The National Elk Refuge and the Jackson Hole Elk Herd: Management Appraisal and Recommendations

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ABSTRACT
The federal government established the National Elk Refuge and began feeding the elk herd in Jackson Hole, Wyoming, in 1912. Currently administered by the U.S. Fish and Wildlife Service, the program has four goals: to preserve critical winter range for the elk herd, to keep the elk from depredating the nearby ranches, to provide habitat for other species on the refuge, and to provide compatible human benefits. In many ways, the program has been a remarkable success. The once-dwindling elk herd has rebounded and been used to repopulate other areas of the country, depredation has been reduced, the refuge provides habitat for a wide variety of species, and both the herd and the refuge have provided many tangible and intangible human benefits. Numerous problems face the U.S. Fish and Wildlife Service, however. Disease and habitat loss threaten the elk herd, ranchers face economic losses from the risk of interspecific disease transmission, the dense concentration of the elk on the refuge is degrading habitat for themselves and other species, and the human benefits derived from the herd and the refuge are at risk for the same reasons. Furthermore, these problems have become increasingly difficult to resolve as relations between the U.S. Fish and Wildlife Service, the other responsible agencies and non-government organizations, and the general public have become increasingly contentious. This paper appraises the management of the National Elk Refuge and the Jackson Hole elk herd and makes recommendations for resolving some of the problems facing the U.S. Fish and Wildlife Service. These recommendations include increasing public involvement in management decisions, increasing agency knowledge of the social context, holding decision seminars and other problem-solving exercises, and increasing the role of the USFWS in land-use decisions outside the refuge.

In 1994, U.S. Fish and Wildlife Service (USFWS) Director Mollie Beattie called on the agency to take an ecosystem approach to fish and wildlife conservation (USFWS 1984). The current director, Jamie Rappaport Clark, has also called on the Service to “look for new and innovative ways to achieve species and habitat conservation” (J. Clark 1997). This paper examines the role of the USFWS in the management of one of the most important components of the Greater Yellowstone Ecosystem—the Jackson Hole elk herd. Since it created the National Elk Refuge (NER) and began feeding the elk in Jackson Hole, Wyoming, in 1912, the United States government has spent tens of millions of dollars to conserve the herd and to protect nearby ranches from wildlife depredation. One of the first and most visible attempts in the nation to conserve an individual population of what was once a dwindling species, the federal program has in many ways been remarkably successful. The Jackson Hole elk herd has grown to record levels, the herd has been used to restock or supplement herds throughout the United States and Canada, ranches suffer relatively little depredation, and the refuge has become a preserve for a wide variety of species besides elk (Smith 1991; NER Narrative Reports; NER Mission statement).

However, the management of the NER and the Jackson Hole elk herd has become increasingly controversial in recent years. In the courtroom, in the press, on the streets and in meetings, participants frequently argue about issues epidemiological, ecological, and economic. Distrust and ill will among private citizens and the various responsible agencies have rusted the decision-making processes.

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process and made it difficult to resolve such problems openly, comprehen-
sively, and fairly.

Because the NER is one of the flagships of the National Wildlife Refuge
System, successful and innovative management may have implications for
other national wildlife refuges, for the Greater Yellowstone Ecosystem, and for
other attempts at ecosystem management in general (see Clark and Minta
1994).

This paper has three goals: (1) to describe the history of the management of
the Jackson Hole elk herd and the NER and the sources of conflict in recent
decades; (2) to analyze the management problems using a framework known
as the policy sciences; and (3) to recommend strategies that may help the
USFWS resolve some of those issues.

STANDPOINT AND METHODS
During the summer of 1998, I interviewed more than 30 people for this project,
including representatives from the NER, Grand Teton National Park, the
Bridger-Teton National Forest, the Wyoming Department of Game and Fish
(WDGF), the Teton County Commissioners, the Teton County Planning
Department, the Jackson Hole Land Trust, the Jackson Hole Conservation
Alliance, the Teton County Natural Resource District, the Wyoming Wildlife
Federation, the Greater Yellowstone Coalition, and local outfitters. I also
reviewed 20 years of local newspapers and collected many articles relevant to
the NER and the Jackson Hole elk herd. I also read and compiled books, journal
articles, and government documents about the NER, the USFWS, wildlife law,
wildlife management, and ecosystem management.

I analyzed the data using an interdisciplinary problem-solving framework
known as the policy sciences. This framework was designed to help researchers,
managers, and decision makers avoid the piecemeal, technically-focused,
problem-solving efforts that are so common today (Lasswell 1970). It provides
a means of orienting to the problems at hand and their contexts so that practical
solutions can be found. Original formulations of this approach can be found in
Lasswell and Kaplan (1950), Lasswell (1971), and Lasswell and McDougal
(1992). Reviews of the way in which this framework has been applied to other
management problems can be found in Clark and Willard (in press) and in
Clark et al. (1999). A good introduction to the uses of the policy sciences in
natural resource management can also be found in Clark (T. Clark 1997).

Very briefly, the policy sciences framework includes three “legs,” each
of which contains a series of questions that policy analysts must ask if they seek
to gain a comprehensive view of the problem at hand. First, in problem
orientation, the analyst asks questions about both his or her own goals and the
goals of the other participants. Since a problem is by definition a discrepancy
between a desired state of affairs and an actual or projected state of affairs, it is
critical to understand the desired state of affairs, or goals, first (Weiss 1989;
Dery 1984). Second and third, the analyst seeks to understand the trends and
conditions that have led to the current situation. Fourth, the analyst must make projections about the future given the current conditions. Finally, the analyst considers alternatives and makes recommendations for change. Second, the social process is a series of questions about the who’s and what’s. Who are the participants? What are their perspectives? What are their base values? In what situations do they interact? What strategies are they using? What are the outcomes? What are the long-term effects? (Clark and Wallace 1998) Third, the decision process includes questions about the how’s. How are the participants gathering information? How are they promoting their own point of view? How are policies prescribed? How are they enforced? How are the policies appraised for effectiveness? How are they terminated when they are no longer relevant? (Clark and Brunner 1996)

I present this brief description of the policy sciences so the reader will know the methods I used to analyze the management of the Jackson Hole elk herd and the NER. This paper effectively serves as an appraisal of management and is therefore part of the decision process. The outline of the paper itself essentially follows the problem orientation format. However, I have avoided using policy sciences terminology throughout the rest of the paper in hopes of increasing readability for those unfamiliar with the framework.

STANDPOINT OF THE U.S. FISH AND WILDLIFE SERVICE
Part of the Department of the Interior, the USFWS was pieced together out of the Bureau of Biological Survey and the Bureau of Fisheries in 1940. Since that time, it has undergone name changes, lost some responsibilities, and gained others. Today, the agency employs about 7,500 people at more than 700 offices in both regulatory and land management roles (USFWS, undated). Traditionally, the agency has been segregated into several different divisions. The 92,000,000-acre National Wildlife Refuge System is the largest such division of the USFWS. The system includes 509 individual units in all 50 states and the territories (Fink 1994; NWRSIA 1997; Chandler 1985).

Very little, if any, overall strategy has guided the creation of the individual refuges since President Theodore Roosevelt created the first refuge on Pelican Island in Florida in 1903. Instead, refuges have been created to serve localized needs and influences (Fink 1994). The first attempt to provide legislative guidance to the system, the Refuge Recreation Act of 1962 (RRA), was very limited in scope. It authorized the Secretary of the Interior to administer individual wildlife refuges for the purpose of “public recreation when in his judgment public recreation can be an appropriate incidental or secondary use,” (Fink 1994; Public Law No. 87-714, 76 Stat. 653 (1962), current version codified at 16 U.S.C. §§ (460(k)-460(k)(4) (1988)).

