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Mountain Plovers and the Politics of Research on Private Lands

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*The critical role of private lands in the conservation of threatened and endangered species has been well documented. Although researchers and policymakers recognize the need to include private lands in conservation planning, they often falter over the question of how to do so. The current literature contains only a few research studies on species of conservation concern on private lands. We describe our experiences with the partnership-based approach we used with private landowners to conduct research on the mountain plover (*Charadrius montanus*), a species that was proposed for listing under the US Endangered Species Act. In our approach, research is an objective tool that is accessible to all partners involved, and researchers do not take a lead role in the resolution of sociopolitical issues. We provide guidelines for conducting studies on private land, with the goal of improving researchers' interactions with private landowners.*

Keywords: Charadrius montanus, *mountain plover, private lands, threatened and endangered species, conservation*

Research efforts directed at the conservation of species in the United States have focused on public lands, most likely because of ease of accessibility and because many public land management agencies have mandates for species conservation. A review by Hilty and Merenlender (2003) of 258 terrestrial field research studies published from 1997 through 2000 in *Conservation Biology* and *Biological Conservation* found that only 27 percent of the studies were conducted wholly or in part on private lands. However, 72 percent of the land surface in the United States is privately owned (Sanford 2006). The existing literature recognizes the critical role of private lands in determining the extent to which species conservation goals will be effective (Bean and Wilcove 1997, James 2002, Hilty and Merenlender 2003). More than 90 percent of the species listed as threatened and endangered under the US Endangered Species Act (ESA) have at least some part of their habitat on private lands, and about two-thirds of those species depend on private lands for the major part of their required habitat (Doremus 2003).

In general, private lands are more productive, better watered, and higher in soil quality than public lands (Scott et al. 2001). The establishment of public lands has seldom been configured for optimal biodiversity, with the result that comparable, or higher, levels of biodiversity and species productivity are often found on private lands (Maestas et al. 2003, Sanford 2006). Nonetheless, research biologists have largely failed to incorporate private lands into research activities. Neglecting private lands in research efforts limits species information to a restricted set of land-cover types, which may result in failure to understand important conservation issues (Hilty and Merenlender 2003). Given the differences between public and private lands, and the fact that most research on imperiled species is carried out on public lands, more research on private lands needs to be conducted to manage and conserve many threatened and endangered species.

Private landowners are often reluctant to take part in research programs targeted at species of conservation concern, however. This reluctance arises from the fear of agency restrictions on the private landowners' freedom to manage their land if a protected species is found in their holdings. Furthermore, landowners may resent being forced to bear the economic burden of conserving a species for the society at large (Doremus 2003).

The ESA gives private landowners little incentive to cooperate with information-gathering activities. In addition,

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the current regulatory approach may generate perverse incentives that induce landowners to manage their land in ways that discourage the presence of threatened or endangered species (Polasky and Doremus 1998, Innes 2000, Polasky 2001, Langpap 2006). Anecdotal evidence of such behavior abounds (Mann and Plummer 1995, Bean and Wilcove 1997, Bean 1998, Brook et al. 2003), perhaps in part because conservationists have failed to give private landowners much incentive to protect endangered species (Wilcove 1999). In the absence of a workable, effective approach to protecting threatened or endangered species on private land, landowners' fears and resentments may preclude efficacious conservation efforts.

Examples of efforts to conduct research on endangered species on private agricultural lands in the United States are rare (Brook et al. 2003). Although agricultural systems cover a sizable proportion of the terrestrial landscape, they have largely been ignored in species conservation efforts (Banks 2004). The social dichotomy between agriculture and conservation can lead to antagonistic viewpoints concerning land use and biodiversity (Banks 2004, Sanford 2006). Beyond the burden of obtaining access (Hilty and Merenlender 2003), fear of opposition from agriculturists provides a rationale for researchers to avoid working on private lands (Banks 2004). Research biologists are trained as scientists, not as practitioners in conflict resolution among societal subcultures. Nonetheless, an appreciation for the social context of working with private agricultural landowners will benefit conservation efforts (Carr and Hazell 2006). Indeed, positive interactions between research biologists and private landowners are vital for the conservation of species of concern, especially in agricultural landscapes. Research biologists have a duty to make the transition from top-down control to partnership-based conservation efforts (Sanford 2006).

