjected to respectful questioning about validity, accuracy, authenticity, and reliability; and
- Capacity building for all participants in learning from different kinds of knowledge.

Joint fact finding also helps to mitigate uncertainty and improve credibility by embracing uncertainty. Today, adaptive management strategies are used to make incremental management decisions in light of scientific uncertainty and the dynamic nature of environmental processes. (Lee 1993) (Ravetz 1986) (Walters and Holling 1990) In dealing with the many unknowns inherent to environmental management in an accessible and transparent fashion, stakeholders are able to negotiate how this uncertainty should be dealt with and reflected in the implementation of a resource management plan.

The Lesser Prairie-chicken Case

The Lesser Prairie-Chicken's (LPC) habitat is located in Colorado, Kansas, New Mexico, Oklahoma, and Texas. This region includes prime habitat for the Sand Dune Lizard (SDL), and represents considerable economic value to the state and local governments, ranchers and oil and gas industries, generating substantial natural resource royalties and tax revenue. Farming, ranching and oil and gas exploration in the late 1800's precipitated a long slow decline in the species. Farm and ranch consolidation and the growing importance of developing energy minerals in the early 1960s lead to a precipitous decline in the Prairie-chicken until the best consolidated habitat remained on public land in southeastern New Mexico. By the early 1990's, both the Lesser Prairie-chicken and the Sand Dune Lizard were considered threatened and became candidates for federal listing under the Endangered Species Act. (The Collaborative Conservation Strategies for the Lesser Prairie-chicken and Sand Dune Lizard in New Mexico 2005)

While everyone agreed that both species were dwindling, there was deep disagreement on the causes. Some maintained the decline was from changes in the weather and a recent drought in the region, others felt it was because of increasing oil and gas development and grazing practices. Still others pointed out that the real problem was in lax state and federal land-management procedures and conservation practices. There was long-standing disagreement on the scientific evidence, and many representatives felt there were weak connections between decline and its causes. For over a decade, regulators and private interests remained deadlocked in developing conservation strategies or actions. In September 2002, following an attempt to initiate a conservation plan through New Mexico's State Game and Fish Department, a coalition of 15 conservation groups filed a petition with the BLM to designate key portions of the region as Areas of Critical Environmental Concern (ACEC). At the same time, the U S Fish and Wildlife suggested that unless positive steps toward conservation were initiated, one or both species could be listed as endangered.

State and federal agencies with the Wildlife Management Institute, proposed, in December 2002, forming a Working Group "of appropriate public and private stakeholders to develop a conservation strategy for the management of the natural habitats for the two at-risk species." In February 2003, a group of 30 stakeholders[45] was convened by the NM State Game and Fish Department on behalf of state and federal agencies, ranchers, oil and gas industries, conservation, local government and recreation entities to discuss potential management strategies for the economically and environmentally valuable habitats. (Collaborative Conservation Strategy, 2005) Over the following two and a half years, the stakeholder representatives were able to achieve an extraordinary level of understanding regarding the biology of the two species and develop a knowledge of and appreciation for their collective interests, while successfully negotiating a twelve-part conservation strategy for the Lesser Prairie-chicken and Sand Dune Lizard.

Outcomes

The "Collaborative Conservation Strategy" set standards for evaluating, maintaining, and expanding critical habitat. The strategy outlined ways to minimize disturbance and initiate reclamation that may result from grazing and energy development activities on both public and private lands. It set priorities for the remaining good and potentially good habitat in the region. In addition, it limits some forms of predator control, and recommends management and education efforts to reduce poaching and accidental shooting. A captive propagation facility near Carlsbad, New Mexico, will reintroduce birds to unoccupied parts of the historic range. The conservation strategy outlines key research and monitoring actions and proposed that detailed criteria to measure success of conservation efforts be developed and outlined in key implementation steps, which are presently underway.

