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STRATEGIC COMMUNICATIONS AND ITS CRITICAL ROLE IN BIRD HABITAT CONSERVATION: UNDERSTANDING THE SOCIAL-ECOLOGICAL LANDSCAPE

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Abstract. Bird populations throughout the hemisphere are in jeopardy from a host of human behaviors that are having significant adverse effects on the landscapes these species need to survive. To conserve habitats important to bird species in decline, it is imperative that conservationists take into account the social and economic factors that influence ecological landscapes at various scales. Science-based conservation goals and objectives for birds are the foundation for achieving conservation. A critical piece of on-the-ground implementation, however, lies in working with individuals and businesses as well as legal and social systems through an effective process of strategic communications and education. This process involves elements that are similar in function to biological planning, conservation design, conservation delivery, and monitoring and research. This paper discusses a social-ecological system framework and how it can guide strategic communications for bird habitat conservation. A case study of the Playa Lakes Joint Venture is discussed.

Key Words: bird habitat conservation, communications, education, social-ecological landscape.

COMUNICACIÓN *ESTRATÉGICA* Y SU PAPEL CRÍTICO EN LA CONSERVACIÓN DEL HÁBITAT DE AVES: ENTENDIENDO EL PAISAJE SOCIAL-ECOLÓGICO

Resumen. Las poblaciones de aves en el Hemisferio Norte se encuentran en peligro a raíz de una variedad de factores antropogénicos que están afectando negativamente y significativamente los habitats que estas especies necesitan para sobrevivir. Para conservar los hábitats de importancia para especies de aves cuyas poblaciones muestran tendencias negativas en su abundancia, es imperativo que los conservacionistas tomen en cuenta los factores sociales y económicos que afectan los ambientes ecológicos a diferentes escalas. El establecimiento de objetivos generales y específicos de conservación con base en la ciencia, constituyen el fundamento para lograr la conservación. Sin embargo, un aspecto crítico para lograr implementar este enfoque en la práctica es trabajar junto a los individuos y los comercios, involucrando sistemas legales y sociales a través de un proceso efectivo de comunicación y educación estratégicas. Este proceso involucra elementos similares en funcionamiento a la planeación biológica, el diseño de estrategias de conservación, la implementación de estas estrategias, y el monitoreo y la investigación de los resultados de estas medidas. Este artículo discute acerca de un marco teórico para sistemas socio-ecológicos y su utilidad para guiar comunicaciones estratégicas para la conservación de hábitats críticos para especies de aves. Se presenta como ejemplo un caso de estudio de Playa Lakes Joint Venture.

INTRODUCTION

> "Humanity is part of nature, a species that evolved among other species. The more closely we identify ourselves with the rest of life, the more quickly we will be able to discover the sources of human sensibility and acquire knowledge on which an enduring ethic, a sense of preferred direction, can be built."
>
> – E. O. Wilson, *The Diversity of Life*

Bird populations throughout the hemisphere are in jeopardy from a host of human-induced threats that directly or indirectly

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increase mortality and decrease recruitment and reproductive success. The greatest of these threats are habitat destruction and degradation, which are exacerbated by mortality from pollution, disease, by-catch, collisions with human-made structures, illegal hunting, the wild bird trade, and global climate change.

Affecting positive change to landscapes for the benefit of bird populations ultimately requires working with people to alter the human-nature interaction. If certain agricultural practices are limiting Savannah Sparrow (*Passerculus sandwichensis*) and Bobolink (*Dolichonyx oryzivorus*) nesting success, for example, conservationists need to determine how to influence farmer attitudes and behaviors to achieve the desired habitat management. These changes, however, may not prove sustainable if a host of direct and indirect demographic, sociopolitical, cultural, or economic drivers are reinforcing environmentally adverse behaviors on the larger landscape (Geist and Lambin 2002, Nelson et al. 2006). Bird habitat conservation in most cases requires a deeper understanding of the society-nature interaction as a dynamic evolving process in the region of interest (Manuel-Navarrete et al. 2006), and the development of both biological and communications objectives to alter that interaction to achieve environmental sustainability (Fischer-Kowalski and Weisz 1999).

Understanding the interdependence of ecological and social systems and linking these systems in a conceptual framework are critical steps in the process of carrying out conservation objectives to restore or sustain bird populations (Chapin and Whiteman 1998). Central to this framework is the fundamental role strategic communications and education play in conservation efforts at international, national, state, regional, and local levels (Hesselink 2004). Strategic communications is distinct from a typical communication approach that simply relays information to people without in-depth research and planning. Strategic communications is integrated into the full scope of a program, and requires that issues be defined in both scientific and social terms.