The aim of this article is to demonstrate the importance of a partnership-based approach through a research study conducted on private agricultural lands in eastern Colorado on the mountain plover (*Charadrius montanus*), a species that had been proposed for listing under the ESA. We provide a step-by-step account of how we involved private landowners in the research study on this petitioned species. This account includes reflections on the research process as well as our results. After describing the biology of the mountain plover and its current status, we discuss our approach to dealing with the social challenges of conducting research on a species with this status on private agricultural lands. We then describe the biological results of our research and relate how our biological information contributed to an informed listing decision. Finally, we examine our partnership-based approach with private landowners. Our hope is that this article will help to enhance research opportunities and promote debate on how best to achieve conservation goals on private agricultural lands.

The mountain plover

The mountain plover (figure 1), thought to be an endemic species of the Great Plains region (Mengel 1970), is an upland shorebird of the xeric tablelands from Mexico to northern Montana (Knopf and Wunder 2006). Historically, plovers were reported across western prairies in areas of intensive grazing by bison (*Bison bison*) and prairie dogs (*Cynomys* spp.). Today, mountain plovers are still observed on areas grazed by prairie dogs, along with areas grazed by domestic cattle and sheep, and on agricultural fields (Knopf and Rupert 1999). The eastern plains of Colorado provide the breeding habitat for more than half of the continental population of mountain plover (Kuenning and Kingery 1998). Smaller, more isolated breeding areas occur throughout the western Great Plains region (Knopf and Wunder 2006).

Figure 1. The mountain plover, an upland-nesting shorebird of west-central North America. Photograph: Fritz L. Knopf.

In the late 20th century, populations of grassland birds declined across North America (Knopf 1994). Steep, constant declines have been reported for mountain plovers across their range since 1966 (Knopf and Wunder 2006). One factor that researchers have suggested may be contributing to the decline of mountain plovers is the birds' tendency to nest on agricultural lands (figure 2; Knopf and Rupert 1999, Shackford et al. 1999). Mountain plovers breed primarily on nonirrigated agricultural lands consisting of dryland wheat and spring fallow (Knopf and Rupert 1999, Shackford et al. 1999), and the destruction of eggs through agricultural practices may reduce reproductive success (Knopf and Rupert 1999).

This potential threat of agricultural practices to plover recruitment and the documented decline in continental populations, along with the fact that a significant portion of the birds' breeding habitat is in eastern Colorado where farming and ranching are major industries, were some of the factors that contributed to the proposal of the US Fish and Wildlife Service (USFWS) to list mountain plovers as threatened under the auspices of the ESA (USFWS 1999).

The research challenge

Often missing in the dialogue on ESA issues is that the identification of a critical species is based on detailed biological

Figure 2. Mountain plover nest on a recently tilled agricultural field in eastern Colorado. Photograph: Fritz L. Knopf.

information obtained through long-term research studies. Although information on the species' distribution may be available (Tear et al. 1995), information on population demographics and dynamics is often lacking and poorly funded until the status of the species is defined as a conservation crisis. Thus, a proposal to list a species as threatened or endangered is often based on incomplete information (Mann and Plummer 1995, Tear et al. 1995). In the case of the mountain plover, funding for the research that identified the tenuous status of the species and potential threats was provided through a larger project undertaken within the US Department of the Interior (USDOI) to address conservation issues associated with the decline of grassland birds nationwide.

Practical issues associated with the logistics of doing fieldwork on private agricultural lands were a primary motivation for taking a partnership-based approach, rather than the current ESA regulatory approach, to the proposed listing of the mountain plover (Brook et al. 2003). One way to gain permission for access to private land is to establish partnerships with individuals and organizations that know and have an established level of trust with private landowners (Graziano 1993, Hilty and Merenlender 2003, Wilcove and Lee 2004). We recognized the need to work cooperatively with the agricultural community to examine the relationships between agricultural landowners' management practices and mountain plovers' breeding biology. We approached the conservation director of the Colorado Farm Bureau (CFB) to discuss the social and political aspects of the proposal to list the mountain plover as a threatened species. Recognizing the role of private land in species conservation and the importance of landowners' concerns, the conservation director foresaw that CFB members would understand it was in their best long-term interest to be proactive in addressing these issues. Researchers worked with the CFB conservation director to define how the research should be conducted and to assist in establishing a communicative relationship with landowners. The prelisting proposal discussions determined that (a) no government (state or federal) employees or vehicles were to be permitted on private lands; (b) field research activities were to be conducted by an independent, academically housed postdoctoral research associate (postdoc RA); and (c) the specific locations of private holdings cooperating with the research were to remain confidential and not on a permanent record where they could be accessed by third parties.