The negotiating parties in southeastern New Mexico are committed to avoiding the litigation and conflicts over the Lesser Prairie-Chicken and the Sand Dune Lizard that have plagued other

threatened species such as New Mexico's Silvery Minnow in New Mexico's Middle Rio Grande Basin or the Spotted Owl in Oregon. As a result of these groundbreaking negotiations, it is probable that habitat for the Lesser Prairie-Chicken and Sand Dune Lizard will be conserved and enhanced and will preclude listing the species as endangered by the U S Fish and Wildlife Service.

Convening the Lesser Prairie-chicken Working Group

Development of the conservation strategy resulted from a carefully crafted process. The Bureau of Land Management (BLM) and the U S Fish and Wildlife Service (FWS) contacted a facilitator who formed a team to help the agencies design, plan for, and manage the collaborative negotiations for the Lesser Prairie-chicken Working Group. (Richardson and Herzlich 2005) (See Appendix A for Working Group membership.) Over two months, the team conducted a situation assessment interviewing a cross-section of individuals from the potential stakeholder groups to scope key issues and propose an initial agenda for the negotiations.

At a kick-off meeting in February 2003, the Working Group established and drafted ground rules for the negotiations. (See Appendix B, Ground Rules and Operating principles) A Coordinating Committee was created with membership representing the stakeholder groups to work with facilitators in scheduling meetings, setting agendas and distributing materials to the group.

A Technical Committee of wildlife biologists, land management specialists and independent scientists and technicians from the University of New Mexico was established to gather relevant data, consult with outside experts as needed, provide scientific review of the biological status and threats to the species, and comment on potential conservation strategies. Failing a clear procedure for soliciting and incorporating scientific advice, adversarial and advocacy science often dominates the policy-making process. Scientists in government agencies, academia, environmental advocacy organizations, and industry associations conduct their research in isolation from each other, and often publish studies with very different outcomes. Finally, a Document Committee was designated to draft the strategy based on decisions from the Working Group.

In May 2005, the Working Group presented their findings and recommendations for the conservation of the LPC and SDL in New Mexico in final report **"Collaborative Conservation Strategies for the Lesser Prairie-chicken and Sand Dune Lizard in New Mexico."**

In August 2005, an independent evaluator interviewed a cross-section of member of the Working Group.[6] The interviewer asked the participants to reflect on their role in the negotiations and how the group worked with scientific and technical information and the GIS system.. The interview questions asked how well the scientific and technical information was understood and inquired about the ways biologists, rangeland management and wildlife habitat experts were involved. The interviewees also discussed how the Working Group developed ways to gain insight into key technical and scientific issues such as habitat quality and landscape suitability.

The Stages of the Negotiations

The facilitation team that proposed the Working Group adopt a five-phased process designed to move the group expeditiously from developing a common understanding of the issues to developing and testing an overall conservation strategy.

Phase 1: Accommodating Legal and Regulatory Constraints, Learning about the Regional History, and Creating a Vision

During the first phase, the group developed a vision for the future and gained an understanding of the legal, regulatory and technical constraints affecting the habitat. Participants exchanged written materials and presentations by federal agencies and outside experts. The oil and gas representatives gave a presentation on the economic contributions of the industry to the region, state and nation.

[6] The interview and evaluation process consisted of holding in-depth interviews with 15 members of the Working Group representing each of the stakeholder groups, as well as key members of the Technical Advisory Committee. The balance of the Working Group and Technical Advisory Committee members received a survey assessing their insights and attitudes about topics parallel to the interviews.

> "There were presentations made by all government agencies. We also had [presentations from] mineral and oil and gas and range specialists, and mineral leasing experts. Representatives… from the Fish and Wildlife Service… talked about the Endangered Species Act… and [the] technical sub-committee gave… presentations on habitat parameters. These briefings were done early enough so everybody knew the species, what it needs, [and what the] impacts or threats [are]."

