The Global Conservation Program

Achievements and Lessons Learned from 10 Years of Support for Threats-based Conservation at a Landscape and Seascape Scale

The Eastern Steppe Living Landscape (Mongolia)

WILDLIFE CONSERVATION SOCIETY

The Eastern Steppe Living Landscape

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Key Achievements, Impacts and Lessons Learned Attained with GCP Funding

The Wildlife Conservation Society (WCS) has a long-term commitment to promoting wildlife conservation within the Eastern Steppe of Mongolia, perhaps the world's largest intact grassland ecosystem which is immensely valuable for both biodiversity and humans. Since the beginning of the USAID GCP project in the Eastern Steppe in 2003, WCS was able to make important conservation progress in the region, including the following major accomplishments.

Eastern Steppe Landscape, Project Highlights

- **Developed a Threats-based, Landscape-scale Conservation Plan for the Eastern Steppe**. WCS is dedicated to the long-term conservation of the Eastern Steppe, with a commitment measured in decades, not years. Effective implementation over such a long time scale requires careful, detailed planning, monitoring of progress and adaptation. Over the past 5 years, WCS's program in the Eastern Steppe has been dedicated to developing an ambitious vision for the conservation of the landscape and a strategic plan for achieving that vision. Planning has relied on the Landscape Species Approach (LSA), WCS's framework for landscape-scale conservation planning. Eastern Steppe project staff have been central in developing the methods of the LSA that are now used by many other WCS programs worldwide. All of the steps of the approach have been completed for the Eastern Steppe, including: selecting a set of Landscape Species; setting quantitative targets for conserving those species; mapping the distribution of human activities that affect the species; mapping the distribution of the species themselves; identifying priority areas for action and monitoring; and setting priority conservation strategies. These efforts now form a critical basis of information for an even broader-scale, collaborative development planning effort undertaken with The Nature Conservancy (TNC), the World Wide Fund for Nature (WWF) and the Mongolian government.

- **Improved the Capacity of Local Government, Communities and Scientists to Manage and Monitor Natural Resources**. Lack of capacity and knowledge to effectively enforce existing wildlife laws and policies, and to manage and monitor wildlife populations, has consistently been one of the largest barriers to the effective conservation of wildlife in the Eastern Steppe. While many strategies have been employed over the last five years to train and build capacity, the main focus has been on the following two: (1) a multi-agency collaborative wildlife protection program aimed at monitoring and preventing illegal harvest and trade of wildlife in border region protected areas, training 50 people from four agencies (the Protected Area Administration, the Environmental Protection Agency, the State Specialized Inspection Agency [SSIA], and the State Border Defense Agency) and launching a wildlife law enforcement database; and (2) a community-based natural resource management program to support local livestock herder communities in their quest to legally own, manage and monitor natural resources within their traditional grazing lands. WCS, in partnership with a local community organization, has trained close to 20 member communities and over 100 individuals about the laws regulating community-managed areas and about the legal process for establishing community-owned or -managed protected areas. WCS has trained and equipped volunteer rangers from local communities to monitor wildlife within their community-managed areas and has established a monitoring system and database with information on the communities and the wildlife within them.

- **Improved Key Policies and Laws**. WCS has focused substantial resources on working with the government to enact improved laws and policies. WCS and partners supported the implementation of a government-led 2-year ban on hunting marmots, whose populations were rapidly declining because of hunting and trade. On the basis of subsequent WCS surveys of the marmot population, the government has continued to extend the ban on marmot hunting. WCS also successfully lobbied the government to institute a 2005 ban on Bromadiolone, a pesticide used to control Brandt's voles which has negative impacts on many other key species, such as saker falcon and cranes. In 2006, WCS published *The Silent Steppe: the Illegal Wildlife Trade Crisis in Mongolia*, a watershed report on the impacts of hunting and wildlife trade in Mongolia. On the basis of this report, and a subsequent WCS-led review of Mongolia's laws relevant to hunting and wildlife trade, the Mongolia government has formed its own working group to solicit suggestions for additions and changes to the laws. There is now broad support for revisions of the Mongolian law on hunting and the working group, with WCS's support, continues to work towards concrete improvements. Additionally, WCS has worked hard to convince the government of Mongolia to adopt infrastructure and resource development policies that are sensitive to environmental impacts and do not have severely negative consequences for the biodiversity of the steppe. Efforts to include a vast array of stakeholders in all initiatives have led to a government that is now a willing partner in conservation-sensitive development planning, such as processes to implement biodiversity offsets and the "Development by Design" approach being facilitated by TNC.

- **Increased Local and National Awareness of Conservation Issues**. A general lack of awareness of biodiversity and conservation issues has always been a key factor contributing to decline of biodiversity in Mongolia, especially within the sectors of government and society that make development decisions. WCS's conservation planning, capacity building, and law and policy efforts have all contributed significantly to raising awareness, especially by being highly participatory. Two particular WCS efforts have been key to raising awareness. First, for more than 5 years, WCS personnel have facilitated a monthly conservation networking event in the capital. The event provides a forum for discussing current environmental and conservation issues facing Mongolia, drawing participants from academic and research institutions as well as the government, NGO and private sectors. Recently, participants have initiated the process of forming a Mongolian chapter of the Society for Conservation Biology. Second, since 2007, WCS has partnered with Conservation Ink and the Denver Zoo to implement a program aimed at educating rural school children about ecology and conservation on the Eastern Steppe. The program, entitled "The Nomadic Trunk for Conservation", circulates throughout the steppe, presenting a trunk full of educational material to schools and communities.

- **Collection of Critical Ecological Information**. An important factor contributing to threats and biodiversity loss in the Eastern Steppe is a simple lack of critical information on the ecology, population dynamics and distribution of wildlife species. WCS has dedicated resources to collecting information on Mongolian gazelle and Siberian marmot. These two species require protection and wise management, are icons of the steppe and the largest contributors to the livelihood of herder communities, and are truly keystone species without which the entire steppe ecosystem would change immensely. Key baseline information has been compiled on the size and distribution of these species, as well as their spatial requirements (which, for gazelle, are huge) and critical habitats. WCS Eastern Steppe personnel have also invested resources in identifying Important Bird Areas and monitoring important diseases, particularly foot and mouth disease and highly pathogenic avian influenza.

GCP Program Background

The goal of the Wildlife Conservation Society's Biodiversity Conservation at the Landscape Scale (BCLS) Program is to ensure conservation of biological diversity in regions of global importance, using a landscape- (or seascape-) and species-based approach. For the past 10 years, the WCS Living Landscapes Program (LLP) has been developing and testing wildlife-focused strategies to resolve the conflicts between people and wildlife that threaten biodiversity found in these important wild places. The LLP-developed Landscape/Seascape Species Approach (LSA) is threats-based and highly participatory; it promotes conservation of landscapes (and seascapes) by focusing efforts on key animal species found within that landscape/seascape. The conservation of these Landscape Species offers a focused and cost-effective way to retain a full complement of biodiversity and overall ecological integrity.