Individuals involved with the research participated in many local and regional CFB meetings in the late 1990s to introduce landowners to the concerns and circumstances surrounding mountain plover nesting on private agricultural lands. The meetings were successful in that some landowners who thought, or knew, that the species occurred on their holdings volunteered to discuss the details of a proposed research study. Wilcove and Lee (2004) called these individuals "flagship landowners." Thus, when the proposal to list the species was published, the groundwork necessary to gain access to private land was in place. This listing proposal facilitated the politics of funding research within USDOI programs to investigate the relationship between agricultural practices and the breeding population viability of mountain plovers.

One of the most important factors in the success or failure of species conservation on private lands appears to be the abilities of the person tasked with contacting landowners (Hilty and Merenlender 2003, Wilcove and Lee 2004). Once funding was in place, all invested partners provided input on the hiring of a postdoc RA (at Colorado State University, through the Colorado Natural Heritage Program). The postdoc RA led the research study, including assuming responsibility for evolving the partnership-based approach with private landowners. One-on-one meetings with flagship landowners formalized a working relationship. The postdoc RA contacted additional landowners (in person or by phone) to arrange one-on-one meetings to discuss the research study. As Carr and Hazell (2006) noted, merely gaining permission does not establish a personal, communicative relationship with private landowners. The discussion in the one-on-one meetings involved the specific details of the research study, including the objectives, the field methods, and the value of the information gathered. These meetings also involved direct attempts to address private landowners' concerns and, if they agreed to participate, to establish their conditions as to the protocol to be followed by research personnel to access their holdings. This personal approach established a foundation for building trust.

Working with 22 private landowners in 7 counties, the postdoc RA and field assistants gained access to approximately 40,470 hectares (ha) of agricultural lands during the first year of the study (figure 3). By 2003, landowner participation grew to 32 individuals in 13 counties, with access to 89,034 ha. The rate of retention for landowner participation in the research program was greater than 95 percent each year (figure 3), and the spatial coverage of the 13 counties represented well over half of the counties in eastern Colorado where the presence of plovers had been documented (Kuenning and Kingery 1998).

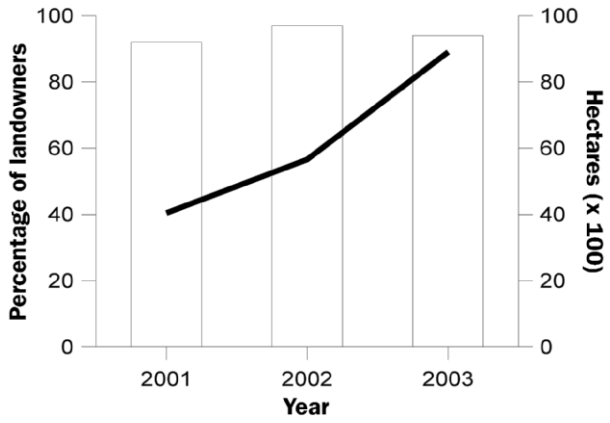

Figure 3. The percentage of private landowners (bars) contacted who agreed to allow access to their holdings to conduct research on the mountain plover during a proposed listing decision (2001–2003) in eastern Colorado. The line represents the corresponding total number of hectares.

The field effort

From 2001 to 2003, we monitored the nest success of mountain plovers on rangelands (grazed or nongrazed native prairie) and agricultural fields. Our survey methods were dependent on private landowner terms and varied among habitats (i.e., no vehicles were driven on fields with growing crops). A total of 395 mountain plover nests were located and monitored across each 111-day breeding season (18 April–6 August) during the three-year study (figure 4). The numbers of nests located on rangeland and on agricultural fields were comparable throughout the study.