To achieve science-based conservation goals and objectives for birds, conservationists must work with individuals and institutions, as well as legal and social systems, through an effective process of strategic communications, outreach, and education. This process entails planning, implementation, and evaluation—steps that are functionally analogous to those of conservation science. Communications likewise requires dedicated staffing and financial resources to be successful.

This paper presents a social-ecological framework for understanding human-nature interactions. It portrays communications and conservation science as comparable processes to foster improved understanding between biologists and those who focus on communications. A general method for linking these processes to benefit bird habitat conservation is presented. As an example of the benefits of linking communications and conservation science, this paper presents a case study of the Playa Lakes Joint Venture (Joint Venture), a regional public-private partnership that is working to conserve habitat for birds, other wildlife, and people.

SOCIETY-NATURE INTERACTIONS: A SOCIAL-ECOLOGICAL FRAMEWORK

Humans are integral components of ecosystems; likewise, the functions and products of ecosystems are critical to social systems (Chapin and Whiteman 1998). Humans impact the environment through their actions of extraction, emissions, waste disposal, and land use (Haberl et al. 2006). Of these, land use is the component of global change that is having the greatest impact on ecosystems (Chapin and Whiteman 1998) both in terms of spatial extent and duration. Humans, in turn, are sensitive to the supply of natural resources available for consumption. These resources constitute the material foundation of cultural systems (Fischer-Kowalski and Weisz 1999). Humans also incorporate experiences with nature into the symbolic realm of culture, for example, through art, music, ritual, and the cultural significance placed on human artifacts (Haberl et al. 2006, Jacobson et al. 2007).

Regional ecological and social systems are tightly associated and interdependent; major changes in either one will have repercussions in the other. Therefore, to secure a future for bird populations, conservationists must understand not only the ecological, but also the cultural and economic interactions that link ecological and social systems into a common regional system, and the feedbacks that govern these interactions (Chapin and Whiteman 1998, Geist and Lambin 2002).

Chapin and Whiteman (1998) present a common framework for regional ecosystem and social system processes (Fig. 1). It portrays both systems as complex webs of interactions among various components (i.e., processes) that affect their make-up. According to the framework, natural ecosystems are complex webs of interactions among species groups, soil, disturbance, local climate, and humans. External factors affecting ecosystems include topography, parent material and atmospheric deposition,

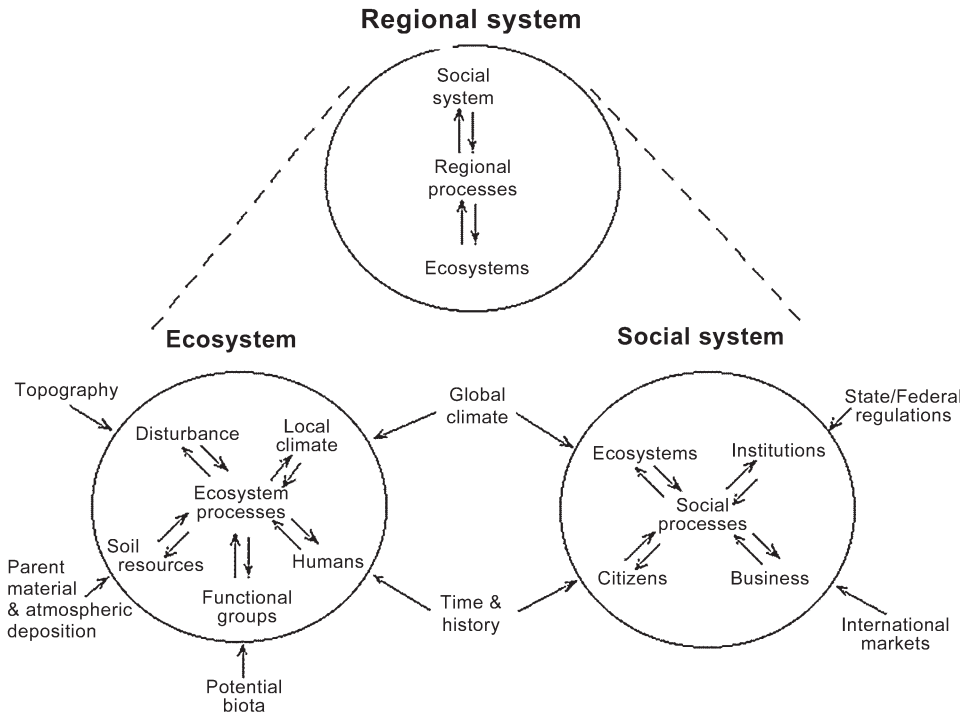

FIGURE 1. The regional social-ecological system (Chapin and Whiteman 1998).

potential biota, time and history, and global climate. Similarly, the social system is a complex web of interactions among ecosystems, institutions, culture, and business. External factors influencing social processes include global climate, state and federal regulations, and international markets. Both systems are characterized by interacting positive and negative feedbacks that operate over a range of temporal and spatial scales and influence the region's ecological sustainability (Geist and Lambin 2002).