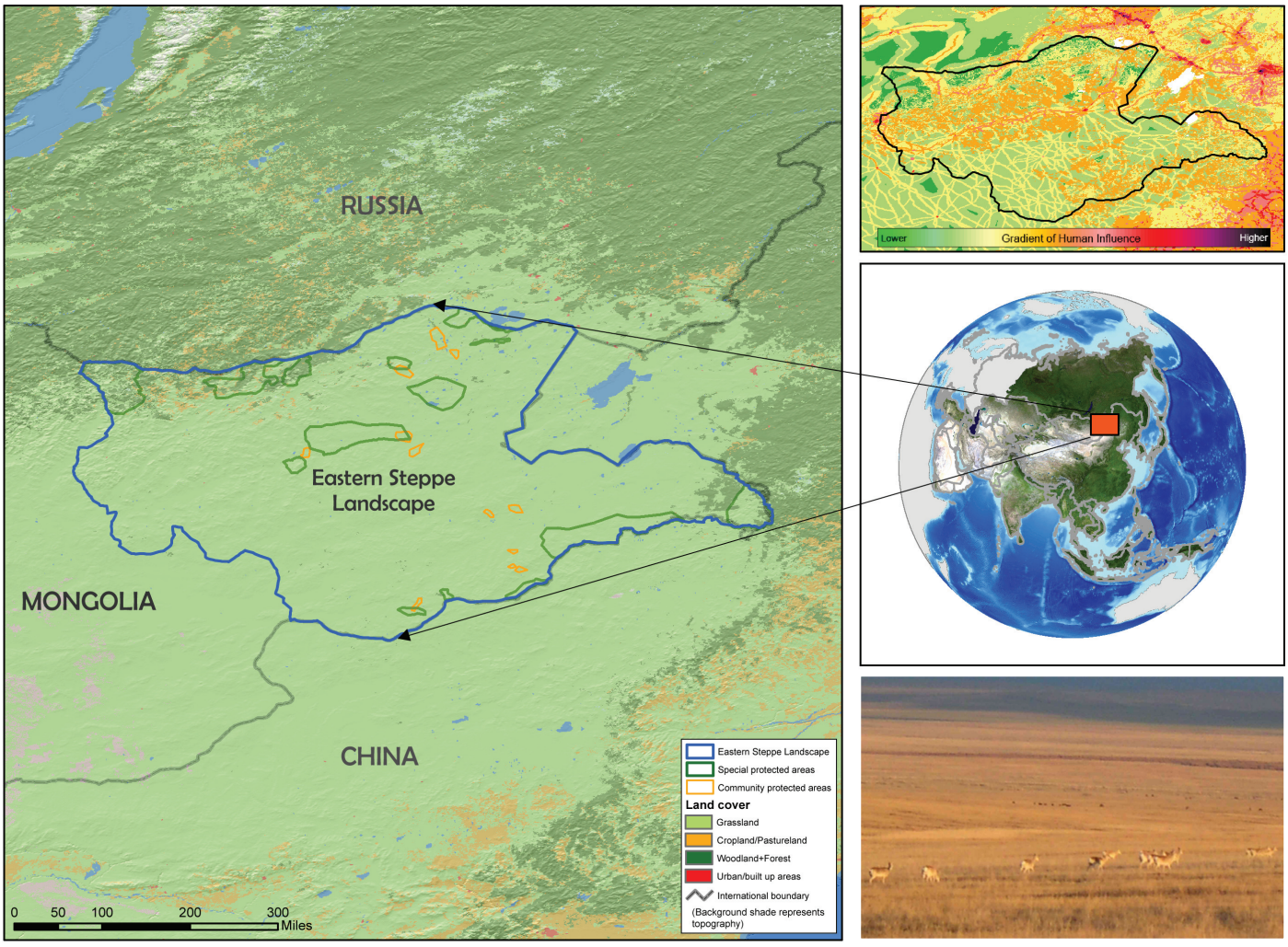

Figure 1. The Eastern Steppe Living Landscape. Insets (top to bottom): the human footprint in the Eastern Steppe, the landscape's global location, and gazelles on the steppe (bottom photo © K. Didier).

While WCS recognizes the integral role that protected areas play within national biodiversity conservation plans, we also realize that parks and reserves are seldom sacrosanct and are always embedded in larger, human-dominated landscapes. Regardless of how large or small a protected area may be, the plants and animals it contains are often threatened by human resource use, whether directly or indirectly. Therefore, the management of parks and reserves cannot occur in isolation from the surrounding landscape; rather, management plans must take into account where and how human activities conflict with biodiversity conservation as well as where conservation activities might adversely impact human welfare. As human populations continue to expand, the incentive for over-exploiting natural resources within and outside protected areas will increase and, therefore, the need for biodiversity conservation tools that address human-wildlife conflict will become even more important. In our efforts to conserve Landscape Species that frequently move beyond protected area boundaries, we recognize that parks and reserves must be integrated into the broader landscape, a landscape in which, realistically, people will continue to exploit natural areas and wild species to meet their socio-economic needs.

The Wildlife Conservation Society's BCLS Program was designed to ensure biodiversity conservation in a selection of globally significant sites, by identifying actions to conserve Landscape Species and by increasing the capacity of local and national organizations to implement such actions. Over the course of Cooperative Agreement LAG-A-00-99-00047-00, the WCS GCPII/USAID portfolio has included 7 sites:

- **Glover's Reef Living Seascape** (Belize)
- **Greater Madidi Landscape Conservation Area** (Bolivia)
- **Ndoki-Likouala Landscape Conservation Area** (Republic of Congo)
- **Greater Yasuní-Napo Moist Forest Landscape Conservation Area** (Ecuador)
- **Maya Biosphere Reserve Living Landscape** (Guatemala)
- **The Eastern Steppe Living Landscape** (Mongolia)
- **Southern Sudan Transboundary Living Landscape** (Southern Sudan)

Location, Global Importance and Key Threats to this Landscape

Temperate grasslands, savannas, and shrublands are among the most threatened and least protected ecosystems on earth. About three quarters of this biome type has been converted for human use (mostly crop or livestock production) and only 5% of the biome has been incorporated into protected areas, the least of any biome on earth. The 250,000 km^2 Eastern Steppe of Mongolia (Figure 1) is roughly the size of the state of Oregon, is bordered by Russia to the north and China to the east and south, and is characterized by treeless flat plains, rolling hills and a significant number of important wetlands. The Eastern Steppe has been designated a Global 200 Ecoregion and a Last Wild Place, and is the location of Mongolia's first Ramsar Site. This vast wilderness is home to numerous mammals, including the Mongolian gazelle – one of the world's last great spectacles of migrating ungulates – estimated at a population of over one million, based on surveys conducted between 2000 and 2005 by WCS. The region is one of the most important habitats in eastern Asia for migratory birds, including six species of cranes; multiple locations across the Eastern Steppe have been designated as Important Bird Areas, with recent surveys identifying many more proposed sites. The Eastern Steppe is characterized by a temperate climate with scarce precipitation and marginal resources. Human populations on the steppe historically have been sparsely distributed and engaged in traditional nomadic livestock production, an adaptation to the natural conditions. Approximately 200,000 people live on the steppe, where they herd approximately 4 million head of livestock. The low human population density, the relatively low-impact extensive livestock agriculture and a traditional respect for nature have meant that much of the landscape has remained relatively untouched; wildlife have had the intact habitat and space they need to survive and flourish, making Mongolia and the Eastern Steppe one of Central Asia's last wildlife refuges.

However, the historic pattern of sustainable use of the steppe's resources is changing. One of the consequences of Mongolia's transition from a centrally controlled command economy to a free market system has been the opening of trade borders with China and other Asian countries. The demand for wildlife and wildlife products has fueled a commercial trade in wildlife across

Mongolia, resulting in major declines in the numbers of wildlife recorded on the Eastern Steppe due to this hunting pressure. Governmental development plans for the region include the intensification of the livestock production system and large-scale crop-based agriculture, which will undoubtedly disrupt the fragile balance of life for both nomadic pastoralists and wildlife on the grassland steppe. The country's economic needs are also driving oil, coal, gas and mineral exploitation in the region, threatening to fragment the grassland with the infrastructure that these industries will require.