To determine the impact of agricultural practices on nest success, we developed a suite of 33 daily nest success models to examine explanatory variables, including habitat, year, sex of the incubating adult (uniparental care), and breeding season time trends (linear or quadratic). For our analysis, we used an extension of the Mayfield nest survival model, which takes into account the biases associated with not locating all nests at the same stage and allows for flexibility in modeling daily nest survival (Dinsmore et al. 2002). Our approach to model selection was based on information theoretic methods using Akaike's information criterion (Burnham and Anderson 2002). Our results indicated that daily survival of mountain plover nests was similar whether nesting occurred on rangeland or on agricultural fields (figure 5). Our model selection approach suggested that daily nest survival decreased linearly on a logit scale (ß coefficient = –0.0159, 0.0042 standard error) through the 111-day breeding season. The regression coefficient (ß coefficient) for agricultural fields was 0.0179. However, the standard error was 0.0770, larger than the coefficient estimate, and the 95 percent confidence interval (–0.1330, 0.1688) encompassed zero, further suggesting no difference in nest success between agricultural fields and rangelands. The inclusion of the other explanatory variables (year or sex) did not improve our ability to explain the variation in this linear trend. Following Dinsmore and colleagues (2002), we estimated the probability of a mountain plover nest surviving the 29-day incubation period using the average mean initiation date for eastern Colorado on 9 May, 2001–2003. The rate of nest success to hatching of eggs was 0.37 (0.05 standard error).

We were able to document that agricultural practices are not an added threat to the nest success of mountain plovers. Nest success on agricultural fields and on rangeland is comparable, although the primary cause of nest mortality differed between the two habitats. We grouped causes of mortality into four categories: (1) destroyed by nest predators, (2) destroyed by agricultural practices, (3) abandoned, and (4) unknown. We suspect the unknown causes of mortality were mainly climatic conditions (e.g., flooding of the nest site; figure 6). The majority of nest mortality on agricultural fields was attributed to both agricultural practices and predators for all years of the study, while the mortality on rangelands was

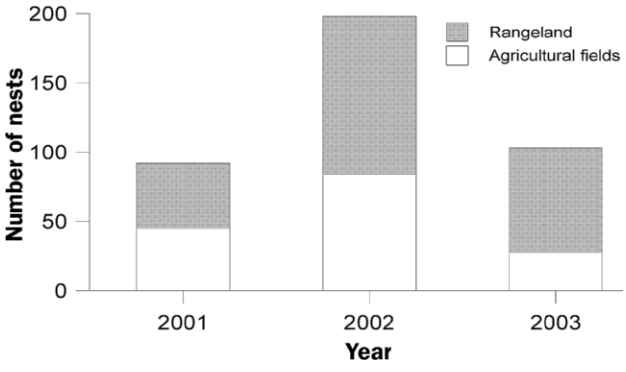

Figure 4. The number of mountain plover nests monitored on rangeland (native prairie or grazed lands) and agricultural fields throughout eastern Colorado for a research project investigating agricultural impacts on nesting activity during a proposed listing decision (2001–2003).

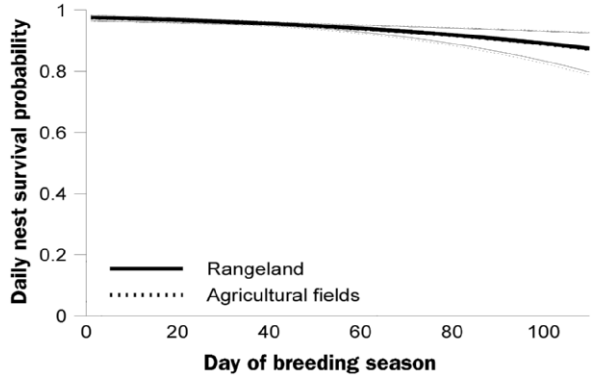

Figure 5. Daily nest survival probabilities and confidence intervals (thinner lines) for mountain plovers that nested on rangeland (native prairie or grazed lands) and agricultural fields in eastern Colorado during a proposed listing decision (2001–2003). The survival curve for agricultural fields is hidden behind the survival curve for rangelands.