The emerging field of long-term social-ecological research aims to characterize the intricate interactions between the human society and ecosystems and the forces driving their change for the purpose of achieving sustainability (Folke and Gunderson 2006, Haberl et al. 2006, Janssen et al. 2006). A sustainable ecosystem is one that, over the normal cycle of disturbance events, maintains its characteristic diversity of major functional groups, productivity, and rates of biogeochemical cycling (Chapin et al. 1996). Haberl et al. (2006) define social-ecological sustainability as the dynamic balance between socioeconomic demands on ecosystems and the capacity of ecosystems to maintain resilience while supplying these life-supporting services. A transition to sustainability will require fundamental changes in the society–nature interaction as humans have become a geobiophysical force unparalleled in history (Haberl et al 2006).

Conservationists are increasingly concerned with understanding and managing change in natural systems (Hesselink 2004). Drivers of land use change include demography, economic structures, governmental regulation, subsidies, technology, family dynamics, and global climate (Nelson 2006). Social innovations that create windows of opportunity for transforming social-ecological systems are needed to find paths towards sustainability in the face of such change (Folke and Gunderson 2006).

In ecological systems, negative feedbacks, often in the form of trophic cascades (Pace et al. 1999, Terborgh et al. 1999, Estes et al. 2001), tend to promote sustainability and prevent the loss of biological diversity (Chapin and Whiteman 1998). For example, most large mammalian predators have been extirpated from more than 95% of the contiguous United States and Mexico, and thus many ecological communities either lack dominant selective forces or have new ones dependent upon humans (Clark et al. 1999, Berger et al. 2001, Ripple et al. 2001). A study of the impact of moose herbivory on neotropical migrants in willow communities showed that human predation of moose outside of Grand Teton National Park (Park) has

benefitted riparian nesting songbirds. Bird species richness and nesting density varied inversely with moose abundance. Two riparian specialists, Gray Catbird (*Dumetella carolinensis*) and MacGillivray's Warbler (*Oporornis tolmiei*), were absent from Park riparian areas where hunting is prohibited and moose densities were high (Berger et al. 2001). Humans now function as the top predator outside of the Park with the extirpation of grizzly bear and wolves from the region 60-75 years ago. Such ecological feedbacks have strong physical bases in resource availability (Chapin and Whiteman 1998).

While social systems have webs of positive and negative feedbacks that are structurally similar to ecosystems, the feedback loops are less tangible and predictable, and can be ignored or misconstrued because they are socially mediated (Chapin and Whiteman 1998). Though humans operate as part of the ecosystem, social and institutional responses to ecological changes do not always promote sustainability. Examples of unsustainable practices include government subsidies to fishers when fish populations are low, rather than limiting harvest and enforcing prey-switching, and government granting of perpetual tenure over boreal forest use to industry in response to the social feedbacks of reported economic losses and the need to fulfill ongoing consumption. The sustainability of any regional landscape for birds cannot be separated from the future of the people who occupy the land (Chapin and Whiteman 1998).

Numerous detrimental social feedbacks currently threaten the sustainability of ecosystems. Transformation to a sustainable society can only occur through close collaboration of natural and social scientists to develop creative ways to insert such ecologically beneficial feedbacks into socially embedded feedback loops (Jacobson and McDuff 1998, Brewer 2006). As agents of change, conservationists must create shifts in perspective by understanding the attitudes, motivations, and decision-making processes of the social systems and people of interest. Only then can conservationists discover how to translate ecological feedbacks, which remain unheeded, into the social system through communications and education.

Communications and education play a critical role in translating ecological information into social systems (Whiteman 1999, Newton 2001, Brewer 2002, Hesselink 2004, Shanley 2006). For example, nongovernmental organizations and citizenry can insert powerful feedbacks by marketing the purchase of sustainably harvested timber from companies that conduct business in an environmentally responsible manner. The public can spread such 'contagious' beneficial behaviors through a population, similar to the spread of an infectious disease during an epidemic (Gladwell 2000).

Adaptive co-management focuses on creating functional feedback loops between social and ecological systems, and has the potential to build resilience in ecological systems. It involves networks of collaborating actors, from local users to municipalities to regional and national or supranational organizations (Olsson et al. 2004). Conservation problems often involve such a diverse set of stakeholders with various backgrounds and disciplines. In Western societies, for example, private property plays an important role in conservation, and institutions mediate many of the interactions between ecosystems and humans, particularly landowners. Strategic communications is essential for developing partnerships, institutional capacity, and effectively marketing ecologically beneficial attitudes and actions on the landscape.