It was not until the National Wildlife Refuge System Administration Act of 1966 (NWRSAA) that Congress consolidated individual refuges into the National Wildlife Refuge System under the jurisdiction of the USFWS and provided some administrative guidance. However, the NWRSAA conspicu-

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ously lacked a statement of purpose for the system as a whole. The individual refuges retained their diverse authorities and missions (Fink 1994). In addition, the NWRSAA lacked a planning and public participation requirement. While the 1946 Administrative Procedures Act established decision-making procedures for all federal agencies, it exempted all matters related to “public property” and thus created a loophole for the four federal land management agencies. While acts like the 1976 National Forest Management Act, the 1976 Federal Land Planning and Management Act and the 1978 National Parks and Recreation Act established rule-making procedures for the USDA Forest Service, the Bureau of Land Management, and the National Park Service, there was no corresponding act for the USFWS until 1997. The National Environmental Policy Act of 1969 (NEPA) and the Endangered Species Act of 1973 (ESA) placed some restrictions on the management of the National Wildlife Refuge System, but the agency and the individual refuges retained a great deal of discretion over planning and actions they chose to undertake and the people they chose to include (Moote and McClaran 1997; Fink 1994).

According to a former deputy director of the USFWS, Mike Brennan, the managers of the national wildlife refuges have traditionally had an “inside-the-fence mentality.” Managers were reluctant to try to influence land-use and wildlife decisions outside the refuges and were hesitant to allow individuals and organizations from outside the fence to influence refuge management decisions (Brennan, pers. comm.). In addition, the USFWS has provided very little administrative guidance to its refuge managers since the early 1970s (Reiswig, pers. comm.). Former USFWS director John Turner once told Congress that the regional offices still implemented planning without adequate central oversight and that this had resulted in “a wide variety of hybrid and localized planning efforts.” The lack of guidance also meant that community and political pressures had a great deal of influence on refuge management (Fink 1994).

To rectify some of the problems with the administration of the National Wildlife Refuge System, Congress passed a law amending the NWRSAA in November 1997. Known as the National Wildlife Refuge System Improvement Act (NWRSIA), the legislation was the product of negotiations between Secretary of the Interior Bruce Babbitt, House Resources Committee Chairman Don Young (R-AK), and others (Babbitt 1997). According to the NWRSIA, “The mission of the system is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

With the exception of the NWRS lands in Alaska (which are governed by the planning provisions of the Alaska National Interest Lands Conservation Act), the NWRSIA requires each individual refuge or group of refuges to have a comprehensive management plan by 2012. Management plans must be revised every 15 years thereafter. Among other things, each plan must identify and describe significant problems that may adversely affect the populations and

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habitats of fish, wildlife, and plants within the planning unit and the actions necessary to correct or mitigate such problems. In preparing the plans, the USFWS is required to consult with adjoining federal, state, local and private landowners, and affected state conservation agencies, and to coordinate the development of the conservation plan or revision with relevant state conservation plans for fish and wildlife and their habitats. In addition, the USFWS must “develop and implement a process to ensure an opportunity for active public involvement in the preparation and revision of comprehensive conservation plans” (NWRSIA 1997).

In sum, the National Wildlife Refuge System has become a more consistent and organized bureaucracy over the years and has become more open to public input. How does the legislative and administrative history of the National Wildlife Refuge System pertain to the NER in particular? Both newspaper accounts and interviews with veteran NER officials indicate that the history of the management of the NER has mirrored the trends and conditions in the system as a whole (Griffin, pers. comm.; Jackson Hole News 1984a). First, in previous decades, the managers of the refuge appear to have had a narrow view of their mission. For example, in the 1980s, bison from Grand Teton National Park began feeding on the feed lines laid out for the elk. The managers declared this to be a problem. “The Elk Refuge was set up to preserve some of the last winter range for the Jackson Hole elk,” one official said. “We don’t have any problems with bison in Jackson Hole, but we do have serious concerns with them on the refuge. We don’t want to see a National Elk and Bison Refuge” (Jackson Hole News 1986). Second, NER managers seem to have resisted opening the decision process to public scrutiny. For example, in 1984, refuge manager John Wilbrecht ordered his staff to kill some of the bison that had entered the refuge. He gave the order without informing the public of his decision. When word leaked out to the local newspaper that five bison had been killed on the refuge, reporters were outraged and the newspaper published a sarcastic editorial about the lack of openness on the refuge (Jackson Hole News 1984a, 1984b; Griffin, pers. comm.).

After the bison incident, the public spoke out. Local residents apparently resented both the closed decision process and the limited vision of the mission of the NER (Jackson Hole News 1984b; Cromley on bison management planning, this volume). After years of meetings and public debate and two changes in administration, refuge officials appeared both to have a broader view of the purpose of the refuge and to be more open to public scrutiny (Reiswig, pers. comm.; Cromley on bison management planning, this volume).

Barry Reiswig took the helm at the NER in 1996. Since that time he has followed the lead set by his predecessor Mike Hedrick and has sought to improve lines of communication with the public and the other agencies. He has also declared bison to be welcome on the refuge and expressed his concern for other species that rely on the refuge (Thuermer 1997a; Teton County Natural Resources District 1998; Reiswig, pers. comm.).
Bruce Smith has stepped outside the refuge in recent years and worked with other agencies to study the Jackson elk herd as a whole (Smith, pers. comm.). However, refuge officials still appear hesitant to engage in public and private land management decisions around Jackson Hole that may affect the elk herd. With some notable exceptions, refuge officials do not try to influence management decisions on the Bridger-Teton National Forest, Grand Teton National Park, state lands, or private lands. Reiswig says he hesitates to become involved in such decisions because it would require additional funds and manpower, he does not want to stir up the latent anti-federal sentiment that pervades Wyoming, and he does not see it as a primary part of the USFWS mission. Managing the whole elk herd, he says, is primarily the mission and the responsibility of the state (Reiswig, pers. comm.).

**GOALS OF THE U.S. FISH AND WILDLIFE SERVICE**

By 1911, hunting and habitat destruction had reduced the total number of elk in North America to around 50,000 animals. One of the largest remaining herds lived in about 2,100 square miles around Jackson Hole. The approximately 20,000 animals summered in the high country of what is now southern Yellowstone National Park, Grand Teton National Park, and the Bridger-Teton National Forest and migrated up to 100 miles in the fall to the valley floor and perhaps to points even further south (Smith 1991). However, the Jackson Hole elk herd began collapsing around the turn of the century as ranches covered traditional winter range and blocked migration routes. In the spring of 1909, dead elk were so thick on the valley floor that one rancher claimed to have walked a mile on their carcasses (Bama 1997). On the flip side, the elk also caused problems for the ranchers by raiding the feed they had set aside for cattle. Some ranchers reportedly spent freezing nights on their haystacks defending their livelihoods from the hungry elk (Bama 1997). After these events were repeated in 1910 and 1911, the outcry from conservationists and desperate ranchers reached Washington, D.C. (Preble 1911). Between 1911 and 1913, Congress set aside 1,000 acres of federal lands and appropriated $70,000 to purchase emergency feed and 1,760 acres of privately owned ranch land for the elk (Smith 1991; Wilbrecht et al. 1995). The goals of the federal government were twofold: to preserve elk in the United States for ethical and economic reasons by protecting one of the last remaining herds and to prevent the Jackson Hole elk herd from depredating local ranches.