WCS's Eastern Steppe Living Landscape Program (ESLLP) strives to conserve the unique and valuable biodiversity of this region, using a participatory, adaptive and threats-based approach to conservation planning and implementation. In 2004, a participatory assessment of threats was completed; WCS personnel held workshops in each of the three Aimags (provinces) of the Eastern Steppe and visited individual ger (Mongolian felt tents) households to interview livestock herder families. In 2007, the results of this assessment were revisited with stakeholders at a large workshop in Ulaanbaatar. Stakeholders have consistently identified three key threats to biodiversity:

- **unsustainable hunting**, poaching, and wildlife trade;
- **overgrazing of pasture by livestock**, leading to habitat degradation, especially in the steppe and wetlands; and
- poorly planned **mining and infrastructure development**, leading to habitat loss and fragmentation.

Other threats that are consistently mentioned include the use of illegal toxins to control wildlife, wildlife diseases, human-set fires, cropland development and climate change. While there are probably hundreds of factors contributing to the existence and severity of these threats (i.e., "indirect threats" or "contributing factors"), five represent critical points of engagement for WCS:

- **low capacity** to enforce laws and policies and to monitor threats and biodiversity, especially in local government agencies and communities;
- **lack of awareness** of the environmental and conservation problems facing the Eastern Steppe, at the local, national and global levels;
- **poor or non-existent laws and policies** to govern development and natural resource use;
- **lack of effective plans** or planning processes, especially for guiding development and natural resource management; and
- **lack of critical knowledge on the ecology** of the steppe, which would enable sustainable management.

WCS staff have worked to identify threats and to gather information, on both broad and local scales, on where these threats are occurring so that conservation resources can be directed efficiently. WCS personnel surveyed experts across the entire Eastern Steppe to help produce models of the distribution of threats, known as "Human Landscapes". On a local scale, where WCS staff members are actively working, they have used the knowledge of herders and community residents to map by hand where threats are occurring (see Figure 2).

The Wildlife Conservation Society's Historic and Current Roles in this Landscape

WCS has a long-term commitment to promoting wildlife conservation within the Eastern Steppe. Since 1989, when WCS senior conservationist Dr. George Schaller first visited the region, WCS has been the leading advocate for wildlife conservation in the Eastern Steppe. In 1993-1994, Dr. Schaller helped initiate WCS's collaboration with a UNDP-GEF project that included assessing the feasibility of establishing a conservation program for the steppe. This effort led to the UNDP-GEF Eastern Steppe Biodiversity Project (ESBP) in 1997, which operated until 2003. The ESBP provided critical baseline data for the WCS program, including an extensive GIS database, and created an important network of local stakeholders interested in conservation, including the Eastern Mongolian Community Conservation Association (EMCCA) with which WCS continues to work closely. In 1998, WCS began intensive research on Mongolian gazelle to help fill large gaps in the knowledge of their population dynamics and movement patterns – key factors in managing this species and the steppe landscape – and of the relationship between the diseases found in livestock and in the gazelle population. These studies highlighted gazelles' huge space requirements and the need for conservation actions and management systems that extend well beyond the boundaries of protected areas to the entire landscape of the Eastern Steppe. This understanding led directly to WCS's successful request, in 2003, for USAID-GCP support for a landscape-scale conservation program.

Although other organizations work in Mongolia, WCS remains the leading advocate for wildlife conservation in the Eastern Steppe. The World Wide Fund for Nature (WWF-Mongolia) has been working in the country for many years but has focused efforts in the Altai-Sayan eco-region of western Mongolia. In 2007, WWF-Mongolia began to work in Mongolia's Onon-Balj river basin within the context of their global focus on the Amur-Heilong eco-regional complex. The Onon-Balj National Park is located in the northwest portion of the Eastern Steppe. The Nature Conservancy (TNC) began operating in the region in 2006, officially opening a representative office in Mongolia in 2008. TNC-Mongolia focuses on conservation of the grasslands of the Eastern Steppe as part of their global focus on the Mongol-Manchurian eco-region. They are working with key stakeholders to develop a plan for development and conservation on the Eastern Steppe using their Development by Design approach which focuses on taking projects through the "mitigation hierarchy" of avoidance, minimization, rehabilitation and offset.

Since starting work in 1989, WCS has been known as the organization that collects and provides rigorous, field-based scientific information about steppe wildlife, their requirements and threats. Since 2003, with the support provided by USAID-GCP, this reputation has grown, such that WCS is now also known for: advocating for ecologically sensitive development planning; improving national policies regarding wildlife hunting, trade, and management; implementing on-the-ground, community-based conservation actions across the steppe; building the capacity of local government agencies across all of Mongolia to monitor wildlife and enforce wildlife laws; and building the capacity of the main stewards of the steppe, the nomadic herder communities, to manage their lands.

WCS Approach to Threats-based Conservation at a Landscape Scale

WCS's long-term vision for the Eastern Steppe Landscape is that Asia's last wildlife migration spectacle of over one million Mongolian gazelle thrives across the world's largest intact temperate grassland, and a full assemblage of wildlife species (e.g., grey wolf, Siberian marmot, white-naped crane, saker falcon, Pallas' cat) are sustained by a network of well-managed national parks and communal lands.

WCS has dedicated much of the past five years to developing a strategic conservation plan to reach this long-term vision, relying on the Landscape Species Approach, WCS's framework for landscape-scale conservation planning. Over the past 5 years, WCS ES-LLP staff have helped develop the methods for completing the steps of the LSA (see Figure 3). These steps were completed for the Eastern Steppe, and the initial strategies have been implemented and adapted as needed. The major outcomes of these planning steps appear below.

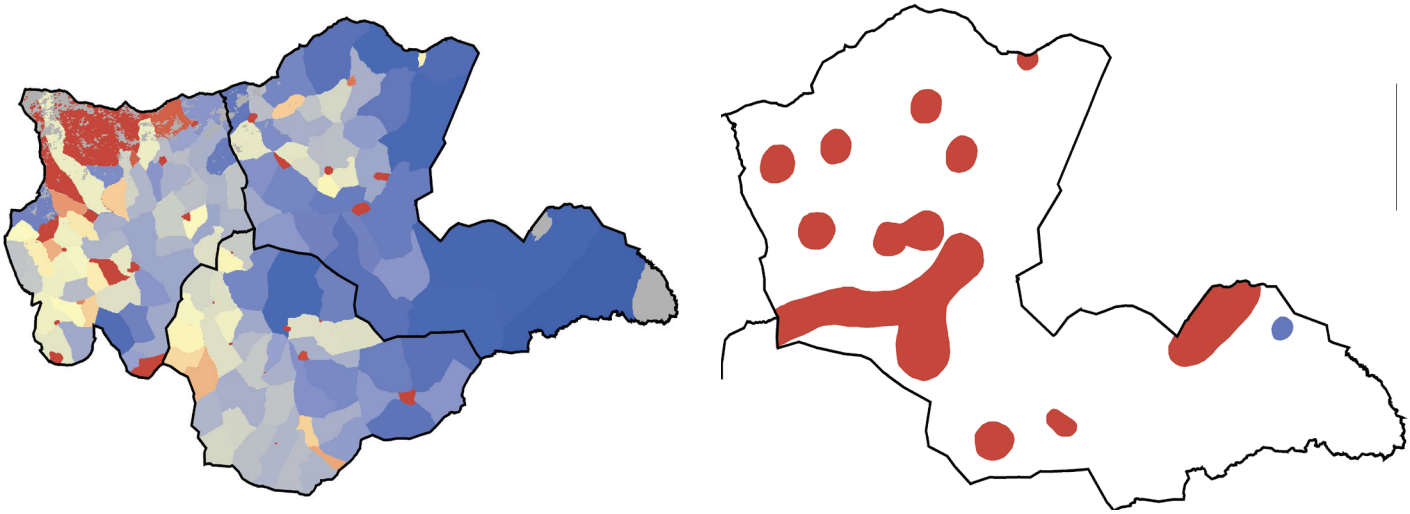

Figure 2. The knowledge of local herders and community residents was useful in mapping where threats are occurring across the steppe (livestock competition, left, and livestock overgrazing, right). For both maps, high levels of threat (up to 100) are indicated in red, medium levels in yellow, and low threats in blue. Areas in white are where the threat of overgrazing is not occuring.