THE ROLE OF STRATEGIC COMMUNICATIONS IN DELIVERING BIRD HABIATAT CONSERVATION

Conservationists and wildlife biologists expend significant effort to understand the ecological requirements of bird populations and develop habitat objectives to achieve desired population responses. Carrying out these objectives, however, ultimately involves influencing the behaviors of people. Scientific findings need to be translated into meaningful and practical outputs and programs so that they can inform conservation policies and practices (Newton 2001, Dhar et al. 2002, Brewer 2006, Shanley 2006).

If the habitat to conserve or manage is on private land, for example, how does one influence landowners to undertake the desired management practices? Moreover, how does one carry out broader landscape-level conservation if objectives are spread across a region owned by a host of diverse public and private entities? Indeed, the conservation of natural resources is inextricably tied to public attitudes, opinions, and behaviors (Newton 2001) and involves a host of complex challenges and increasing numbers of stakeholders (Jacobson and McDuff 1997).

Conservation action is driven by human values toward the land, and thus conservation solutions lie with interdisciplinary problem-solving involving economics, policy-making, sociology, psychology, and organizational behavior, with strategic communications and education playing a key role in implementation (Jacobson and McDuff 1997, Hesselink 2004). Strategic

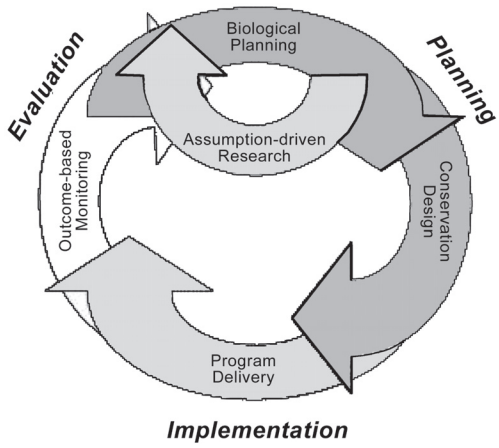

FIGURE 2. Strategic Habitat Conservation (National Ecological Assessment Team 2006).

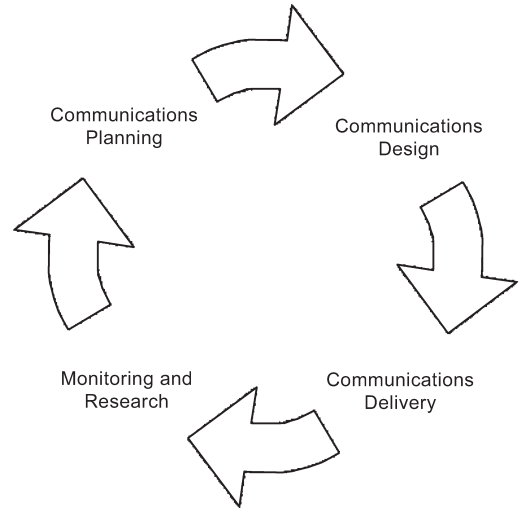

FIGURE 3. Strategic Communications Process.

communications triggers changes to the social system of the target audience by introducing "an innovation in a large group of potential customers that motivates them to practice a new approach to management" (Hesselink 2004). It requires that audiences be involved in planning, and that interventions be based on their values. It is customer-driven.

A natural symbiosis exists between conservation science and communications. Communications and education need to be grounded in sound science to be of real value. Likewise, conservation science needs to be tied to communications programs to have any impact on the landscape. Therefore, to effectively carry out the habitat objectives identified in conservation plans for waterfowl, landbirds, shorebirds, waterbirds, and resident game birds, strategic communications and education must be integrated into conservation delivery.

The U.S. Fish and Wildlife Service and the U.S. Geological Survey are currently promoting Strategic Habitat Conservation (SHC), which entails biological planning, conservation design, conservation delivery, and monitoring and research (Figs. 2 and 4) (National Ecological Assessment Team 2006). Communications involves a similar process of planning, design, delivery, monitoring and research (Fig. 3).

The SHC diagram depicts conservation delivery as essentially a "black box" with little specification of its constituent activities (Fig. 4). It is here that strategic communications plays a critical role. The finer scale activities of strategic communications and other related activities of conservation delivery such as partnership development, capacity building, and policy-making provide the detail absent in the conservation delivery image (Fig. 4).

The finer scale activities of the communications process are analogous to the scientific elements of SHC (Table 1). The process results in the formulation and delivery of specific communication objectives that are tied to biological objectives. Significant planning is needed up front to determine the most effective product to meet the needs of the audience of interest.

LINKING HABITAT AND COMMUNICATIONS OBJECTIVES

The conservation design element of Strategic Habitat Conservation results in habitat decision support tools, priority areas, and habitat objectives that directly relate to population objectives determined through biological planning (National Ecological Assessment Team 2006). These products help answer the questions: "How much and what kind of habitat is needed and where?" Conservation delivery answers the question: "How do we achieve these objectives on the landscape?" Conservation delivery is the strategy for translating habitat objectives into on-the-ground action by working with people through strategic communications and education programs.