The ranching representatives invited the group to tour the region. Over a three-month period, the Working Group held meetings in Carlsbad NM (in the southern-most tip of the habitat), Portales NM (on the northern edge) and Milnesand, New Mexico in the center of the core habitat. (See Map 1, **Title**.) At these meetings, local ranchers led tours showing grazing practices, the economics of modern-day ranching, and demonstration conservation programs. In Milnesand, the group went to the Lesser Prairie-chicken Festival and enjoyed the experience of the LPC "booming" and mating dances at dawn.

> "This [local historic and economic] process forced everybody to get into much deeper thinking about the biology of the situation and [legal] requirements – what's feasible and not from an operational standpoint. What's an impact and to what degree, [we can shape] … adequate mitigation."

> "Quite a lot of info was put together. We had different people come in to talk from FWS, different presentations made by various biologists in SE NM. We had meetings in various areas to solicit input from some of the people on the ground who were not scientists."

> "The different industries each gave a presentation on how the oil and gas industry works and how a livestock operation works. The major stakeholders were oil and gas, livestock, and regulatory industries. The environmentalists, [were] there to provide input into the science – as far as their being a stakeholder, their "stake" was success of chicken. That applies to everyone. No one is out to destroy. To say that they were at tier 1 stakeholder, I question. Their input is acceptable and in some cases good to hear, because in a lot of ways proactive to shape policy as relates to species."

All of the participants felt that the efforts to prepare stakeholders with background information about biological, regulatory, legal, and conservation issues were successful. In this early phase, stakeholders and experts jointly explored technical issues related to biology such as key features of the habitat and needs of the species. In addition to presentations by the regulatory agencies, stakeholders also took the opportunity to learn from each other about the economics of the oil and gas industry and history and meaning of local ranching.

Phase 2: Setting Ground Rules and Identifying Optional Conservation Actions

In the second phase, the group developed ground rules and clarified issues and threats to the habitat. (See Appendix B for the ground rules, decision-making guidelines and operating principles). In this second stage, the group also worked to condense background information into a tabular listing of all potential threats to the species, and potential conservation solutions in the form of management practices that could be undertaken by agencies and/or land users. During this period the Working Group debated the relative importance of possible solutions.

> "This whole process [was] based on the idea that we needed to have help and a facilitator to sit down with us to reach consensus. I guess the thought to remember [is that] we've been negotiating with environmental groups for over 20 years. Most of us know each other already [What we need is] someone to do the organizing [design the process] and administrative work, stand up front [manage the negotiations], and help us communicate."

Phase 3: Developing Initial Options and Identifying Place-based Conservation Practices

In the third phase, the Working Group formed geographic sub-groups – "Carlsbad," "Roswell" and "Milnesand" – and proposed specific projects appropriate to these areas. The group also began reviewing the overall management practices and the technical committee began providing insight into the sequence and efficacy of the proposed conservation practices. In this stage, the participants agreed threats and solutions would vary throughout the region.

> "My understanding is that you're evaluating process and how it worked, how improved – I would encourage that if this process or a form is pursued in the future, if it involves endangered species, that a map – accurate maps be available early on to identify where potential areas of impact by group's discussion is going to occur. If you're talking in general sense, going to get a lot of general thoughts. That can go on for years. A process should be working to accomplish – what needs to be done and those steps considered/evaluated. Don't have just one person or entity most of the time that's the sole impacted party."

Phase 4: Understanding Deeply-Held Values and Creating a GIS Driven Visual Data Base

In the fourth phase, the working Group proposed broad management standards and practices, with assistance and guidance from the Technical Committee. Participants worked collaboratively to understand the facts from divergent points of view. They had to agree on assumptions that would be used to evaluate the quality of the habitat, and appreciate what the history and uses of the land meant to one another.

> "I don't think that if you honestly have an interest in the management of those lands, that you can afford not to participate. It is essential that you know who's involved and who the decision-makers are. [The process] serves as an important vehicle for establishing these relationships."

> "Each of us needs to take three or four days and get away or talk with a couple of other people and think about the good, the bad, and the ugly of an approach."