Today, thanks to additional donations and appropriations, the refuge encompasses 24,700 acres. But since it still represents a small portion of the herd’s historic winter range, managers have continued to feed the elk on the refuge in all but nine of the last 86 years (USFWS 1998). The WDGF, which pays half the cost of feeding the elk on the refuge, also operates three smaller feed grounds nearby. In the winter of 1998, about 8,500 elk ate supplemental feed on the refuge, 3,000 more than esteemed biologist Olaus Murie estimated the refuge could naturally carry (Murie 1951). Several thousand additional elk

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wintered on the three nearby state feed grounds and on standing forage on other public and private lands (Thuermer 1998).

By securing thousands of acres of winter range and supplementing the natural forage with supplemental feed, the federal government has achieved today the goals it laid out in 1912. Very few elk raid ranchers’ winter feed lines, winter mortality in the elk herd is now between two and three percent, the population is at an all-time high, and elk from Yellowstone National Park and the NER have been used to supplement or re-establish herds in 25 states and two provinces (Smith 1991).

Over the last several decades, new goals for the NER have also evolved. In a 1987 mission statement, refuge officials declared that it was their goal not only to protect critical elk winter range, but also to preserve “habitat for endangered species, birds and other big game animals, and provide compatible human benefits associated with its wildlife and wildlands” (Griffin, pers. comm.; NER 1987). The NER has succeeded in achieving these goals by default and also through active management. Forty-seven different mammals have been found on the refuge, including moose, bison, bighorn sheep, mule deer, coyotes and pronghorn antelope. One hundred seventy-five species of birds have been observed on the refuge including bald eagles, trumpeter swans, and ospreys. Humans derive benefits from the refuge in many tangible and less tangible ways. For example, economists estimate that elk hunters generate about $4.5 million of local economic activity each fall (Boyce 1989). In addition, a 1997 USFWS report notes that 562,441 people visited the refuge in that year, and 30,000 tourists viewed the elk on sleigh ride tours of the refuge. Elk-related tourism generated about $2.5 million in direct revenue for the local economy, the report claims, and generated 41 jobs with a total employment income of $662,500 (USFWS 1997; Matson, this volume; Kahn, this volume).

In summary, there are four goals for the managers of the NER: (1) to conserve the Jackson Hole elk herd by preserving winter range; (2) to keep elk from depredating on nearby ranches; (3) to preserve habitat for other species including endangered species, birds and other big game animals; and (4) to provide human benefits associated with the NER’s wildlife and wildlands. In many ways, managers have been remarkably successful in attaining these goals. However, officials also acknowledge that the goals are becoming increasingly difficult to achieve due to interagency conflict and conflict with the public and special interest groups (Reiswig, pers. comm.; Griffin, pers. comm.).

THE PROBLEMS

The ways in which problems are defined dictate the ways in which they can be resolved. This paper only considers the problems faced by the USFWS with regard to the Jackson Hole elk herd. It defines a problem as anything preventing the USFWS from achieving the four goals listed above. In turn, the problems are broken into two categories. Substantive problems include those things that directly threaten the goals of the USFWS as described above. Procedural
problems include those issues that indirectly threaten the goals of the USFWS by preventing officials from resolving the substantive problems.

SUBSTANTIVE PROBLEMS
At root, all the substantive problems can be traced to one thing—that the feeding program on the NER and the other feed grounds concentrates too many elk in too small an area in the winter months. The resulting density of elk has had several repercussions.

Brucellosis
One of the biggest controversies in the Yellowstone region in recent years has been caused by a disease known as brucellosis. The disease is caused by a bacterium called *Brucella abortus* which attacks the reproductive organs and lymphatic system of its host. When the disease infects elk, bison, and cattle, it causes spontaneous abortion and usually causes sterility in cattle. Although it is rare, the bacteria may also infect humans and cause a potentially crippling or even lethal disease known as undulant fever (Smith and Roffe 1992).

Brucellosis was first discovered in the United States in 1864 in Louisiana cattle (Keiter and Froelicher 1993). The first tests of Yellowstone bison in 1917 and NER elk in 1930 found those populations to be infected as well, probably by domestic livestock (Smith and Roffe 1992). As the disease did not seem to be overly detrimental to the elk or bison populations, it was not considered a major problem by wildlife managers for many years. However, beginning in 1934, the federal government joined the states in an attempt to eradicate the disease from the country’s cattle herds. Costing about $1.3 billion to date, the program has relied on various methods to eliminate the disease, including vaccination and the occasional slaughter of infected herds (Keiter and Froelicher 1993). The Animal and Plant Health Inspection Service (APHIS), the Department of Agriculture agency in charge of administering the federal program, also regulates interstate transport of livestock. If the agency certifies a state as brucellosis-free, the state is allowed to ship cattle across state lines with few restrictions. However, cattle from states that are not certified brucellosis-free must undergo expensive tests and quarantine before they can be shipped to other states. Thirty states, including Wyoming, are now certified brucellosis-free, and APHIS officials hope to have eradicated the disease from all of the country’s livestock within the next year (Thorne, undated; Keiter and Froelicher 1993).

The successful eradication program in domestic livestock has placed increased attention on the infected elk and bison herds around Yellowstone, one of the last strongholds of the disease. The issue was catapulted into the national spotlight in the winter of 1988-89 when the state of Montana killed 569 bison as they exited Yellowstone National Park to prevent the animals from potentially infecting the state’s cattle. Although there are no documented cases of wildlife transmitting brucellosis to cattle in the wild, fear of losing its brucello-
sis-free certification was enough to spur the state of Montana to action (Smith and Roffe 1992). Although it has not received as much national attention, the Jackson Hole elk herd is also heavily infected with brucellosis. According to USFWS biologists, about 28 percent of the elk that wintered on the NER between 1970 and 1991 tested positive for the antibody to brucellosis. Thirty-nine percent of the adult females tested positive during that time. Both Wyoming Game and Fish and USFWS biologists agree that the high rate of brucellosis in the Jackson Hole elk herd is caused by the concentration of animals on feed grounds. In fact, one survey showed that only one to two percent of those elk of the greater Yellowstone area which do not feed at feed grounds were infected by the disease. And according to Wyoming Game and Fish veterinarian Tom Thorne, those non-feed ground elk that tested positive for the disease probably picked it up at a previous visit to a feed ground (Thorne, undated; Smith and Roffe 1992). Wyoming is one of the few states that has established multiple permanent elk feed grounds on such a large scale. Most other states rely more heavily on habitat acquisition and have almost no brucellosis problem within their elk herds.

Other diseases
Brucellosis is not the only disease of concern. Bovine tuberculosis, caused by Mycobacterium bovis bacteria, has been present in game-farm elk and deer in the United States and Canada for at least two decades. Wyoming does not allow game farming. But in 1992, 14 captive elk and deer herds in the United States and Canada tested positive for TB, including four in Montana, one in Colorado, and one in Nebraska (Roffe and Smith 1992). Managers of the Jackson Hole elk herd fear that as game farming grows in the surrounding states, so too does the risk that the disease will leap from the captive herds to the wild population. If it did, it could be devastating (Reiswig, pers. comm.).

Mycobacterium bovis usually gets its first foothold in the lymph nodes and spreads slowly to all tissues in the body. Although slightly different from the bacteria that usually cause human tuberculosis, people can readily contract bovine tuberculosis. Treatment in both humans and animals is long, difficult, and prone to failure (Roffe and Smith 1992). Given the proximity of the NER to the town of Jackson, an infection of the Jackson Hole elk herd would be potentially catastrophic for humans and animals alike.