Planning

The first step in creating a strategy for conservation action is to identify the problem or issue tied to the habitat objectives and the communication goals and objectives to address

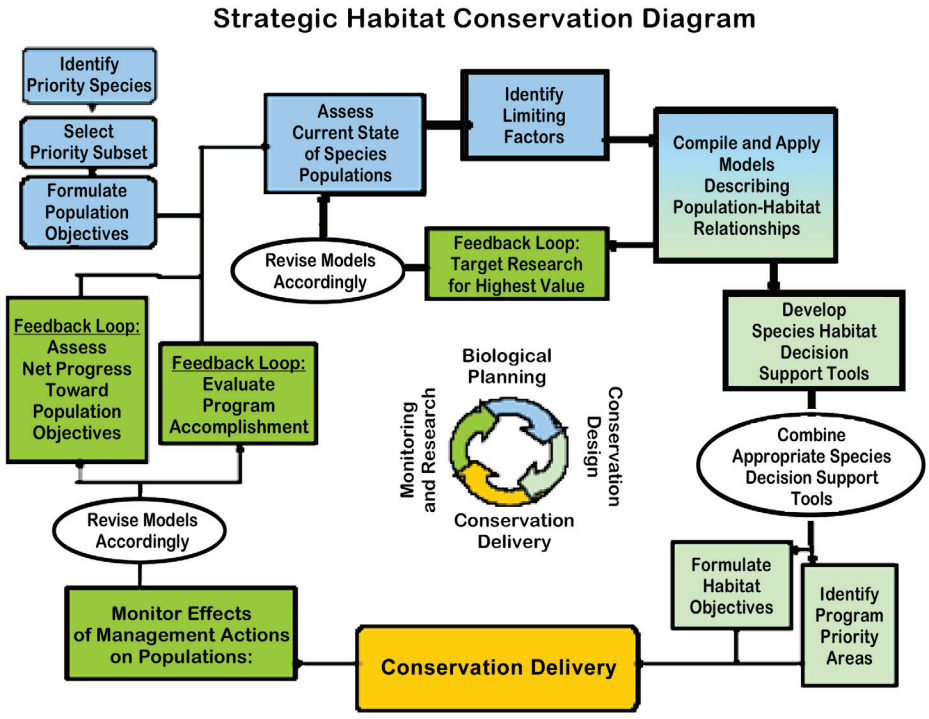

FIGURE 4. Strategic Habitat Conservation Diagram. Some activities may occur simultaneously.

it. Identifying the specific audiences or stakeholders involved in the issues is essential. This involves linking the conservation problem and specific habitat goals and objectives with an understanding of patterns of landownership, for example, and the forces or institutions that influence, or could influence, landowner attitudes and behaviors towards the habitat of concern. Is the land owned primarily by private individuals or corporations, public agencies, or a mix of the two? For each audience, what specific behaviors or outcomes are desired? The objectives should be measurable, detail a meaningful and realistic task for the audience, and define a timeframe for achieving the objective (Jacobson et al. 2006).

TABLE 1. Analogous biological and communication process elements of conservation.

Biological Process Elements	Communications Process Elements
Identify priority bird species or populations	Identify target human audiences or population segments
Develop population goals and objectives	Develop behavior goals and objectives
Assess current state of species	Assess audience and population segments
Identify limiting factors of populations	Identify barriers and benefits to behavior change
Describe population-habitat relationships	Describe population–nature interactions
Develop species-habitat decision support tools	Develop communication tools for behavior change
Formulate habitat objectives	Formulate specific objectives for behavior change
Deliver management/conservation activities (*Communications is a major component)*	Deliver communications plan with strategies and tactics
Monitor effects of management on species	Monitor effects of communications strategies and tactics on target audiences
Evaluate program accomplishments	Evaluate program accomplishments

Once audiences are identified, it is necessary to determine how best to reach them. What are the backgrounds, needs, interests, and behaviors of the audience or population segment of interest? What social, economic, and institutional forces are influencing these audiences? How can they be involved in the planning process? What are the limiting factors in terms of constraints and resources? What messages, channels, and activities will most effectively achieve the desired changes in knowledge, attitudes, and behaviors? How frequently should the message be sent? Typically, a combination of vehicles is used, including the most trusted sources and the most widely used media determined from human dimension research such as focus groups and surveys.

To be most effective, communications and education messages need to be simple, personally relevant, and from trusted sources. The actions requested need to be specific, practical, and easy to carry out. Outreach events often help shape people's opinions more than just words. Participation is critical; people will allow local leaders to make decisions for them if they feel they have been heard or were a part of the process. Local events and targeted messages work better than national campaigns. The closer an event or message is to home, the better (Newton 2001).