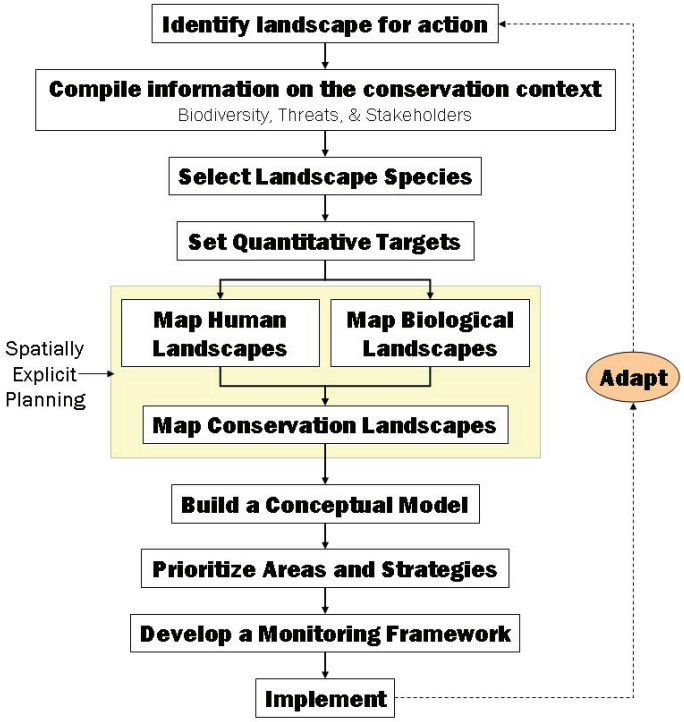

Figure 3. The steps of the Landscape Species Approach (LSA).

The Landscape for Action

In 2003, the three eastern Aimags (provinces) of Mongolia were identified as the initial landscape for action for three reasons. First, this area included the vast majority of high quality steppe remaining in the region, known as the Daurian Steppe, as well as most of the range of the Mongolian gazelle. Secondly, these three Aimags are a common unit for political and development decision-making; together they are called the "Eastern Region" or "*Zuun Bus*." Finally, in addition to the steppe, the region captures two other unique ecosystems that deserve increased conservation attention, namely the forests of the Khentii Mountains and the unique and highly threatened rolling steppe and forests of the Numrog region in the far eastern "finger" of Mongolia. After several years of focusing on these three Aimags, WCS is now adapting the landscape's boundaries to include those portions of the Daurian Steppe that extend into Russia and China, where substantial gains can be made in addressing cross-border wildlife trade issues and improving gazelle habitat to more closely approximate their historical range.

Compiling Critical Information on the Conservation Context

A critical first step for new conservation projects is to compile information about the region of interest, including basic information on the biodiversity (which species and ecosystems are present, and which are threatened), the threats to biodiversity and the groups and organizations that have a stake in the conservation and development of the region. WCS ES-LLP staff relied on a large database of biodiversity information produced by the Eastern Steppe Biodiversity Project, as well as the Landscape Species selection process, described below, for the collection of initial information on the biodiversity of the steppe. Meanwhile, information on threats was compiled, using the participatory approaches described previously, and significant resources were invested in identifying and compiling a network of stakeholders. One principal mechanism for doing so has been a monthly series of conservation information and networking events that WCS initiated in 2003 and has continued to sponsor.

WCS has invested substantial effort in developing a partnership of local herder communities in the steppe, under the auspices of the Eastern Mongolia Community Conservation Association (EMCCA). Staff have also made distinct efforts, through regular meeting attendance, to keep aware of the activities of bi-lateral and multi-lateral funding organizations working in Mongolia (USAID, GTZ, World Bank, Asian Development Bank, Korean Development Bank) and to increase their awareness of the threats to biodiversity stemming from development. Finally, more recently, the ES-LLP project has begun to engage those private sector actors interested in development opportunities in the steppe, through outlets such as the "Eastern Region: Investors' Forum – 2009".

Selecting a Suite of Landscape Species

Project staff applied WCS's methods for selecting a suite of Landscape Species, developed by the Living Landscape Program (LLP), to select and refine a set of Eastern Steppe Landscape Species on which to focus conservation actions. These methods were designed to select a suite of complementary species that represent each of the key threats to biodiversity and each of the important ecosystems of the Eastern Steppe, and that have large area requirements, are keystone species

and/or are economically and culturally important to the human residents of the steppe. Successful conservation of such a suite should, in theory, facilitate conservation of most biodiversity in the landscape, including other species and the ecosystems on which wildlife species rely.

The Eastern Steppe selection process began with the identification of 30 native candidate species that largely reflected the selection criteria and for which sufficient ecological information was available. With the assistance of species experts, necessary information on these species was compiled, including area requirements, habitat use, use of management zones, vulnerability to threats, ecological functions and socio-economic importance. Using software produced by LLP, a draft suite of Landscape Species was identified for the Eastern Steppe; this suite of species was then submitted (along with the selection process itself) for peer-review by a set of international and national wildlife experts. The draft suite was also presented to a group of national-level stakeholders, including representatives from government agencies, multi-lateral and bi-lateral donor organizations, academic and research institutions and the broader conservation community. Recommendations for improvement were included, and the final suite of eight species, which efficiently represent the 11 habitats, 20 management zones, and 13 threats of the Eastern Steppe, was identified: Mongolian gazelle (*Procapra gutturosa*); grey wolf (*Canis lupus*); eastern moose (*Alces alces*); Siberian marmot (*Marmota sibirica*); white-naped crane (*Grus vipio*); Asiatic grass frog (*Rana chensinensis*); saker falcon (*Falco cherrug*); and taimen (*Hucho taimen*).

Setting Quantitative Targets

A critical step in conservation planning is the setting of quantitative targets (also known as 'goals' by the Conservation Measures Partnership). Quantitative targets are formal statements about what conservation projects would like to achieve, expressed typically as a desired future status of focal biodiversity features, such as Landscape Species. Setting targets provides the benchmark for tracking and measuring progress of conservation actions, in a way that can easily be shared with stakeholders.