Other diseases of concern include chronic wasting disease, which is related to mad cow disease and has been found recently in deer in southern Wyoming and northern Colorado, septicemic pasteurellosis, a bacterial disease, and scabies, a mite that causes elk to lose their hair and eventually freeze to death (USFWS 1998).
Habitat

Refuge managers have become increasingly concerned in recent years about the effect of the concentrated elk herd on the refuge itself. Studies based on old photos, exclosures, and surveys have shown a decline in the amount of woody vegetation on those portions of the refuge most commonly frequented by the elk (Matson, this volume; USFWS 1998; Smith, pers. comm.). Elk browsing kills and limits regeneration of species like willow, aspen, and cottonwood. As refuge managers have broadened their focus to animals other than elk, they have become more concerned about the decline in woody plants and the consequent degradation of habitat. The reduction in such woody species has been linked to a decline in passerine bird nesting in Yellowstone National Park (Jackson 1992). It may also limit fish habitat (Smith, pers. comm.).

Cost

In this age of budget cuts, the cost of the feeding program may also become a problem. The WDGF currently shares the cost of feeding the elk on the refuge with the USFWS. In the winter of 1997, the two agencies spent $443,000 on pelleted alfalfa. Previous winters were similar (USFWS 1998). Although the record-keeping system makes it difficult to calculate exactly how much has been spent on feed and labor over the years, it probably adds up to several million dollars in today’s dollars (NER Narrative Reports). While neither agency has indicated any intention of reducing the amount of money spent on the feeding program, both are facing tightened budgets. Such sums cannot go without scrutiny forever.

Other effects

There are also other, less-studied side effects of the feeding program. For example, because winter mortality has been reduced to two or three percent, the biggest source of mortality in the herd is hunting. This may be exerting different selective pressure on the animals and changing their fitness in an altered management regime. In addition, with supplemental feed so accessible, the herd may have lost its memory of some natural winter range in which to survive the lean months in January, February, and March. Again, this loss of herd memory may affect the fitness of the animals in a changed management regime. Finally, the feeding program has unquestionably changed human perceptions of the elk. Several people interviewed described the elk as “domesticated,” a perception with several repercussions. First, although the elk may be challenging to hunt, the knowledge that the animals were feeding on a feed line only a few months earlier may make the experience less enjoyable. In addition, the perception of domestication encourages the development of winter range by developers who believe a bale of hay can replace an acre of habitat.

In sum, all the problems described above are areas where the current and historical goals of the USFWS are not being achieved or are directly threatened. All these problems are related to the large number of elk that are concentrated by the feeding program on the NER in the winter.
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PROCEDURAL PROBLEMS
The substantive problems with the management of the Jackson Hole elk herd and the NER cannot be resolved without working out the procedural problems.

U.S. Fish and Wildlife Service
USFWS officials believe the best way to solve the substantive problems is to disperse the herd as much as possible. For many years, federal officials sought to accomplish this goal by acquiring more land for the NER. However, except for a few small parcels, the skyrocketing cost of land in Jackson Hole makes further expansion of the refuge unlikely even if the anticipated political objections could be overcome.

Thus, refuge manager Barry Reiswig is now pursuing other tacks. First, he would like to reduce the number of elk that winter on the refuge by reducing the overall population of the herd. Under a 1975 agreement signed by the WDGF and the USFWS, the number of elk wintering on the refuge is not supposed to exceed 7,500 animals. This agreement clearly states that it is the responsibility of the Game and Fish Department to maintain the objective number of refuge elk through hunting programs (Cooperative Agreement 1974). However, the number of elk wintering on the refuge has exceeded the objective every year since 1986. In 1996-1997, about 11,000 elk wintered on the refuge (USFWS 1998).

According to officials with the WDGF, the elk population began to get out of control in 1984. In that year, the department faced tremendous criticism and political pressure for allowing the total herd size to drop “too low.” Only about 5,000 animals were counted on the feed lines that year. Outfitters protested in the streets and legislators criticized the department staff (Gerty 1987a; Jackson Hole News 1984c, 1984d, 1984e). In response, the department changed the hunting rules and allowed the population to increase. Although it has been trying to reduce herd size in recent years, officials say it will probably take several years to change the population growth trajectory. Eventually, state officials say, they would like to return the herd to its objective size (Bohne, pers. comm.; Holz, pers. comm.).

According to Reiswig, however, even the objective level of 7,500 animals may not be low enough to solve the many problems associated with such a large herd. He would like to see the objective number of elk wintering on the refuge reduced to around 5,000 elk (Reiswig, pers. comm.; WDGF 1996). Thus the USFWS is pursuing other means of dispersing the herd as well. For example, NER officials are proposing to install a sprinkler irrigation system to increase the standing forage on the refuge. Reiswig hopes this will reduce the need for feed lines and encourage the dispersal of the elk (Reiswig, pers. comm.; USFWS 1998).
State
The state has staunchly opposed the USFWS proposal to reduce the objective number of elk wintering on the refuge to 5,000 animals. Instead, state officials are seeking to solve the problems associated with a concentrated herd through its Brucellosis, Feedgrounds, Habitat or “BFH” program. The “habitat” portion of this moniker refers to the state’s efforts to restore habitat on lands outside the refuge. Each year, state officials work with the Forest Service to conduct prescribed burns and apply other habitat restoration techniques on hundreds of acres of crucial winter range on the national forest. State officials also work with groups like the Rocky Mountain Elk Foundation, the Jackson Hole Land Trust, the Teton County Government, and private landowners to discourage development on private land which is crucial winter range (Thorne et al., undated).

As part of the BFH program, the state is also seeking to control brucellosis through vaccination. Beginning in 1984, the WDGF began vaccinating elk for brucellosis on its feed grounds (Jackson Hole News 1984f). The vaccine, known as strain 19, had previously been used to control the disease in cattle. The program currently costs the state between $80,000 and $100,000 a year (Thorne, undated). WDGF veterinarian Tom Thorne asserted that studies on the feed grounds showed the vaccine was about 60 percent effective in reducing brucellosis in elk (Drake 1998). However, other researchers at the University of Idaho and Colorado State University questioned the science by which Thorne arrived at those statistics. Edward Gorton, University of Idaho professor of wildlife resources and applied statistics, wrote, “It appears to me that the vaccination program of elk in Wyoming has been carried out on the basis primarily of hope and faith that it will lead to increased calf survival rather than on the basis of solid evidence that such vaccination will reduce fetal losses among Wyoming elk populations.” Gorton added that he believed the department instituted the vaccination program “for political reasons due to the need for Wyoming’s Game and Fish Department to demonstrate to the ranching community and their legislators that the department is doing what [it] can to protect Wyoming’s brucellosis-free status” (Drake 1998).

Thus, in the winter of 1998, the USFWS refused to allow the WDGF to begin vaccinating elk on the refuge. Barry Reiswig said the service denied permission to the WDGF for several reasons. First, he said, the vaccine has not been proven effective and may cause other ecological problems that have not yet been studied. Second, Reiswig said he believed vaccination for brucellosis was effectively treating the symptom and not the cause. Reiswig believes brucellosis is like the canary in the coal mine: it should be warning managers that the current management regime may be untenable in the long term. If managers cover up brucellosis with a technological fix without creating a comprehensive disease management program, Reiswig said, they may be setting themselves up for worse problems from other diseases later (Drake 1998; Reiswig, pers. comm.).
In February 1998, Wyoming Governor Jim Geringer filed suit in federal court seeking a declaratory judgment about whether the USFWS had the right to prevent the state from vaccinating the herd on the refuge. The state asserted that it had primacy over wildlife management in Wyoming and therefore had the right to vaccinate the elk on the refuge whether the USFWS approved or not. The case was resolved in favor of the USFWS (Gearino 1998; Drake 1998).

In sum, both state and federal officials are trying to solve the substantive elk management problems in several different ways. However, procedural problems in the form of conflict between the responsible agencies and other interested parties have prevented the resolution of the substantive problems (Bohne, pers. comm.; Reiswig, pers. comm.). Since current and future substantive problems will never be resolved until the procedural problems are at least partially resolved, the rest of this paper focuses on the procedural problems facing the USFWS.