In addition to managing a wealth of technical studies about the species' biology, the Working Group invented a new way of "seeing the land" through creating a sophisticated geographic information system (GIS) that could analyze qualities of the land and show the relationships between development and habitat. In this stage a multi-layered Geographic information System was created as a collaborative effort between the New Mexico State Land Office (NMSLO), the New Mexico Department of Game and fish (NMG&F), and the Bureau of Land Management (BLM). The GIS was not released to the Group until this stage in the process because of the need to negotiate legal agreements with the NM Game and Fish Department about how to show confidential information about lek locations and voluntary conservation programs on private land.

> "Maps were extremely important to some members of industry who wanted to know [what and] where we were talking about, what were limits of the areas. We didn't want to talk in generalities. In some cases that related to … my personal lots, my company's holdings. It was important to getting some members to accept what was produced."

Early in the process stakeholders also expressed frustration about negotiating without maps and the information they provided:

> "One of the biggest shortcomings was lack of actual maps. Mapping visual presentation of – these are the areas of prairie-chicken and lizard activity; these are the areas impacted by regulation – that information was long time in coming. And in the long run, it was the crucial piece of information that allowed us to reach consensus."

After the GIS maps were available, nearing closure a representative of the oil and gas industry brought photographs of one of the thirteen reservation areas in the southern region. He showed the proposed conservation area was riddled with power lines, access roads and oil and gas rigging. He then argued the land was inappropriate as a conservation area suggesting that most of the 13 designated areas are likely in inappropriate locations. In response, the BLM Carlsbad wildlife biologist proposed that the oil and gas representatives, ranchers, and BLM representatives tour each area and make on-the-ground determinations of the habitat vitality of these reservation areas.

This was a major challenge to the efficacy of the maps, and the industry and BLM representative agreed to a joint fact-finding process to resolve the discrepancy. Later, the industry agreed to negotiate Plans of Development (PODs) for any new development proposed for land containing suitable or potentially suitable habitat. These agreements point out the importance of building trust and working relationships as well as the willingness to jointly gather needed information by inspecting sites and agreeing on impacts and mitigation strategies.

Still other participants observed that the availability of maps was a turning point in the process:

> "The [GIS] mapping process… sped it up quite a bit. Before, we were speculating about stuff . . . representatives were saying, 'How's this going to affect me?' They wanted to see it in front of them… With the GIS, [we were] able to get a better grasp on the spacing of the protections and type of protections involved. Once we had those data in there, the understanding level increased substantially."

As the Working group became comfortable with using the maps and as the implications of pursuing different conservation strategies became clear, the stakeholder groups began proposing strategies to address oil and gas exploration and development. Participants had to agree on assumptions that would be used to evaluate the quality of the habitat and propose ways to acknowledge and value economic and historic uses of the land. In addition to including analysis

of technical studies about the species' biology, the Working Group used the GIS overlays to analyze relative qualities of the habitat and show the relationship between the potential for development and habitat quality.

The GIS was created out of the need to clarify intense discussions focused on defining key geographic and habitat areas, as well as understanding complex technical issues imbedded in defining criteria that could be used to designate "occupied," "suitable," and "potentially suitable," and "unsuitable" habitats.

> "I would encourage that if this process or a form is pursued in the future, if it involves an endangered species, that accurate maps be available early on to identify where potential areas of impact by the group's discussion are going to occur. If you're talking in general sense, you're going to get a lot of general thoughts."