Using LLP's guidelines, quantitative targets were set for the Eastern Steppe Landscape Species in 2006. By consulting scientific literature and experts, several sequentially more ambitious targets were set: minimum viable populations; populations that can sustain hunting or offtake; and populations necessary to maintain ecological integrity. In 2008, WCS facilitated a series of provincial-level workshops designed to integrate local participation into landscape-level conservation planning. During these workshops, representatives from provincial government, veterinary and public health agencies, the Protected Area Authority, private sector industry, the State Border Defense Agency, local NGOs and local livestock herding communities were asked to set population targets for Mongolian gazelle, saker falcon, and white-naped crane in their region. Encouragingly, most of the stakeholder-set targets involved maintaining or increasing current populations (see Table 1).

Spatially Explicit Planning

Given that the Eastern Steppe, like most landscapes, is an enormous place (nearly 250,000 km^2), it is nearly impossible for any single organization, or even a

Table 1. Population targets (number and time span) for a subset of Eastern Steppe Landscape Species set at provincial-level stakeholder workshops.

	White-naped Crane *Grus vipio*	Saker Falcon *Falco cherrug*	Mongolian Gazelle *Procapra gutturosa*
Khentii Province	Goal: 2-3 times increase Time: 3-5 years	Goal: 800-1000 individuals Time: 5 years	Goal: 30% increase annually Time: 10 years
Dornod Province	Goal: 25% increase (to 700 breeding pairs) Time: 10 years	Goal: 50% increase Time: 2 years	Goal: 1 million Time: 2 years
Sukhbaatar Province	Not Applicable	Goal: 10-20% increase (80-100 breeding pairs) Time: 5 years	Goal: 25% increase annually Time: 3 years

group of organizations, to actively work across the entire region. Therefore, decisions must be made about those areas in the landscape in which a project should focus their work, or at least those in which they should work first. In the Eastern Steppe, the Landscape Species Approach's detailed framework was used to help staff make these tough decisions about where to work. The approach involves first mapping, for each Landscape Species, the areas of the steppe that currently do, or potentially could, given conservation action, support the species (these maps are called ***Biological Landscapes***). Secondly, it involves mapping the location and intensity of human activities that affect these Landscape Species (***Human*** or ***Threat Landscapes***). Finally, the process involves overlaying the Biological Landscapes for each species with the Human Landscapes that affect that species to produce maps (***Conservation Landscapes***) that show where conservation activities could best mitigate human-caused threats that have had, or will have, impacts on the species. Conservation Landscapes, together with information on the costs and feasibility of acting in certain areas, the activities of partners (e.g., TNC, WWF), opportunities and conceptual models (see next step) are critical inputs for prioritizing which strategies the program chooses to implement, and where.

In the Eastern Steppe, this type of spatially explicit planning began in 2003, when WCS staff began compiling a spatial database of ecologically relevant information (e.g., grassland productivity) and human use data (e.g., livestock density), including information from the participatory threats workshops. In 2006, initial versions of Human and Biological Landscapes were completed and presented to scientists, NGO partners, and other national-level stakeholders for review at a workshop in Ulaanbaatar. Based on suggestions received during the workshop, the landscapes were revised and have been continually updated with new or improved information. Examples of current Biological, Human and Conservation Landscapes are shown in Figure 4.

Conceptual Model

Conceptual modeling helps conservation projects to clearly visualize the major forces influencing the biodiversity of interest and how those forces operate and interact, and then to identify, prioritize, and clearly communicate strategies for reaching their goals. The WCS Eastern Steppe conceptual model was created in 2003, and has been continually revised using expert and stakeholder input. In 2008 in particular, WCS facilitated a series of workshops during which local and provincial-level stakeholders reviewed and updated the project's conceptual model. The most recent iteration of the conceptual model (Figure 5, also see Tables 2 and 3) includes potential conservation strategies for continuing to work in the Eastern Steppe in the upcoming years (although not all of these will be able to be implemented). The conceptual model has proven especially useful, as it clearly outlines goals and objectives, threats or challenges and opportunities for intervention. WCS personnel have used the model to align the project's strategies with those of other conservation organizations working on the Eastern Steppe, including WWF-Mongolia, TNC-Mongolia and the EMCCA. The conceptual model has also been used to guide the development of a RARE-Inspiring Conservation campaign on the Eastern Steppe.

Prioritize Areas and Strategies

Prioritization is an important component of strategic planning, as resources are rarely, if ever, available to implement all possible strategies or to work across the entire landscape. It is therefore important to prioritize based on clear, objective criteria, including the potential impact of proposed strategies and areas, the feasibility of implementation, the cost of proposed activities relative to available resources, and any opportunities that may exist. Throughout the five years of GCP funding, the ES-LLP team continually applied the LSA's strategic planning steps and adapted strategies as new information became available. The strategies that the project pursued are described below.

The project's process for prioritizing areas and strategies was based primarily on a series of provincial-level, participatory stakeholder workshops held in the Eastern Steppe in 2008. These workshops were coordinated in partnership with the Dornod, Khentii and Sukhbaatar Environmental Protection Agency and included representatives from several government agencies, the EMCCA, herder communities and partner NGOs. During these workshops, participants were asked to identify and map priority areas for conservation as a whole (not just for WCS), and to identify the critical strategies to implement in these areas. They were asked to make suggestions based on the quantitative targets, Biological Landscapes and Human Landscapes for the Landscape Species, particularly the three most widely occurring species (the Mongolian gazelle, saker falcon

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A healthy steppe, with Mongolian gazelles