Implementation

Pilot testing is a way to determine what modifications are required for selected activities and materials. Getting feedback from a random segment of the population can provide important information about the effectiveness of the products for the wider population. Changes can be made based on test results prior to full-scale implementation of the communications plan. Time, staffing, and financial resources are all critical elements to ensure a robust and efficient communications program (Jacobson et al. 2006).

Evaluation

Setting measurable objectives is a critical step in enabling a determination of how the communications strategy is working. Post-program implementation surveys can verify, for example, if a video has, in fact, changed landowner attitudes and concerns and what the barriers were to behavior change. For example, was the requested management too difficult to achieve? Was the incentive price not high enough? Was the location of the program sign-up inconvenient? Was the program promoted through the wrong vehicles? Four factors define the success of a strategic communications program: product, price, place, and promotion (Andreasen 1995). All need to be geared to the audience of interest to change behavior, which is the ultimate goal.

One kind of strategic communications that is most applicable to environmental problems is social marketing, which aims change people's behavior to promote health, social development, or the environment (Andreasen 1995, McKenzie-Mohr and Smith 1999). However, social marketing should not be equated with commercial sector marketing. It is inherently different. Promoting environmental change requires an approach that deals with negative demand, high risk behaviors, intangibles that are hard to portray, changes that take a long time to manifest, public scrutiny, and multiple publics to satisfy (Andreasen 1995). It requires audience-focused programs that consider their needs and wants.

Case Study: Playa Lakes Joint Venture

The Playa Lakes Joint Venture (Joint Venture) (Fig. 5) is a non-profit partnership of federal and state wildlife agencies, conservation groups, private industry, and landowners dedicated to conserving habitat in the Southern Great Plains for birds, other wildlife, and people (Playa Lakes Joint Venture 2006). The region largely encompasses the Shortgrass and Central Mixed-grass Prairie Bird Conservation Regions (BCR) 18 and 19 (U.S. NABCI Committee 2000).

Playas and their watersheds are some of the highest priority habitats for conservation in the Joint Venture. They are the most notable and numerous wetlands, with more than 60 000 playas scattered across the region, with the highest concentration in the southern and western portions. Playas are shallow, seasonal wetlands that lie in the lowest point of a closed watershed. Most are smaller than 12 ha. Their basins are lined with clay soil and collect and hold water from rainfall and runoff events. Playas have an unpredictable and rapidly changing hydroperiod and experience several wet-dry cycles each growing season. As a result of their ephemeral nature, playas are the center of biodiversity on the plains, supporting more than 340 species of plants and 200 species of birds and other wildlife (Playa Lakes Joint Venture 2006).

Throughout the year, playas provide cover and native forage in the form of seed and invertebrates important to the survival of waterfowl, shorebirds, and grassland birds. Playas may be the most important wetland habitat type for waterfowl in the region, hosting about 20 species during wintering and migrating seasons. Priority species include Wood Duck (*Aix sponsa*), Mallard

FIGURE 5. Playa Lakes Joint Venture Administrative boundary.

(*Anas platyrhynchos*), Northern Pintail (*Anas acuta*), and Lesser Scaup (*Aythya affinis*). The Joint Venture is located along a vital inland migratory corridor on the continent for shorebirds, including priority species such as American Golden-Plover (*Pluvialis dominica*), Greater (*Tringa melanoleuca*) and Lesser Yellowlegs (*Tringa flavipes*), White-rumped (*Calidris fuscicollis*) and Baird's Sandpiper (*Calidris bairdii),* and Wilson's Phalarope (*Phalaropus tricolor*). In addition, priority shorebird species such as Snowy Plover (*Charadrius alexandrinus*), Mountain Plover (*Charadrius montanus*), and Long-billed Curlew (*Numenius americanus*) nest in the region. Priority grassland-nesting and wintering landbirds include Cassin's Sparrow (*Aimophila cassinii*), Dickcissel (*Spiza Americana*), Lark Bunting (*Calamospiza melanocorys*), McCown's Longspur (*Calcarius mccownii*), and Chestnut-collared Longspur (*C. ornatus*).

Playas are the primary source of recharge for the Ogallala Aquifer which underlies approximately 70 417 ha of the Great Plains region (Playa Lakes Joint Venture 2006), particularly in the Southern High Plains where nearly all of the playas are located. The Aquifer is a major source of water for agricultural, municipal, and industrial development in the region.

The biggest threat to playas is sedimentation. Sedimentation occurs on playas in cropland when rain or irrigation runoff carries loose soils into the playa basin, gradually filling it, and disrupting the wet-dry cycles necessary to sustain the unique plant communities. Sediment build up reduces the volume of water playas can hold and increases the rate of evaporation, thus limiting recharge. According to researchers, more than half of all playas have been buried by sedimentation during the past two to three decades (Playa Lakes Joint Venture 2006).