The GIS system was composed of maps that were familiar to the Working Group and that were based on data that the group collectively and individually trusted. The system was designed to be an interactive tool that allowed the participants to guide adjustments in boundaries and habitat designations and conservation locations. The thematic overlays also allowed the group to see habitat and nesting areas as well as drilling and exploration locations. At the Working Group meetings, the participants were able to outline conservation areas and debate strategies for conservation and recovery of the species. (See Appendix C

Phase 5 – Negotiating Key Conservation Strategies, Meeting the EIS Deadline and Making Revisions

The fifth and longest part of the process – extending from October 2003 to May 2005 – consisted of reviewing and refining strategy proposals around which the group was able to reach general agreement, and seeking to reach solutions in areas that were controversial. In October 2003, the BLM notified the group that that it was amending the Special Species section of the Resource Management Plan (RMP).[7] The RMP amendment required that an EIS be prepared and a range of alternatives for oil and gas regulation be evaluated. Filing the intent to amend the RMP gave the Working Group a specific time line and regulatory mechanism in which to negotiate key

[7] The RMP provides the basis for the BLM's land use policies and regulation, and the special Species section provides the agency with details about how to conserve and protect threatened and endangered species.

elements of the conservation strategy. The BLM made it clear that they hoped the Working Group would be able to frame the preferred alternative for the EIS. During this phase of the negotiations, the stakeholder groups used the GIS overlays to test alternatives and build consensus around several the controversial issues, such as designing mechanisms to limit and regulate oil and gas exploration and development.

> "Before, we weren't going anywhere. After, it became more specific. Instead of talking about millions of acres, we were only talking about hundreds of thousands. Instead of talking about no new leasing anywhere, we were talking about new leasing, but only right here."

> "Once maps were available, we utilized them to come up with plans that allowed for continued viability of different industries as well as improving the population and habitat of the chicken."

To generate an acceptable strategy, the facilitators met with each of the stakeholder groups – oil and gas; ranching; conservation; and government agencies – and through a process of "shuttle diplomacy" enabled the groups to incrementally design and reach agreement on an approach to regulating oil and gas throughout the region and within specific sub-areas.

> [This was a] "way of trying to tease out the knowledge [about the science] in the options that they moved through… The Facilitators took it to each constituency group in side meetings and that was a process through which they actually hit the ground with an acceptable plan. [The options matured and] Really changed [to make the final proposal."

Next, the Technical Sub-Committee formed a study group composed of scientists and wildlife biologists from the BLM, the State Land Office the U S Fish and Wildlife Service and the New Mexico Game and Fish Department as well as non-scientific representatives of ranching interests and the oil and gas industry. The BLM provided new aerial photographs and the University of New Mexico Heritage Program assisted the group in "ground truthing" habitat quality information and in adjusting and clarifying the GIS information.

> "GIS interactively gave us a lot more ability to move from one what-if to the next."

> "Once they realized how much habitat we were talking about, they were more open-minded to other strategies."

The group was by now comfortable discussing and debating scientific, economic and value-laden information and was able to design and define the key overlays that became the heart of the Conservation Strategy[8].

Taken to the Working Group and adopted by consensus, this was a major breakthrough for a strategy that allowed the oil and gas industry to trade exploration and development in areas that are not suitable habitat for areas of potentially suitable and suitable habitat for reclamation of habitat elsewhere. It also enabled the Working Group to meet the BLM deadline to submit their alternative for the Special Species RMP amendment GIS. The group agreed that these exchanges would be based in a 1 to 1 ratio and executed through the BLM field office. Further, all new exploration and development area in the PPA would be accompanied by a Plan of Development (POD) which would be negotiated by the oil and gas lease holder and the BKM field office wildlife biologist staff.

Implementing the Strategy

Ultimately, a slight modification of the working Group's proposals became the BLM's preferred alternative because of two key factors. First, because the Working Group made a commitment to grapple with complex issues and to understand conflicting perspectives, the participants grew to trust one another and work together. Second, building on these working relationships, the participants designated an Implementation Committee for monitor implementation of the