PROBLEM ANALYSIS

THE SOCIAL PROCESS
This section summarizes the participants other than the USFWS, which was discussed earlier, and their perspectives (see also Kahn, this volume).

Wyoming Department of Game and Fish
The WDGF is controlled by the Wyoming Game and Fish Commission. The commissioners and the director of the agency are appointed by the governor of Wyoming. Thus, the agency’s policies have come to reflect closely the views of the governor, especially in recent years (Thuermer 1995; Sadler 1995).

The current governor, Jim Geringer, is a Republican who often espouses states’ rights ideology. For example, in 1995, he gave a special reception for the commissioners from Nye County, Nevada—the founders of the Wise Use Movement (Jackson Hole News 1995a). Geringer has also frequently complained about the heavy-handed tactics of the federal government in such matters as federal land management and the enforcement of the Endangered Species Act (Testa 1995; Jackson Hole News 1995b).

Another way to understand the perspective of the WDGF is through its mission statement, which declares that the department is to provide “an adequate and flexible system for the control, propagation, management, protection and regulation of all Wyoming wildlife” (Wyoming Statutes 23-1-103). This broad mandate reflects the many pressures facing the agency. On one hand, it is responsible for controlling and regulating wildlife to prevent animals from depredating on private property. If it fails to do so, the agency must reimburse the landowner for damage. In 1994, for example, the department spent almost $1 million to reimburse landowners for wildlife depredation. This costly mandate reflects the power of the agricultural community in the state.

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many ways, the agricultural community is one of the department’s most important constituents and controlling wildlife one of its most important duties (Thuemer 1997b).

However, the department is also responsible for the propagation and protection of wildlife, and it is not just the enabling statute that makes this such an important function. The WDGF derives almost all its revenues from hunting and fishing licenses (Marlin 1996). In sum, the WDGF faces powerful forces on all sides. Any attempt to change the management regime in recent years has faced tremendous resistance from one side or the other. For this reason, agency officials seem keenly aware of what they perceive to be “politically viable” and are hesitant to change the status quo.

U.S. Forest Service

The Bridger-Teton National Forest encompasses 1,460 square miles of the Jackson Hole elk herd’s 2,000-square-mile range, including 73% of the herd’s 120 square miles of crucial winter range as defined by WDGF biologists (WDGF 1987).

The National Forest Management Act of 1976 requires the Forest Service “to provide for adequate fish and wildlife habitat to maintain viable populations of existing native vertebrate species.” However, the Multiple Use Sustained Yield Act of 1960 also requires the national forests to be “administered for outdoor recreation, range, timber, watershed and wildlife and fish purposes.” In addition, the Bridger-Teton National Forest is rich with oil and gas deposits and is frequently the site of drilling operations. Obviously, these diverse mandates occasionally come into conflict in the national forest. For example, wildlife biologists are frequently concerned about the effect of the extensive oil and gas drilling operations, not only on the elk but also on other vertebrates like grizzly bears (Jackson Hole News 1992). Recreational users came into conflict with wildlife interests in 1990 when the Forest Service created a winter travel plan for the forest. Biologists were concerned that snow machines were scaring elk off critical winter range and the Forest Service ended up banning them from certain areas (Jones, pers. comm.).

National Park Service

Grand Teton National Park and Yellowstone National Park encompass 384 square miles of the elk herd’s range. However, very little of this is defined as crucial winter range by the WDGF biologists (WDGF 1987).

It is the mission of the National Park Service as a whole “to conserve the scenery and the natural and historic objects and the wildlife therein” (National Park System Organic Act 1916). While this mission would seem to place the Jackson Hole elk herd high on the list of management priorities for these parks, Grand Teton National Park has at least two other mandates that make this difficult.
First, Grand Teton National Park is one of the only parks in the country that allows hunting. Congress placed this provision in the enabling legislation for the park at the insistence of Jackson locals who were concerned that the Jackson elk herd would otherwise become too large and inaccessible. The hunting program is jointly administered by the National Park Service and the WDGF. The two agencies hold meetings every year to determine how to structure the hunt. Hunters who draw permits are deputized by the Park Service and then allowed to hunt the elk as they move from the summer range in the park onto the adjacent NER (Righter 1982).

While it may be a valuable population management tool for the state, this hunt also creates several problems. First, it is controversial: many members of the public as well as the Park Service dislike having hunting on the national park (Cain, pers. comm.). Second, the hunting pressure pushes the elk off the fall transition range in the park and into the no-hunting zone on the southern half of the NER sooner than they otherwise would go there. This means the elk consume forage on the refuge that might otherwise be available in the winter; less natural forage on the refuge means that supplemental feeding must begin sooner (Reiswig, pers. comm.; Smith, pers. comm.).

Second, Grand Teton National Park is one of the few parks in the country that allows livestock grazing. This provision is problematic in terms of elk management for two reasons. First, the APHIS disapproves of any potential commingling between brucellosis-infected wildlife and cattle for fear of interspecific disease transmission (Thuermer 1997c). In addition, the cattle within the park consume the same forage as the elk. Although it has not been examined in detail, cattle grazing may limit the amount of forage available for the elk within the park in both summer and winter. Summer forage is almost as critical as winter forage for the elk because, without a winter feeding program, elk would have to rely heavily on fat reserves built up over the summer to get through the winter (Smith, pers. comm.).

In sum, the management of Grand Teton National Park is critical to the management of the NER. Grand Teton National Park Superintendent Jack Neckels and wildlife biologist Steve Cain are well aware of these issues, but national and agency mandates and powerful local constituencies force them to make many compromises in management (Neckels, pers. comm.; Cain, pers. comm.).

**Teton County Government**

Teton County encompasses all of the 2,000-square-mile range of the Jackson Hole elk herd, including the NER, Grand Teton National Park and most of Bridger-Teton National Forest. The Teton County Planning and Zoning Commissioners and, ultimately, the Teton County Commissioners (a separate body) make decisions about how landowners can develop their land based on recommendations from the Teton County Planning Department. Since much of the 26 square miles of remaining crucial elk winter range is in private hands, the decisions of the Teton County government are critical to the management of the herd (WDGF 1987).
private hands, the decisions of the Teton County government are critical to the management of the herd (WDGF 1987).

I interviewed Teton County Commissioner Sandy Shuptrine and the Teton County Planning Director Bill Collins. According to them, the planning department typically seeks wildlife recommendations from the WDGF when considering planning and zoning decisions. They also seek comment from the National Park Service and the U.S. Forest Service concerning lands within or adjacent to the park or the national forest, but these recommendations are not always heeded. For example, in early June 1999, the Teton County Commissioners were deciding about a small subdivision and invited comment from the WDGF. Department biologists recommended a riparian setback, and then the County Commissioners voted 4 to 1 against accepting the recommendation. “This is a pattern,” Shuptrine said, “and I’m afraid that it creates a sense of resignation among the advising agencies like the WDGF.” For this reason and because of pressures from higher up in the agency, Shuptrine said, “I feel like Wyoming Game and Fish hangs back in giving us hard information and opinions” (Shuptrine, pers. comm.).

Both Shuptrine and Collins noted that 97 percent of Teton County is in federal hands and that commissioners on both boards tend to believe that a lot of leeway should therefore be given to the landowners who hold the remaining three percent. Although the commissioners may recognize that the private land is often the prime, valley-floor real estate that is so important to wildlife, they also seem to discount this information because they believe game managers can make up for any loss of habitat through such things as the feeding program. For example, during one discussion about a subdivision, a pro-development commissioner stated simply, “The elk will go where we tell them to go” (Shuptrine, pers. comm.; Collins, pers. comm.).