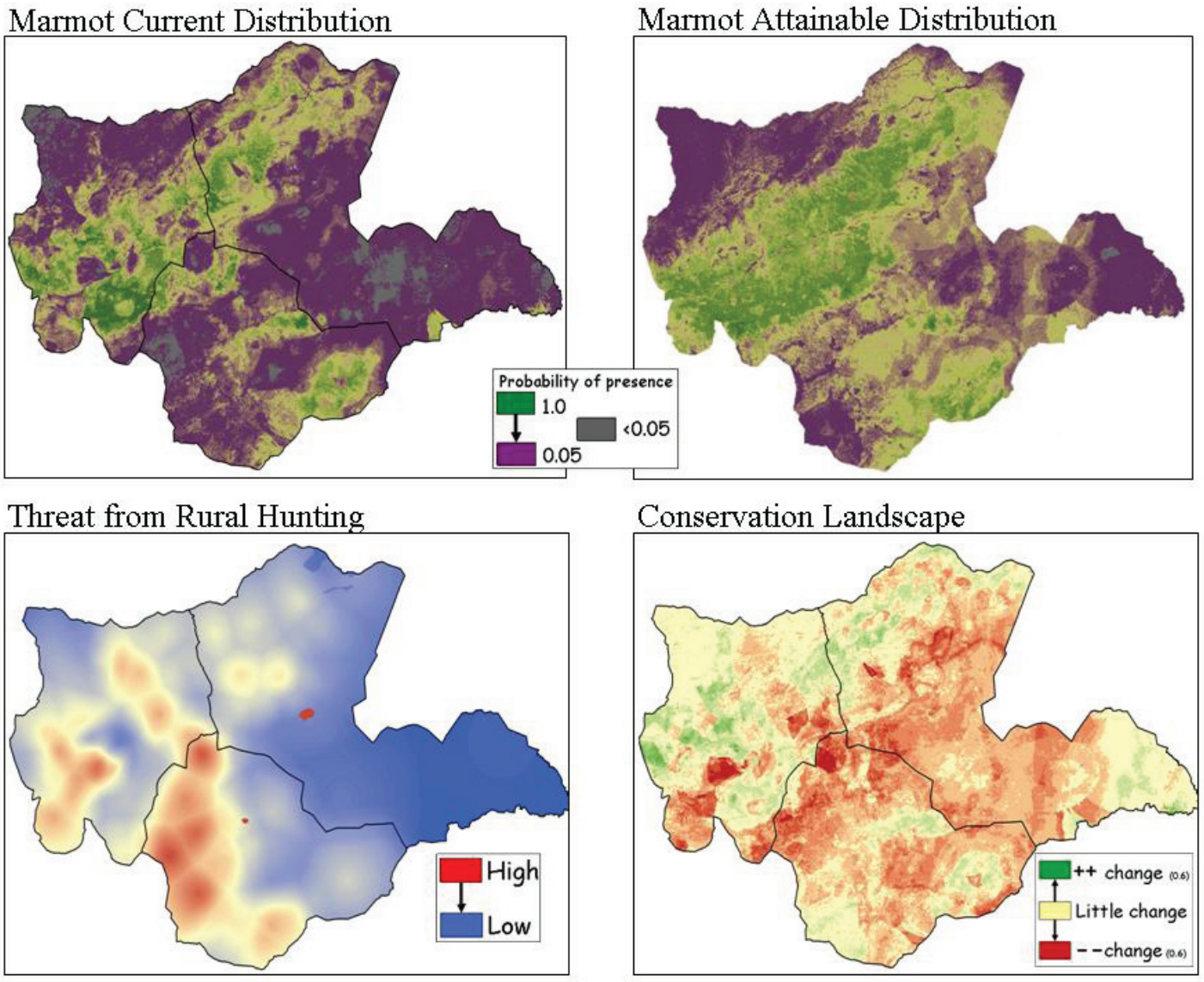

Figure 4. Examples of Biological, Human, and Conservation Landscapes. Top (l-r): a map of the current distribution of marmots and their Biological Landscape. Bottom (l-r): the Human Landscape for the threat of rural hunting and the marmot Conservation Landscape.

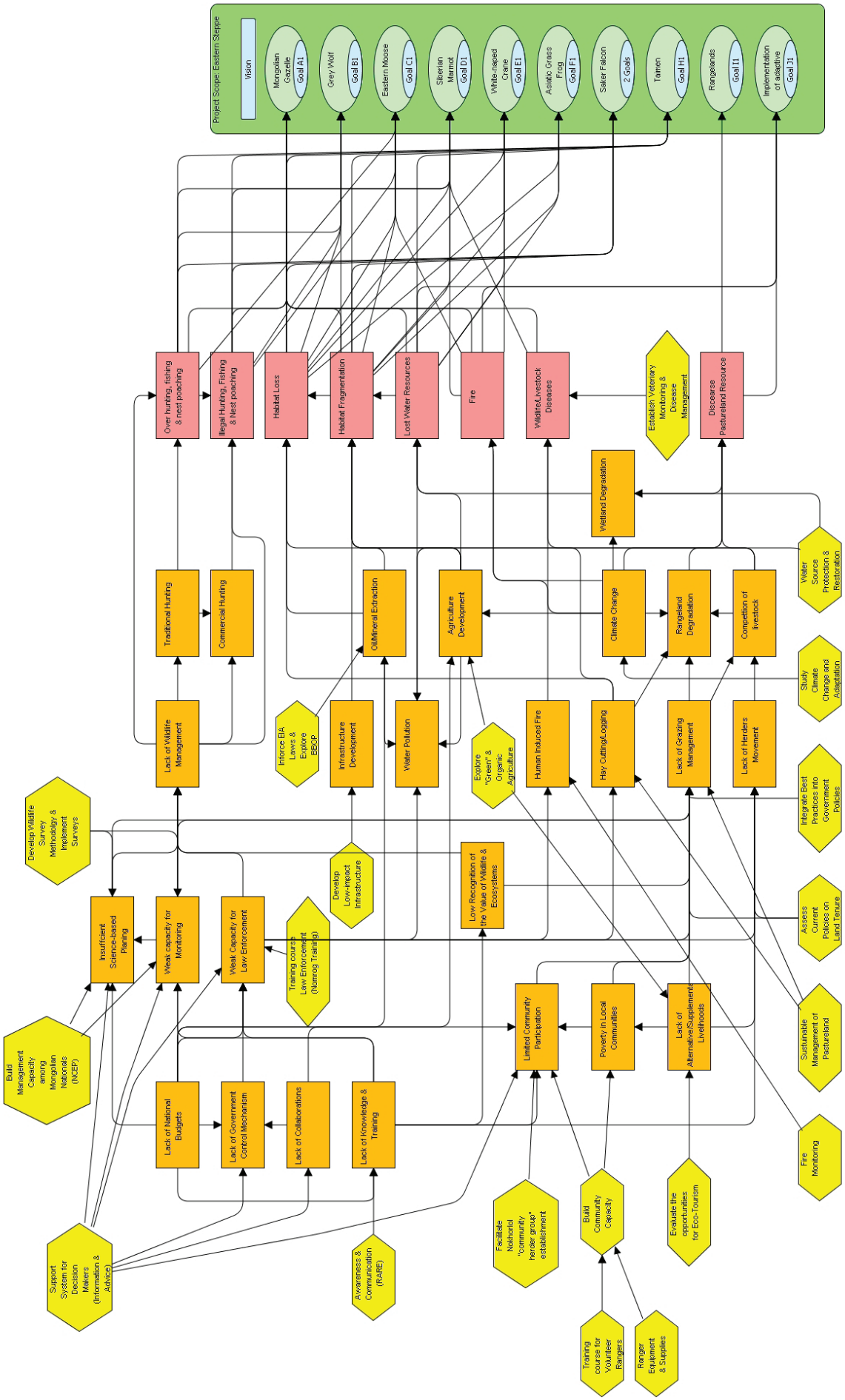

Figure 5. Conceptual Model for the Eastern Steppe Living Landscape, illustrating the links between strategies (in yellow), contributing factors (orange), direct threats (red) and conservation targets (in green).

Table 2. IUCN-CMP Unified Classification of Direct Threats (from the conceptual model shown in Figure 5).

IUCN Classification	Direct Threat(s)
2.1 *Annual & Perennial Non-Timber Crops*	• Lost Water Resources • Habitat Loss • Habitat Fragmentation
2.3 *Livestock Farming & Ranching*	• Wildlife/Livestock Diseases • Decreased Pastureland Resource
3.1 *Oil & Gas Drilling*	• Habitat Loss • Habitat Fragmentation
3.2 *Mining & Quarrying*	• Habitat Loss • Habitat Fragmentation
4.1 *Roads & Railroads*	• Habitat Fragmentation
5.1 *Hunting & Collecting Terrestrial Animals*	• Over-hunting, Fishing and Nest Poaching • Illegal Hunting, Fishing and Nest Poaching
5.4 *Fishing & Harvesting Aquatic Resources*	• Over-hunting, Fishing and Nest Poaching • Illegal Hunting, Fishing and Nest Poaching
7.1 *Fire & Fire Suppression*	• Fire
8.1 *Invasive Non-Native/Alien Species*	• Wildlife/Livestock Diseases
11.1 *Habitat Shifting & Alteration*	• Lost Water Resources • Decreased Pastureland Resource

Table 3. IUCN-CMP Unified Classification of Conservation Actions (i.e. "strategies") from Figure 5.