[8] The first map showed the region and included overlays included the planning boundary area, the historic range of the Lesser Prairie-chicken, known distribution of the SDL and the extent of the Shinnery Oak-Sage Grasslands habitat (See Appendix C: Map 1 – Planning Area for the Lesser-Prairie-chicken – Sand Dune Lizard Conservation Strategy). The second GIS Map "The Lesser Prairie-chicken and Sand Dune Lizard Distribution within the Planning Area," included layers of information and greater detail about land ownership by state, federal and private lands. The map also highlighted the local political subdivisions and boundaries and identified urban, township and villages. Additionally, the map showed the Sand Dune Lizard known population distribution, the New Mexico State Game and Fish Department LPC Areas, the location of good Shinnery Oak- Sand Sage Grasslands, and polygons indicating the distribution of the LPC leks (living and breeding grounds)[8] (See Appendix C: Map 2 - The Lesser Prairie-chicken and Sand Dune Lizard Distribution within the Planning Area).

The third GIS system map was composed of overlays showing private and public land ownership by state and federal agency, political subdivisions and key habitat boundaries for the LPC. This last overlay included the Sparse and Scattered Population Area (SSPA), the Primary Population Area (PPA), the Isolated Population Area (IPA), the State of New Mexico PCA zones and sites; and the Roswell Core Management Area (CMA), which contains the best habitat and largest concentration of leks in the region. Map 4, containing landscape suitability, "Habitat Categories in the Primary Population Area (PPA)." Also set out habitat categories within the PPA that designate Occupied Habitat (off limits to exploration and development), Suitable Habitat, Potentially Suitable Habitat, and Unsuitable Habitat (not suitable for the LPC). (See Appendix C: Map 4 - Habitat Categories in the Primary Population Area)

recommendations and assess progress in restoring the LPS and SDL Shinnery Oak Dune Grassland habitat.

> "I think relationships strengthened between all parties – not just government, but between environmental groups, even. There was a building of understanding that there are other opinions. We can still disagree, but because of the amount of information sharing and education, it was worthwhile. Since adopting the Conservation Strategy in 2005, the stakeholding groups have been working together as an "Implementation Team."

The team met in May and August 2006 and plans to meet quarterly in different locations throughout the region to jointly decide how to speed up implementation of the Conservation Strategy. The make-up of the Implementation Team reflects membership in the Working Group[9].

As part of the implementation of the Conservation Strategy, USFWS is finalizing Candidate Conservation Agreements (CCAs) in counties where the best habitat is located. These agreements outline management practices that, if followed by landowners, would protect them from liability should bird populations decline on their property. There may be an opportunity for Soil and Water Conservation Districts, Resource Conservation Districts, and Natural Resources Conservation Service (NRCS) to assist with CCAs in additional counties.

There are also voluntary programs focused on collaborating on implementation. For example, the oil and gas industry has verbally committed to work with the DOE and to help fund a state-of-the-art facility for a captive propagation program where that bird population is nearly extirpated. The NRCS's state Landowner Incentive Program (LIP) is a voluntary program that provides technical and financial assistance to landowners for habitat management that will benefit federally listed, proposed, candidate or other at-risk species on their lands. The NRCS has also offered other landowner habitat improvement incentive programs through EQIP in three counties

[9] It is co-chaired by a representative of the New Mexico Game and Fish Department and oil and gas representative who formerly worked for BLM. Private landowners and ranchers, oil and gas representatives, The Nature Conservancy, and the Theodore Roosevelt Conservation Partnership are also members of the Implementation Team. Federal agencies that serve in an advisory capacity include the BLM, USFWS, and the Natural Resources Conservation Service (NRCS). The NRCS was not heavily involved in the Working Group but has taken a more active role in implementing the conservation strategy because of some of the critical conservation programs in the Farm Bill, such as the Environmental Quality Incentives Program (EQIP) and the Wildlife Habitat Incentives Program (WHIP), voluntary conservation programs for farmers and ranchers offering financial and technical assistance.

to rest land from grazing around prairie-chicken habitat, providing an incentive payment to landowners.

The Sand Hill Partnership is bringing together New Mexico agencies and stakeholders together with representatives of the Texas Parks and Wildlife to restore playa habitat. The partnership will meet again in October 2006 with local ranchers and community leaders to build interest in habitat restoration and ecotourism.