The Joint Venture employs a Strategic Habitat Conservation framework, as discussed above. For biological planning, the Joint Venture created the Hierarchical All-Bird System database (Playa Lakes Joint Venture 2006) to determine the current carrying capacity of the landscape for birds. The database is used to compare carrying capacity to stepped-down national and international bird plan objectives to determine where, what kind, and how much habitat work needs to be done. This system is also used to evaluate habitat programs to determine which species and numbers of birds benefited, and to answer the question: Are we being efficient?

About 90% of the Joint Venture landscape is in private ownership, and primarily in agriculture. Therefore, farmers, ranchers, and other producers make the ultimate resource management decisions that determine the fate of playas. Most conservation programs available to landowners are administered by the U.S. Department of Agriculture Farm Service Agency, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, and state wildlife agencies. These programs are voluntary because there are no state or federal regulatory protections for playas. The agencies must determine how to motivate landowners to participate in their programs—a challenging task given insufficient staffing and competition for landowner's time.

Landowners and resource managers are the Joint Venture's highest priority audiences. These people own and work the land, and control, administer, and deliver conservation programs. Each encompasses many associated subgroups. Private landowners include farmers, ranchers, commodity groups, corporations, farming and ranching associations, and wildlife agencies. Resource managers include biologists, policy-makers, program administrators, soil and water conservation districts, and legislators.

A primary communications objective for playas in the Joint Venture is to increase willingness and participation among playa landowners to plant or maintain native grass buffers around

their wetlands. Buffers around playas reduce sedimentation and restore habitat for priority birds. Farmers and natural resource agencies can be either allies or bottlenecks for delivery of buffers around playas.

The Joint Venture carried out a four-state focus group effort in 2004 and a multi-state High Plains Landowner Survey in 2006 to assess landowner awareness and attitudes and participation in conservation programs. Based on this research they uncovered important information about how landowners think. Approximately 64% thought playas were positive; 28% were highly willing to plant buffers, 48% were moderately willing to plant buffers; and the Ogallala Aquifer was their primary resource concern, with half unaware that playas recharge the Aquifer. The lack of landowner knowledge of the importance of playas to their main resource concern, the Ogallala Aquifer, revealed a significant need for education tools that could have real potential for behavior change.

Based on audience research, the Joint Venture determined that local farm radio was the most used media among farmers in the region, and thus is using radio to convey messages to increase landowner awareness, concern, and willingness to plant buffers and other bird conservation actions. The Joint Venture produces Playa Country Radio, a weekly 4-min program aired on 31 public and farm radio stations covering the entire region. They intend to expand coverage to more stations in the future.

The Joint Venture also produced an educational film about playas, with the objective of "putting a playa film into the hand of every playa landowner." Over 4500 copies of the film were distributed to landowners, program managers and field staff, and politicians, and 12 TV broadcasts were aired. The Joint Venture intends to solicit the help of the Farm Service Agency to ensure that all playa landowners receive a copy. An evaluation of the video's effect on landowner attitudes pre- and post-film viewing indicated a near doubling of playa awareness and a three-fold increase in playa concern.

The 2006 High Plains Landowner Survey findings are being correlated with biological planning data to estimate how closely the Joint Venture might reach habitat and population goals if it had the capacity to serve all willing landowners. For example, if all 28% of highly willing landowners plant native buffers around their playas through the Conservation reserve Program (CRP), what would be the progress toward bird population goals?

Assuming 60 000 playas, one playa per landowner per field, an average playa size of 3.2 ha, and a 1:3 buffer to playa ratio, the Joint Venture calculated a conservation result of 64 346 ha and 193 768 ha. For individual priority landbird species, the Joint Venture combined a 30-year population loss estimate, based on Breeding Bird Survey (C. Rustay pers. comm) BCR trend data, and a current carrying capacity estimate, based on density and acreage information, to determine population objectives. Assuming a 1.376 Cassin's Sparrows per acre of CRP planted to native grass density in Texas (Berthelsen and Smith 1995), the buffered acres translate into a 15% increase in Cassin's Sparrow toward its objective.

The Joint Venture translates continental population goals for shorebirds and waterfowl into regional habitat objectives, expressed as shorebird and duck use-days per acre. These estimates are calculated based on species mass and energetic requirements and the energetic content of available food in important waterfowl habitats or across areas shorebirds use in the BCR (Haukos and Smith 1993, Anderson and Smith 1998, 1999). The results are habitat or area-based estimates of the energetic carrying capacity for various species guilds. Wetland habitat acres restored are translated into use-days based on assumptions that in Texas 20% of all playas are wet at any one time, 10% of each wet playa is suitable for shorebird foraging, and the entire playa is available and suitable for waterfowl. By comparing the energetic carrying capacities of restored acres and habitat objectives, the Joint Venture determined that this level of native grass buffering would provide habitat for 35% of the migratory shorebird population goal and 40% of the waterfowl objective, assuming the concomitant restoration to a well-functioning playa.