Non-Government Organizations
Perhaps the most important NGOs are the Wyoming Outfitters Association and the Jackson Hole Outfitters and Guides Association. These groups have been extremely active, vocal and effective in their advocacy of outfitter interests and, more specifically, of a large elk herd. In 1984, for example, the outfitters, in conjunction with a sister group known as Concerned Citizens for Elk, complained that the population of the Jackson Hole elk herd had dropped too low. The organizations advocated increased feeding and reduced hunting on elk cows. They held demonstrations, wrote letters to the editor, and complained to their legislators. As a result, WDGF officials say they decided to allow the herd size to increase. The current population, much higher than the agreed objective, is a direct result of the 1984 protests. The outfitters have also relied on lawsuits to pressure both state and federal agencies (Bohne, pers. comm.; Jackson Hole News 1984d, 1984e).

Interestingly, the group that represents the hunters in the valley and across Wyoming is often at odds with the outfitters. Although not all members feel the
same way, a staff member and former head of the Wyoming Wildlife Federation, Lloyd Dorsey, has called on the state to phase out the feed grounds because of all the problems they cause (Dorsey, pers. comm.). The hunters are also often at odds with the outfitters over the allocation of hunting permits. The outfitters typically want more licenses issued to out-of-state hunters, and the resident hunters want just the opposite. In fact, the two groups have frequently disputed the permit allocation system (Gerty 1987b).

Another influential NGO in the valley is a relative newcomer, the Fund for Animals. This organization came to Jackson with a former Kentucky resident named Andrea Lococo in 1996 (Jackson Hole News 1996). Since her arrival, Lococo has organized protests and filed lawsuits against elk and bison hunts on the NER and elsewhere (Sosnow 1994; Stanford 1997). Most recently, the Fund for Animals won an injunction blocking a proposed hunt on the Grand Teton bison herd. The agencies had justified the hunt as the best possible means of controlling the bison herd size. However, the Fund For Animals argued the Environmental Assessment for the bison hunt was insufficient because the agencies had not considered terminating the feeding program as an alternative means of keeping the population in check (Simpson 1998). As their most recent victory demonstrates, Lococo and the Fund for Animals are a force to be reckoned with in the valley even though their following appears to be small.

THE DECISION PROCESS

This section analyzes how the USFWS participates in the decision process surrounding the management of the Jackson Hole elk herd and then looks at the decision process on the NER itself.

Management of the Jackson Hole Elk Herd

There have been many attempts at interagency cooperation in elk herd management in this century. The first such attempt, with a group called The Commission on the Conservation of the Elk of Jackson Hole, Wyoming, was created by a federal organization known as the President’s Committee on Outdoor Recreation. Active from 1927 to 1935, the group included representatives from the relevant federal agencies, the governor of Wyoming and several NGOs, including the Izaak Walton League, Camp Fire Clubs of America, the National Association of Audubon Societies, the American Game Association and the Boone and Crockett Club. The commission accomplished several things. It recommended that herd numbers be stabilized at a number “not in excess of 20,000 head of all ages,” supported land acquisition efforts for the refuge, and funded biology and management studies for the herd (Wilbrecht et al. 1995).

During the 1940s and 1950s the relevant federal and state agencies continued to meet and discuss elk herd management in a less formal setting. Perhaps the biggest issue this group faced with regard to elk herd management was the enlargement of Grand Teton National Park in 1950. The controversy involved
whether and ultimately how hunting should occur in the park. Finally, after years of conflict, the WDGF, the USFWS, the Forest Service and the National Park Service created the Jackson Hole Cooperative Elk Studies Group in 1958. According to one former manager of the NER, “The principal purpose of this committee is to coordinate plans, programs, and findings of studies, and to provide an exchange of ideas, information, and personnel to study the elk herd and its habitat” (Wilbrecht et al. 1995).

The Cooperative Elk Studies Group consists of two committees that mirror its two functions. The Executive Committee includes the manager of the NER, the superintendent of Grand Teton National Park, the Bridger-Teton National Forest supervisor, and the regional supervisor of the WDGF. This committee meets once a year to coordinate management decisions regarding the elk herd. The Technical Committee includes biologists and other staff members from all of the member agencies. This committee meets as often as needed to coordinate studies and public relations campaigns, exchange technical information, and make recommendations to the Executive Committee. Since staff members of the different agencies frequently meet in small groups and conduct work together, there is a fuzzy line between informal contacts and formal meetings under the mantle of the Technical Committee. Among other things, members of the Technical Committee have cooperated on studies of elk calf mortality, the effects of winter recreation on elk, public relations, and habitat restoration. In many ways the Cooperative Elk Studies Group has proven an effective forum for interagency cooperation. However, officials with the WDGF and the NER both said that the group’s effectiveness had been limited in recent years by internal disputes over fundamental policy issues, including who has responsibility for the elk, population objectives, and the vaccination program. The lawsuit between the state of Wyoming and the USFWS over brucellosis vaccination also clouded relations within the group (Reiswig, pers. comm.; Bohne, pers. comm.).

The disputes within the Cooperative Elk Studies Group may also be the result of its limited membership. No members of the public or even the local government are invited to the meetings. Thus, the decision makers have very little social context in which to make their decisions. Leaving the public out of management decisions is not uncommon among federal agencies. Traditionally, agencies like the USFWS and the WDGF have adhered to the “rational model” of bureaucratic planning and decision making. The rational model grew out of the progressive movement in the 20th century and is characterized by the belief that the public interest is rational and unitary. The public is allowed to participate in planning and value judgments, but not in implementation, which is considered the domain of agency experts (Voth et al. 1994; Moote and McClaran 1997). This model is based on the expectation that such a division is the best way to achieve the ultimate goal of the rational model—efficiency. Several recent journal articles have questioned, however, whether the goal of efficiency should be the number one priority and whether the
rational model is the best means of achieving that goal (Voth et al. 1994; Moote and McClaran 1997; Gericke and Sullivan 1994). First, one of the prime goals in democracy is public participation in the decision-making process, whether or not it is efficient. Second, several authors have noted that disenfranchising the public from the process of implementation is in fact very inefficient. When participants feel their voices are not heard or understood, they are more likely to appeal and litigate the resulting decision (Gericke and Sullivan 1994).

My interviews indicate that feelings of disenfranchisement may be partially responsible for the recent spate of lawsuits over the management of the NER and the Jackson Hole elk herd. Consider the words of outfitter Harold Turner: “My voice isn’t being heard,” he said. “Not that my voice is any more important than anybody else’s. But, you know, I think the government’s the government. And I’m not sure they listen to anybody unless they have to, unless somebody forces them to” (Turner, pers. comm.).

Management of the National Elk Refuge
NER officials have made a notable effort to open up the decision-making process to the public in recent years. For example, in the fall of 1997, Barry Reiswig approached the Teton County Natural Resource District and asked for help in creating a group of community members to discuss management issues on the refuge (TCNRD 1998).

The Teton County Natural Resource District is part of a state-run program that seeks to help local communities protect their natural resources by providing them with education, expertise, and a forum for discussion. Previously focused on agricultural issues, the district has sought to expand its horizons in recent years as ranching has dwindled in the area and tourism and recreation have boomed. Thus, when Reiswig asked for help, the board members jumped at the opportunity (Jorgensen, pers. comm.). District Supervisor Larry Jorgensen invited about 30 people he thought would be interested to the first meeting in October and several more to the next meeting in January. The attendees included local landowners, state and federal officials, and representatives from other interested groups. However, the meetings were not open to the public and were not advertised (Jorgensen, pers. comm.).