Finally, events such as the High Plains Prairie-Chicken Festival, held annually in Milnesand, New Mexico, raise critical awareness among citizens and landowners. For instance, a landowner who attended this festival listened for the prairie-chicken call and realized she likely had leks on her land. Since then, she applied for funding from USFWS for prairie-chicken buffer management, and also received a state LIP grant. The New Mexico Partners Program is successfully working with landowners to see if Lesser Prairie-chickens can be located on their land, or if the birds are already nesting on their properties.

Reflections on the Collaborative Approaches to Science and Joint Fact-Finding and Lessons for Practice

The negotiation process that created the Collaborative Conservation Strategies for The Lesser Prairie-chicken and the Sand Dune Lizard provides several lessons about how experts and non-experts can work together on complex science-laden problems. The process also provides insights into how to incorporate join fact-finding and negotiated science into policy and planning decisions.

Three key lessons can be gleaned from the experience of negotiating the conservation strategy.

1. <u>Provide education as well as historic, economic, and experiential knowledge and access to expertise about scientific, technical information.</u>

The Working Group had robust access to technical support and scientific expertise; they used both formal and informal ways to learn about the technical and legal constraints and opportunities. More important they took into account non-objective local judgment about the benefits of local land uses, oil and gas development and the meaning and operation of ranching

families in the region. And they collaborated effectively on difficult judgments about how to conserve the species.

> " [Jointly agreed] definitions were quite important. Even with the grazing example – we were using Robel methodology to measure vegetation height and wanted vegetation to maintain a certain height. We discussed how that impacts grazing. All those definitions were quite important. There are no substitutes for that."

2. Use data resources that are transparent, accessible, and trusted.

Where data are lacking or disagreements about the interpretation of information exist, use a joint fact-finding process to gather and interpret the needed information. In this case the participants understood and trusted the data sources for the GIS system. The data were visually displayed and could be discussed, debated, and manipulated to explore options and make decisions. Moreover, the participants knew and trusted the source of the data. Where they did not, they agreed to collect it first-hand by jointly taking field trips in Carlsbad or by negotiating a plan of development.

Further, the participants were able to direct the GIS technicians to alter the maps, create boundary conditions, run "what-if" scenarios, and test the implications of making decisions and creating options. This level of accessibility having the GIS system operational during Working Group meetings built a deeper level of understanding of the complexity and dynamics of alternative proposals. This collaborative fact-finding process enabled them to make scientific and technical determinations and to build long-term relationships that were sustained through implementation.

These intense discussions focused on seemingly simple issues, such as defining geographic management regions based on the status of the population in the primary Population Area (PPA) as well as the Core management Area (CMA) near Roswell NM. The participants also negotiated boundaries for the Sparse and Scattered Population Areas (SSPA) and the Isolated Population Areas (IPA) near Carlsbad, NM in the southern part of the region.

> "I recommend getting as much science, peer reviewed and published data as possible and deal with the fact that, as much [data] as you have, biology isn't an exact science and there is always going to be anecdotal information, and broad areas where biologists are just going to have to say, 'Gee we don't know.'"

Vegetation studies that were built into the in the GIS were also instrumental in enabling scientists and non-scientists to negotiate and designate "occupied," "suitable," "potentially suitable, " and " unsuitable" habitat areas within the population areas (See Appendix B; Map 4, Habitat Categories within the Primary Population Area). Participants reflected that visualizing geographic areas made it possible for stakeholders to conduct a higher level of analysis and be willing to brainstorm various management approaches:

> "We could get more and more analysis, and fine tune the areas of land we were talking about."

The format of the information was understandable and familiar to both experts and non-experts. The maps allowed participants to understand their interests and see how they overlapped, whether it was grazing access for ranchers, well locations for oil and gas representatives, or prairie-chicken leks for environmental advocates:

> "[It was important] putting in wells… to look at proximity to… the chicken and lizard activity. For ranching, putting on ranching allotments, so ranchers knew what the effect was on different allotments. [It was also important in] looking at vegetation type and analysis. A lot of it was technical, [but] we were very much involved in the direction of providing the processing of the map."