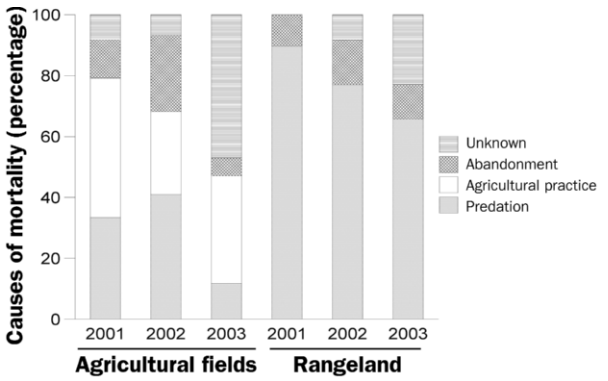

Figure 6. The cause of mortality for mountain plover nests on rangeland and agricultural fields in eastern Colorado during a proposed listing decision (2001–2003).

Figure 7. Recently tilled agricultural field in eastern Colorado, showing landowner avoidance of a flagged mountain plover nest. Phototograph: Fritz L. Knopf.

attributed to predators (figure 6). In addition, we learned that some nests survive agricultural practices (cultivation, tillage, and drilling). Only 45 of the 395 nests (11 percent) were subject to agricultural practices. Of these 45 nests, 21 (47 percent) survived agricultural practices. That is, 24 (6 percent) of the 395 nests that we located were destroyed by agricultural practices. Given our nest success rate of 0.37 (0.05 standard error), reducing nest mortality by 6 percent in one habitat type used in eastern Colorado by plovers, such as agricultural fields, is not likely to affect the population dynamics of mountain plovers substantially.

Consequences to plovers and landowners

One of the factors that has been cited as a possible cause of the mountain plover population decline is the tendency of adults to nest on private agricultural lands (Knopf and Rupert 1999, Shackford et al. 1999). The 1999 USFWS proposed rule lists this factor as a threat, stating that agricultural fields, specifically cultivated lands, create population sinks and thus contribute to the species decline (USFWS 2003). In 2003 the USFWS used information from our research study and other concurrent research studies (Dinsmore et al. 2003, Wunder and Knopf 2003, Wunder et al. 2003, Oyler-McCance et al. 2005, Plumb et al. 2005) in the decision process that resulted in withdrawal of the proposal to list the mountain plover as threatened (USFWS 2003). The document announcing the withdrawal of the proposed rule states that the determination not to list is "because threats to the species as identified in the proposed rule are not as significant as earlier believed, and current available data do not indicate that the threats to the species and its habitat...are likely to endanger the species in the foreseeable future throughout all or a significant portion of its range" (USFWS 2003).

During the second year of the research study (2002), we realized that nest loss on agricultural fields would be reduced if the locations of the nests—which are shaped like a circular cup with a diameter of 10 centimeters or less—were known before an agricultural practice that could destroy nests commenced. We discussed the potential of a field-clearing program with all partners. Landowners participating in this program would voluntarily call a toll-free number within 72 hours of implementing any agricultural practice. Then, before the onset of any agricultural activities in a specific field, a field biologist would survey and mark all nests found on the field so that landowners could avoid these nests (figure 7). This proposal was put before the Colorado Department of Natural Resources (CDNR) and the USFWS, and was formally in place before the completion of our research study. Our results suggested the field-clearing program would not significantly slow any population decline, because agricultural practices are not a significant source of nest destruction. However, the objective of the field-clearing program, which is currently contracted by the CDNR through a private (nongovernmental) organization, was modified to demonstrate landowners' willingness to participate in species conservation efforts.

The success of the partnership-based research effort, and the sociopolitical resolution of conflicts over a species of concern on private lands, resulted in the USDOI presenting its Conservation Service Award jointly to the CFB and the CDNR on 3 February 2005. The mountain plover research effort continues to be used as a model for proactive efforts to resolve species conservation issues on private lands.

Working with private landowners

Our partnership-based approach enabled us to access privately owned land (including agricultural fields and rangelands used for grazing by domestic herbivores) to conduct research on a species proposed for listing as threatened under the ESA. Our success can be attributed primarily to three specific actions. First was the partnership with the CFB. The CFB represented the professional organization in the private sector whose members would be most affected by the mountain plover being listed under the ESA. We were able to identify leaders within the CFB, and they were instrumental to the entire effort. Many agencies and organizations, including the

CFB, have influential individuals who are capable of taking an objective view of issues such as the ESA listing, and working successfully with any group requires working with those individuals to reach the organization's wider membership.