The better the Joint Venture can estimate this link between landowner attitudes and conservation, the better it can estimate how much communications is enough to drive habitat conservation.

The Joint Venture's attitude research has shown that playa landowners are generally predisposed to conserving their playas. So what is inhibiting landowners from buffering their playas? The major hurdles are institutional and programmatic. Many of the resource agencies that deliver conservation programs are important mediators of landowner interactions with their playas, and are not as effective as they could be in promoting positive attitudes and actions towards playas. Issues include the need for increased capacity, education, policy changes, and internal and external communications.

Limiting factors are program dependent. The most pressing programmatic limiting factors of

CRP with regard to conserving playas in the Joint Venture include the following: (1) many counties have already reached the 25% cap for CRP acres; (2) there is a lack of adequate incentive payments (no signup incentives, low rental rates) for playas; (3) the Environmental Benefits Index does not score playas high enough; (4) land must have been cropped 4 out of the past 6 years, eliminating many playas which are unfarmable; (5) inconsistent buffer prescriptions allow for much smaller, non-native buffers; and (6) USDA field staff lack knowledge about playas and the important role of CRP in playa and bird conservation. These policies are basically negative feedbacks to playa buffer creation that need to be converted to positive incentives.

The Joint Venture hired a conservation policy director to deal with these institutional limiting factors and other legal and social-economic issues and policies that affect playa conservation. Understanding how to best influence landowners through institutional and policy changes and related social-economic forces that affect their decision-making are the vital next steps.

DISCUSSION

To reduce habitat loss and degradation and restore declining bird populations, conservationists need to influence people's actions directly or by altering the larger social-economic forces and policies that shape them. Describing the social-ecological landscape is a critical step in understanding the link between ecological problems and the human behaviors and larger systems that are responsible. Changing these behaviors and systems for the benefit of bird populations ultimately requires an interdisciplinary approach to problem-solving, and the transformation of scientific information into strategic communications and outreach programs and tools that effectively reach target audiences. Numerous conservationists tout the benefits of communications and education as critical to their program's implementation. In other programs, however, communications and education are often relegated to an afterthought and poorly funded.

The advancing technological capabilities of Strategic Habitat Conservation, for planning and designing sustainable landscapes for birds, is resulting in more highly informed spatially explicit blueprints that present the most efficient arrangement of required habitat across a given landscape for priority bird populations. This information directs and justifies on-the-ground action. Moreover, it can be combined with specific information on regional land use, ownership, and other social-ecological landscape factors, to define the conservation problem in related scientific and social terms. A communications and education program can then be developed—one that is strategically designed to change the behaviors of target audiences and the programs and systems that influence them. Achieving the habitat and populations objectives, identified in biological planning and conservation design activities, thus depends heavily on innovative, well-planned audience-centered communications. Funding, partnership development, policy-making, capacity building, and strategic communications and education are all essential components of successful bird habitat conservation delivery.

The fine and course-scale processes of strategic communications programs are analogous to those of Strategic Habitat Conservation. These similarities present opportunities for scientists and human dimension specialists to understand each other's efforts, and work collaboratively to solve what are, in effect, interdisciplinary problems involving numerous stakeholders and complex social-ecological systems. Wilson (1992) suggests that finding a solution to biodiversity loss "will require cooperation among professionals long separated by academic and practical tradition." As Carol Brewer (2006) observes, "Major discoveries and advances… are made by teams of researchers with different, but complementary, skills and not by individual specialists." Achieving sustainability will require concerted engagement among key disciplines (McMichael et al. 2003).

The example from the Playa Lakes Joint Venture shows how communications can be strategic by carefully researching target audiences, evaluating communications tools and programs, and identifying and addressing limiting factors. The Joint Venture recognizes that influencing agricultural policies, which govern land use and participation in and funding of conservation programs, needs to be a critical part of conservation delivery to affect the behaviors of its priority target audience—playa landowners. In the end, "conservation is a human endeavor driven by people's values toward the management of land and resources" (Jacobson and McDuff 1998).

To secure a future for North America's declining bird populations, greater fiscal and human resources are required to develop and carry out strategic communications and education programs. Science alone will not save these species. Moreover, scientists and communication specialists need to work together to ensure that their efforts are complementary. Only through an interdisciplinary approach, that seeks to understand and address real world

problems across the social-ecological landscape, will conservationists be able to successfully meet the complex challenges facing land and resource conservation in the 21st century.

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