After defining habitat classification areas and seeing the boundaries displayed on a map, the GIS system allowed participants to think about potential conservation strategies in creative ways. The conservation strategy outlined several initiatives aimed at not just conserving but expanding habitat and devising new ways to accommodate the Prairie-chicken and the Sand Dune Lizard. This will be accomplished through an innovative process of exchanging land reclaimed by the oil and gas industry for new areas that can be released to the oil and gas industry for exploration and potential development. For instance, new leasing and exploration could occur in suitable habitat if an annual assessment demonstrates there is a net increase in suitable and occupied habitat in the primary population area through industry reclamation efforts. The participants also agreed that the economic rights of ranchers' grazing leases must be compensated, if it becomes necessary to remove cattle to protect habitat (BLM, Collaborative Conservation Strategy 2005).

Some of the lengthiest negotiations involved working to develop and map a suite of options and

test "what-ifs," which provided a context for building relationships among the group. These experiences kept the group together throughout the process, even as the deadline neared and tension heightened. The trust and ability to work together helped the group commit to extending the collaborative process into implementing the Conservation Strategy. In addition to mapping, the different ways stakeholders, technical advisors, and facilitators worked together were key in achieving consensus. Several stakeholders observed the importance of facilitation in the process:

> "I think it's a good process that people should use . . . we got a lot out of it and knew a lot more about issues and people's concerns. We gained a lot. There were a lot of [voluntary efforts] that different entities started doing before the strategy firmed up."
>
> "I think making sure you get an impartial moderator [is key]. That's important. Otherwise it can all fall apart."
>
> "I think we gained respect for all the people that were represented."

Although the Working Group had the assistance of the facilitation team throughout the process, some of the sub-committee meetings were not facilitated. Interestingly, working together in the absence of facilitators at certain points was an important capacity-building experience. For example, the Oil and Gas sub-committee, which was formed specifically to work on defining and mapping the habitat classification areas in the Primary Population Areas, was effective because the participants worked alone and could speak frankly and invent options without committing to a particular course of action.

> "[The Oil ad Gas Sub-committee] was an easier number, and having no facilitator worked better . . . we just talked to each other. It allowed us to get through things."

Although it was small, the sub-committee had a member from each of the stakeholder groups. This representation was important helped the sub-committee get buy-in from the full group when they shared proposals for habitat classification.

3. Set a Manageable Time frame and Never underestimate the power of good working relationships.

Support the participants in developing good working relationships. During the 2 1/2 year of negotiations, the Working Group participants developed good working relationships enabling them to learn about the importance of valuing non-objective judgments in making technical

determinations. These relationships served the process well and enabled the Working Group to make the transition from planning the strategies to implementing the actions.

Finally, it is wise to hold collaborative planning and environmental negotiations in a reasonable timeframe within a clear regulatory framework. Do not rely on open-ended dialogue to resolve disputes. In the Lesser Prairie-chicken case, the negotiations had been extended from nine to eighteen months when the BLM decided to amend the Resource Management Plan (RMP). The regulatory timetable for the EIS encouraged the Working Group to focus their collaborative efforts on solving the most difficult issues and to close on the Conservation Strategy.

Ultimately, the Working Group agreed on technical and scientific information they would use. They jointly decided how to analyze it and directed how it would be used in the conservation strategy. Many of the Working Group members learned about technical issues during the process. However, some stakeholders observed that science and technical information were not always the driving force behind the negotiations. Science, economics, and local values did interact in this process, with stakeholders having both technical and non-technical reasons for supporting or rejecting scientific claims:

> "You have to distinguish understanding from agreement . . . The disagreement with some of the claims of scientists continued, particularly on the part of oil and gas. But I don't know to what extent to assign that to a lack of understanding."

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