IUCN Classification	Interventions
2.1 *Site/Area Management*	• Water Source Protection and Restoration • Sustainable Management of Pastureland
2.2 *Invasive/Problematic Species Control*	• Establish Veterinary Monitoring and Disease Management
3.1 *Species Management*	• Develop Wildlife Survey Methodology and Implement Surveys • Study Climate Change and Adaptation
4.2 *Training*	• Training Course Law Enforcement (Nomrog Training) • Training Course for Volunteer Rangers
4.3 *Awareness & Communications*	• Awareness and Communication (RARE)
5.2 *Policies & Regulations*	• Establish Veterinary Monitoring and Disease Management • Water Source Protection and Restoration • Integrate Best Practices into Government Policies • Sustainable Management of Pastureland • Assess Current Policies on Land Tenure • Fire Monitoring • Study Climate Change and Adaptation
5.3 *Private Sector Standards & Codes*	• Explore "Green" and Organic Agriculture • Develop Low-Impact Infrastructure
5.4 *Compliance & Enforcement*	• Enforce EIA Laws and Explore BBOP
6.1 *Linked Enterprises & Livelihood Alternatives*	• Evaluate the Opportunities for Ecotourism
6.1 *Substitution*	• Explore "Green" and Organic Agriculture • Develop Low-Impact Infrastructure
7.1 *Institutional & Civil Society Development*	• Build Community Capacity • Facilitate Nokhorlol "Community Herder Group" Establishment • Ranger Equipment and Supplies • Support System for Decision-Makers (Information and Advice) • Build Management Capacity among Mongolian Nationals

and white-naped crane). After the series of workshops, participants' suggestions were summarized and compiled into a final map of priority areas (Figure 6) and description of priority strategies. Some strategies identified by participants were specific to particular areas, while others were relevant across the region or nation. Prioritized strategies were:

- **Strengthening collaborative wildlife protection and law enforcement efforts** among government agencies across the Eastern Steppe, but particularly in the Numrog region where the opening of a bridge to China will bring rapid change.
- **Improving pasture management** to balance the needs of livestock and wildlife and maintain connectivity, including expanded efforts in the Russian and Chinese portions of the Daurian steppe.
- **Expanding community-managed conservation areas**, especially along the Kherlen River for white-naped cranes.
- **Completing critical wildlife surveys** needed for effective management, in particular for saker falcon.
- **Expanding and upgrading the Protected Area system**, including adding two new areas and upgrading two existing nature reserves to National Park status.
- **Preventing and controlling outbreaks of wildlife and livestock disease**.
- **Developing wildlife tourism opportunities**, particularly those associated with Important Bird Areas.
- **Developing practical wetland conservation strategies**, especially in northern Dornod Aimag.
- **Managing and mitigating activities associated with oil development**.
- **Ensuring the adoption and implementation of the Mongolian Gazelle Management Plan**.
- **Ensuring the recovery of Siberian marmots** by encouraging appropriate management decisions and enforcement of wildlife trade laws.
- **Encouraging and supporting conservation planning and implementation aimed at Landscape Species and other biodiversity**, especially by WCS partner organizations.

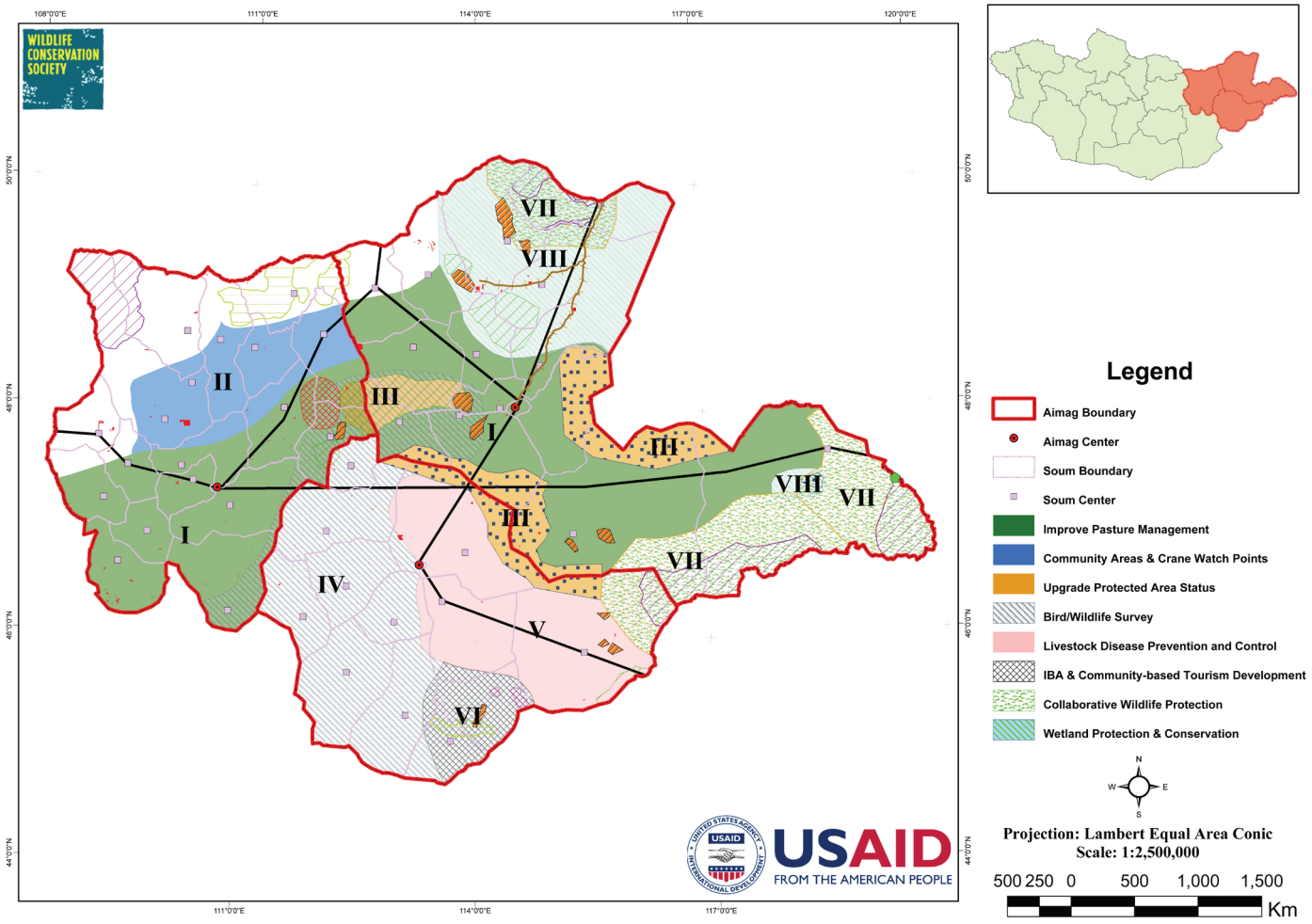

Figure 6. Eastern Steppe Conservation Landscape: priority areas for conservation interventions.

Monitoring Framework

Monitoring plans are a critical part of effective conservation planning and adaptive management. They allow projects to determine and communicate the changing status of biodiversity features and levels of threats and to determine if and how well strategies are being implemented. They also allow projects to evaluate whether the strategies that they have chosen to implement are having their intended consequences and, if not, to adapt these strategies. It is generally not possible to directly monitor all strategies, threats, and biodiversity features; therefore, as with the strategies themselves, it is necessary to prioritize which elements of the monitoring framework can be implemented.