According to several people who attended, the meetings were a pleasant and effective means of encouraging the participants to begin thinking about management issues on the refuge. However, facilitator Dana McDaniel believes part of the reason the meetings were so successful was precisely because they avoided controversy. While they mentioned issues like brucellosis, habitat degradation, and overpopulation of the elk herd, they did not try to address these issues in a comprehensive manner. They did not even try to come up with a vision or a mission statement for the group. Instead, they focused on technical issues like hardening the elk-crossings on one of the streams in the refuge to prevent further habitat degradation and the best means of installing a new irrigation system on the refuge (McDaniel, pers. comm.). Reiswig has also
made less formal attempts to open up the decision process on the refuge to the public by meeting with many constituents in various venues.

Lawsuits
Wyoming’s lawsuit against the USFWS over vaccinating elk on the refuge is not the only one that has been filed over the management of the Jackson Hole elk herd and the NER. In fact, lawsuits over management have been increasing rapidly in recent years. In 1991, animal rights activists sued to stop the refuge’s annual elk hunt. The refuge won (Jackson Hole News 1995c). In 1991, the Parker Ranch filed suit against both the state and federal governments because, the owner alleged, they were responsible for the wildlife that had infected his cattle herd with brucellosis. Although the judge threw that case out because Parker could not prove that wildlife had transmitted the disease, he lambasted both the state and federal governments for not doing more to eradicate brucellosis in wildlife (Thuermer 1992; Keiter and Froelicher 1993). In 1993, the Wyoming Coalition sued the WDGF after the agency shortened the elk hunting season around Jackson Hole. Again the WDGF won (Thuermer 1993). In 1998, the Fund for Animals sued the state and federal governments to stop a bison hunt on the NER and on other public land. The agencies had concluded that a hunt was the best way to keep the bison population in check. However, a district court judge granted an injunction to the Fund For Animals in October 1998 because, he said, the agencies had failed to consider eliminating the feeding program as an alternative means of keeping the population in check (Odell 1998; Urbina 1998).

Such lawsuits may, in some ways, be a desirable part of the decision process. Ideally, they serve to resolve certain issues in an authoritative and comprehensive manner. However, lawsuits are undesirable for several obvious reasons. First, they are costly and time consuming. Second, they tend to breed ill will and distrust. And finally, as one state official said, “You wind up with someone who doesn’t know anything about elk making decisions about how to handle the herd” (Bohne, pers. comm.). If managers implement a better decision process, they may be able to reduce the number of lawsuits.

Summary
The increasing number of conflicts over the management of the NER and the Jackson Hole elk herd are symptoms of an insufficient decision process. If present trends continue, management is only going to become more difficult in future years for the USFWS and the other agencies involved for several reasons:

1. The decision-making process does not adequately take the social process into consideration. Because many of the participants directly affected by management decisions are not involved in the decision process, they are unlikely to accept the decisions that are made.
Neither the USFWS nor the interagency organizations are engaging in an explicit problem orientation. Without an open discussion of their goals, the participants are unlikely to come up with a comprehensive problem definition. Without a comprehensive problem definition, the participants will probably continue to focus on smaller issues and will never fully consider the alternatives.

The decision process appears to be narrowly focused and incomplete, yielding similar decisions and solutions. As work begins on the creation of a management plan for the refuge, it may be the ideal time for the USFWS to reexamine its role, its goals and its alternatives.

ALTERNATIVES AND RECOMMENDATIONS

SOCIAL PROCESS RECOMMENDATIONS
From its inception, many different groups from inside and outside the region have helped turn the NER into what it is today. Both local ranchers and national conservationists pushed the federal government to create the refuge. However, today, very few groups are involved in the management of the NER or the Jackson Hole elk herd. Managers have also expressed surprise at the lack of knowledge among local residents about these issues.

Increasing the number of participants in the management of the Jackson Hole elk herd and the NER may aid managers. Gericke and Sullivan (1994) and Moote and McClaran (1997) note that there are several advantages to increasing public participation in agency decision making. First, studies have found that the general public typically has more moderate views on natural resource management issues than either the participating agencies or the special interest groups (Knopp and Caldbeck 1990). Involving the general public may therefore reduce the level of conflict. Second, public participation will give the agencies a firm understanding of the values and opinions of their constituents and thereby allow them to make better decisions. Third, the public is more likely to approve of the final decision if they feel they have been involved in the decision making. Fourth, it helps build long-term trust between the agency and the public. All of these factors may limit the conflict and lawsuits that currently plague management of the herd and the refuge.

Increasing the number of participants in decision making might be accomplished through specific activities such as the Teton County Natural Resource District meetings or “decision seminars,” outlined below. It might also include less formal activities. Either way, the key to involving the public is to show them that their opinions count in the final decision. In addition to increasing local knowledge about the NER, it may also be helpful for managers to increase their knowledge about the social context. To date, much of the research money on the NER goes into biological and ecological studies despite the fact that such problems and their potential solutions are relatively well understood. Very little money goes into social science research despite the fact that it is human
value judgments that are responsible for the problems. Social science research may help managers understand the problems better. Managers may want to hire professional social scientists to conduct polls and determine local attitudes and values associated with the elk herd.

PROBLEM ORIENTATION RECOMMENDATIONS
The way in which problems are defined is critical to the way in which they are resolved. Currently, the substantive and scientific problems such as brucellosis and habitat degradation are heavily emphasized. Placing more emphasis on the procedural problems that plague management of the herd and the refuge may also aid refuge managers.

The decision seminar is a format that has been used successfully to solve problems all over the world (Burgess and Slonaker 1978). However, to date, such problem-solving exercises have not been used in the Greater Yellowstone Ecosystem. Such seminars might be very useful in solving the problems with management of the Jackson Hole elk herd as well as the NER. Clark (on the GYE, this volume) reviews the potential use of such seminars in the Greater Yellowstone Ecosystem. Brewer (1986) reviewed methods for conducting such seminars.

The managers of the NER may also wish to hold one or a series of decision seminars. Such a seminar could be held over a period of several days. The goal of the seminar should be to find the common interest in the management of the NER and the Jackson Hole elk herd. The structure of the seminar should be clearly spelled out from the beginning. There are three critical components to any decision seminar. First, the goals of the seminar must be clearly set out and understood by the participants. The goals should allow for refinement and promote consensus. Perhaps the goal of the first such seminar should simply be to improve the decision-making process on the NER and the Jackson Hole elk herd.

Second, the decision seminar must integrate multiple methods and disciplines. Such interdisciplinary methods encourage a diversity of approaches to problems and innovative solutions. For this reason, I recommend inviting a variety of participants from both within and outside the region and from a variety of disciplines. At a minimum, the invited participants should include: (1) the Wyoming Game and Fish commissioners and the director; (2) local representatives of the WDGF, representatives from the other relevant agencies, and representatives from the Teton County government and the town of Jackson; (3) representatives from influential NGOs and academic institutions; (4) representatives with extensive experience in the use of such decision seminars for the management of natural resources.

Third, the participants must have a clear idea of the local context. Again, this can be facilitated by inviting all the local interest groups and agencies. The seminar may also be more productive if USFWS officials were to gather more information about the social context before the seminar.

The way in which problems are defined is critical to the way in which they are resolved. Currently, the substantive and scientific problems such as brucellosis and habitat degradation are heavily emphasized. Placing more emphasis on the procedural problems that plague management of the herd and the refuge may also aid refuge managers.
DECISION PROCESS RECOMMENDATIONS
Managers of the NER have long acknowledged that it is impossible to manage the refuge without seeking to influence management of the herd. The biggest threat to the Jackson Hole elk herd remains the loss of their winter range. And if population numbers remain the same, the more winter range that is lost outside of the refuge, the more elk that will be crowded onto the refuge itself. This will increase the substantive problems. Thus, officials may want to increase their involvement in land use decisions off the refuge. Refuge officials have traditionally avoided trying to do this largely because neither they nor the other participants believe the USFWS has the authority to do so (Reiswig, pers. comm.). However, as Michael J. Bean and Melanie J. Rowland point out in their excellent book, *The Evolution of National Wildlife Law* (summarized below), this is not necessarily the case (Bean and Rowland 1997).