Second, we attribute our success to our approach to communicating with private landowners, and to the knowledge and abilities of the person tasked with contacting them. Research biologists are trained to communicate scientific findings and theory. Their ability to accomplish this with a nonscientific audience, such as private agricultural landowners, is often limited. In fact, some practicing research biologists communicate with a nonscientific audience by talking more loudly, pronouncing their words more distinctly, and oversimplifying (Carr and Hazell 2006). The postdoc RA, born and raised in eastern Colorado and thoroughly familiar with the area's agricultural society, knew that the extent to which she engaged landowners in species conservation was linked to her capacity to talk about agricultural issues and activities. Furthermore, our approach was straightforward—people working with people, face-to-face, and on a handshake—and the approach taken when partnering with private agricultural landowners has a great bearing on their willingness to support research on their land (Hilty and Merenlender 2003). Our approach developed a personal, communicative relationship with private landowners, many of whom have since become intrigued with species conservation and the biodiversity of their land, take pride in their role in biodiversity conservation, and continue to express interest in promoting their holdings as contributing to larger conservation issues. This outcome has also been noted in other studies (Hilty and Merenlender 2003, Carr and Hazell 2006).

Third, we used a nonregulatory agency to conduct this research, and we enlisted the private sector (CFB) in making that decision. By including private landowners in the decision to use a postdoc RA to lead the research, we helped not only to empower the landowners in the program from the beginning but also to quell fears (founded or not) that regulatory agencies would immediately become confrontational. The study was presented as seeking research information through collaborative partnerships. Collaborative processes promote shared power. A sense of equal "say" builds trust (Brewer and Brown 1998, Opotow and Brook 2004) and favors the perception that government decisionmaking is fair (Tyler and Lind 1992), while simultaneously promoting conservation goals (Wondolleck and Yaffee 2000). Engaging local citizens, industrial agencies, and governments at all levels in meaningful collaborative efforts is more effective than the rigid application of regulations, and is more likely in the long term to result in the recovery of a species (Shogren 1998). However, a model of the mechanics for negotiating such collaboration is not in the formal training of conservation researchers and biologists.

We are convinced that the mountain plover research program worked specifically because research was presented as a tool, with the diverse interest groups being kept well informed and involved in each step of the program. Researchers stayed in the background, providing objective inputs either as requested or as mere thoughts for consideration. As research biologists, we viewed ourselves as providing the information to all partners promptly, objectively, and on demand, without aligning with any aspect of the politics of the pending ESA decision. We presented ourselves as partners in a process, avoiding any proclamation of leadership in the larger sociopolitical conservation issue, with our commitment to objectivity inherently conferring authority.

Research biologists should avoid the pitfall of taking a leadership role in resolving conflicts between private landowners and regulatory agencies. In our mountain plover study, we learned that the key players representing each sociopolitical interest shifted as the conflict resolution process evolved between the ESA and private landowners. Having alerted all partners to the coming topical issue, the CFB became the early key partner in research program development. Next, the private landowners took the lead, followed by individuals at the USDOI. As the research results began to point to a direction for a solution, individuals at the CDNR assumed leadership in resolving conflicts between agency concerns for species conservation and private land interests. Meanwhile, researchers remained in the background. It was confidence in the objectivity of the research that kept the partners at the table.

Our approach to conducting this research study on private land is one of a small but growing number of examples describing a partnership with private landowners on species conservation efforts. The need to work with private landowners on such efforts has been well established. The construction of such a relationship is complex, influenced by sociocultural and political conflict, diversity, ignorance, and uncertainty (Carr and Hazell 2006). However, research biologists in the field of conservation must take the opportunities to work with private landowners, who are on the ground and in the best position to make a difference in most species conservation efforts. Our ability to work with private landowners provided critical insights into the ecology of a proposed listed species. By boosting the capability of research biologists to develop productive partnerships with private landowners, such collaborative studies will lead to the emergence of sustainable conservation efforts.

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