The idea that the state has the ultimate authority over game management traces its roots back to the 19th century when the U.S. Supreme Court decided a number of cases pertaining to wildlife. In *Geer v. Connecticut* (U.S. 1896), Justice Edward White articulated what has come to be known as the state ownership doctrine. He held that the states had the right “to control and regulate the common property in game…as a trust for the benefit of the people.” The Supreme Court confirmed that decision in a 1912 case known as The Abby Dodge. Almost immediately thereafter, however, the court began to back away from the idea that the state ownership doctrine precludes federal wildlife regulation. In a series of later cases the Supreme Court found that the federal government has the constitutional right to regulate wildlife through its treaty-making power, property power, and the commerce clause. Some of the cases involving property power and the commerce clause appear to be particularly relevant to the issues surrounding the management of the NER and the Jackson Hole elk herd (Bean and Rowland 1997).

The precedent-setting case of *Hunt v. United States* (U.S. 1928) began after the U.S. Forest Service decided to lower the deer population on the Kaibab National Forest because officials feared overbrowsing was damaging the forest. When state officials tried to block the deer removal program on the grounds that it violated their game laws, the United States brought suit and the case made it all the way to the Supreme Court. Although the state relied on *Geer v. Connecticut* as the cornerstone of its defense, the Supreme Court did not even mention that case in its final decision. The court found that “the power of the United States to thus protect its lands and property does not admit of doubt…the game laws or any other statute of the state…notwithstanding” (Bean and Rowland 1997).

A 1976 case known as *Kleppe v. New Mexico* confirmed the decision in *Hunt v. United States* and several other such cases. It is, according to Bean and Rowland (1997), “the Court’s most recent, and probably definitive, pronouncement on the property clause as a basis for federal authority to regulate wildlife.” The case revolved around a 1971 law known as the Wild Free-
Roaming Horses and Burros Act that declared all unclaimed horses and burros on federal lands to be “an integral part of the natural system of public lands” and protected them as such. When New Mexico authorities captured some wild burros and sold them at auction, the Bureau of Land Management demanded their return. The state instead filed suit seeking to have the law declared unconstitutional. In a unanimous decision the Supreme Court found the law to be constitutional and decided that while the “furthest reaches of the power granted by the property clause have not yet been definitively resolved . . . [the property power] necessarily includes the power to regulate and protect the wildlife living there.” The same decision stated that “it is far from clear . . . that Congress cannot assert a property interest in the regulated horses and burros superior to that of the state” (Bean and Rowland 1997).

The federal government may also have the right to regulate game management under the Commerce Clause of the Constitution. The Ninth Circuit Court upheld federal hunting regulations under the Airborne Hunting Act in a 1979 case known as United States v. Helsey. The court found that “Congress may find that a class of activities affects interstate commerce and thus regulate or prohibit all such activities without the necessity of demonstrating that the particular transaction in question has an impact which is more than local” (Bean and Rowland 1997).

In sum, as Bean and Rowland (1997) put it, “It is clear that federal authority to regulate wildlife under the commerce clause is of equal stature to that conferred by the property clause. Accordingly, federal regulation of wildlife pursuant to the commerce clause is unrestrained by the state ownership doctrine. In fact, the contention that state ownership bars federal wildlife regulation has received no authoritative judicial support since the 1912 decision in The Abby Dodge, a decision that, though never overruled, has been given a quiet internment.”

On this basis, it appears that managers of the NER have the authority to help manage the Jackson Hole elk herd outside refuge boundaries. As stated earlier, the USFWS also has a need to influence land use outside the refuge if it is to achieve its goals. I believe there are several ways the USFWS could increase its influence outside of the refuge without generating excessive conflict with the public or with other agencies.

First, USFWS officials could seek to sway the decisions of the Teton County commissioners regarding private land use. Both Commissioner Sandy Shuptrine and Planning Director Bill Collins have said they would welcome more involvement by NER staff in planning decisions. Refuge staff would not have to take an advocacy role; they could simply spell out the effects that county actions might have on the elk herd. The local government clearly acknowledges the importance of the elk herd to the economy of the valley and thus, the USFWS would not need to assume an adversarial role if it were to help the WDGF evaluate and describe Teton County’s land use decisions.
Second, the USFWS might choose to try to influence land use outside the NER through partnerships with various NGOs. For example, the WDGF has already teamed up with various NGOs, such as the Jackson Hole Land Trust and the Rocky Mountain Elk Foundation, to preserve critical elk winter range through easements and outright purchase of land. Mark Berry, the director of stewardship of the Jackson Hole Land Trust, has said he would welcome more contact with refuge staff and would be pleased to engage in a joint conservation project with the USFWS (Berry, pers. comm.).

Third, the USFWS also has funds available to help landowners improve wildlife habitat on their land through the Partners for Wildlife Program. Since its inception at the national level in 1987, the program has developed partnerships with more than 14,000 landowners. In 1996 NER staff member Rox Rogers initiated the Partners for Wildlife Program in Jackson Hole, and in 1996 and 1997, three private land agreements in Teton and Lincoln Counties received funding. However, since Rogers departed, the program has not received as much attention. This program may be a valuable way to preserve elk winter range around Jackson Hole and thereby alleviate some of the substantive problems with the management of the elk herd on the NER (Jackson Hole News 1997).

Fourth, the USFWS could seek to influence land management decisions on the national forest. This would not be unprecedented. Many years ago the predecessor to the USFWS, the Bureau of Biological Survey, helped the national forest map out critical elk habitat on the Bridger-Teton National Forest (Thuermer 1991). The USFWS might choose to aid the Forest Service and the WDGF in their habitat restoration programs.

CONCLUSION

It is worth noting once again that the creation and management of the NER and the feeding program have proven remarkably successful. The once dwindling elk herd has rebounded to record levels, depredation on nearby ranches has been held to a minimum, and the refuge has provided benefits to a host of other species including humans. Despite this success, however, both substantive and procedural problems have been increasing in recent years. Disease, habitat loss, and habitat degradation threaten the elk herd, the nearby ranches, the other species that depend on the refuge, and the associated human benefits. Conflict over the best way to resolve these problems is both the cause and the result of an increase in distrust and ill will between the responsible agencies and other interested parties.

If the refuge managers wish to resolve the substantive problems, they must first begin to resolve the procedural problems. Although there is no overnight cure, I believe there are several ways to begin. First, managers may want to increase their knowledge of the social context. Second, they may want to increase the numbers of private citizens and NGOs involved in the decision process. Third, they may want to hold a decision seminar or other problem-solving workshops.
solving exercise. And finally, managers may want to become more involved in land use decisions outside the refuge through incentive programs, partnerships with NGOs, and advice to other governments and agencies.

The NER is one of the flagship national wildlife refuges in the United States, and the Jackson Hole elk herd is one of the largest and most well known in the country. In addition, the substantive and procedural problems faced by the managers of the NER are similar to those faced by other refuges across the country. For these reasons, management decisions made on the NER will have regional, national, and perhaps even international implications. It is therefore critical that leaders find ways to resolve the problems that increasingly plague management of the refuge and the Jackson Hole elk herd. If they succeed, they may help the USFWS find “new and innovative ways to achieve species and habitat conservation.”

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