While WCS has initiated monitoring of a subset of the Landscape Species, threats and activities (see "Measures of Success"), staff have not yet attempted to formally create a monitoring framework for the program. However, the participatory planning workshops in 2008 allowed substantial progress towards this goal, since workshop participants were asked to identify priority areas for monitoring, particularly those areas that are subject to declining biodiversity due to intensifying threats. Monitoring should occur in most of the priority conservation areas shown in Figure 7, including those areas with: new or improved infrastructure (the Millennium Road [I], the railway [II], and the Numrog Bridge [III]); emerging resource extraction projects (active industrial mining [IV], artisanal mining [V], and petroleum exploration and cropland development [VI]); and fires (VII) (the Roman numerals correspond to those used in Figure 7).

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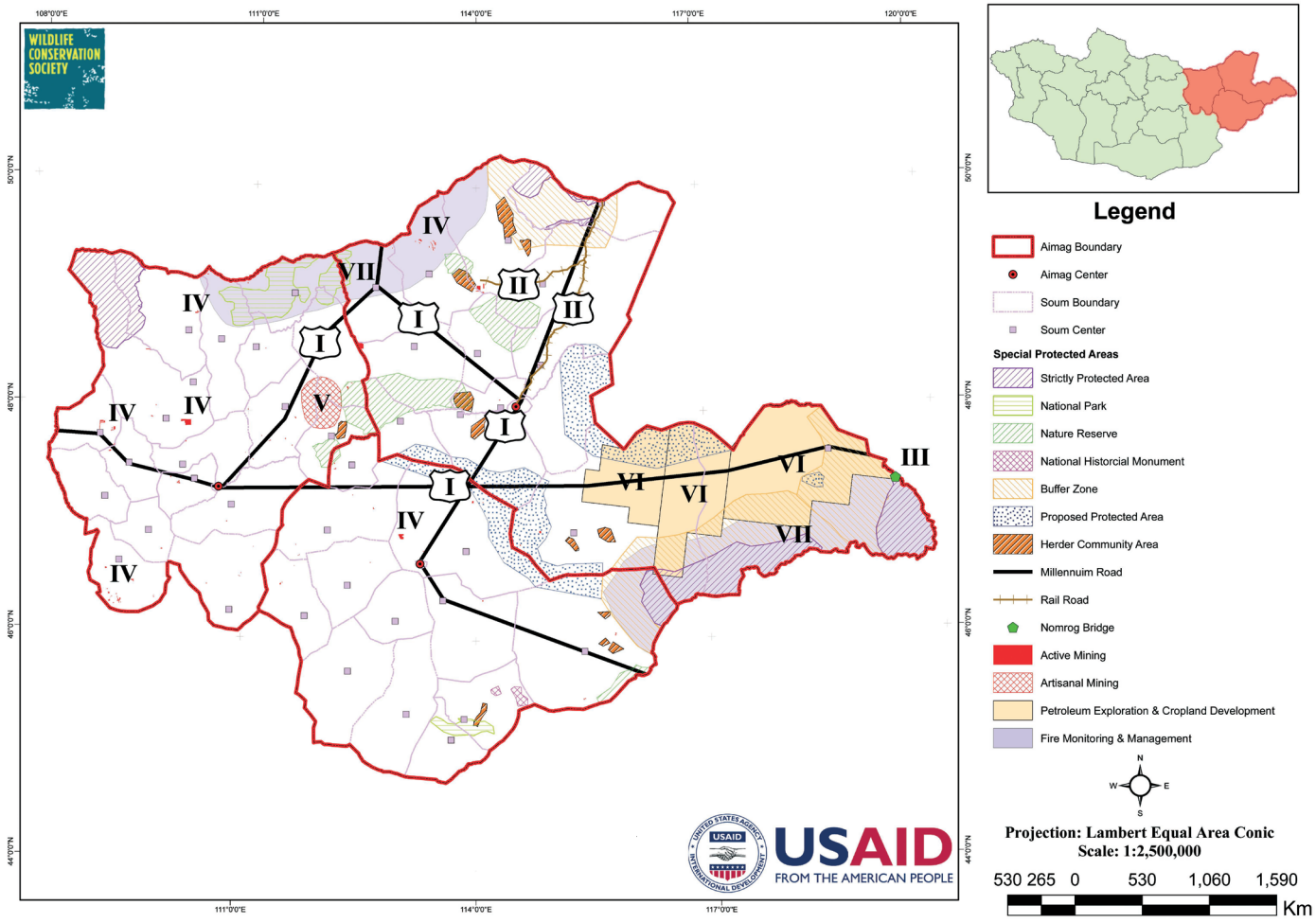

Figure 7. Eastern Steppe Conservation Landscape: priority areas for monitoring.

Implementing Conservation at a Landscape Scale: Overcoming Challenges, Grasping Opportunities and Managing Adaptively

Capacity Building

Lack of the necessary capacity and knowledge to effectively enforce existing wildlife laws and policies, and to manage and monitor wildlife populations, has consistently been the one of the largest barriers to effective conservation of wildlife in the Eastern Steppe. WCS has devoted substantial resources to training and capacity building through six main strategies:

Collaborative Wildlife Protection

There is no single agency or institution dedicated to wildlife management and protection on the Eastern Steppe. The job is split among four different agencies: the Protected Area Administration (PAA), the Environmental Protection Agency (EPA) and the State Specialized Inspection Agency (SSIA), as well as the State Border Defense Agency (SBDA) which has jurisdiction over wildlife and natural resources in border zones. Prior to the start of the Eastern Steppe project, little information sharing or collaboration occurred. Additionally, each agency was severely under-resourced and lacked general knowledge about how to effectively enforce wildlife hunting and trade law and how to monitor wildlife.

From 2005-2009, in an effort to identify the training and capacity building needs of each of these organizations, provide the appropriate training and promote collaboration among the three agencies and local communities, a pilot "Collaborative Wildlife Protection Program" was developed and implemented within and around Numrog Strictly Protected Area (SPA). Efforts included: a 2005 needs assessment; developing a 15-module training handbook in Mongolian and English; two-week long courses given in 2006, 2007 and 2008; assessment of training effectiveness; and on-site follow-up after each course. The courses were given to more than 50 participants (including representatives from the agencies, communities and volunteer rangers), and involved illustrated lectures, discussions and field exercises in wildlife monitoring, law enforcement and effective patrolling. Participants received critical monitoring equipment (e.g., binoculars, spotting scopes, maps, compasses and digital cameras) and training in their use. Finally, patrol forms were created and distributed to course participants and WCS personnel have been collecting them and entering the information collected into a law enforcement monitoring database.

WCS staff and the SSIA Senior Inspector were awarded national honorary medals of the border guards by the Commander of the Eastern Steppe (Sumber) Border Division, an official display of appreciation. This honor was followed by a verbal commitment from the SBDA to undertake wildlife-focused enforcement activities in Numrog SPA, in collaboration with personnel from the Protected Area Authority (PAA). In 2009, both the PAA and the SBDA requested that the training program be expanded to include protected areas in international border zones in other parts of the steppe and country. There is also an interest in incorporating the training modules used into the national curricula for training protected area rangers and the standard training material for border guards.

Community-based Natural Resource Management

In Mongolia, government agencies, civil society organizations and representatives of national and international conservation organizations continue to promote community-based natural resource management as a solution to the limitations of government-led enforcement of communal grazing rules, pasture management plans and wildlife hunting regulations over large areas of the country. As the rights and responsibilities for wildlife and natural resources are transferred to communities of livestock herders, there is an ongoing need to equip communities with the necessary skills to manage natural resources and allow the development of governance structures which effectively control natural resource use and safeguard the environment.

For several years, WCS has worked to build the capacity of local livestock herder communities to manage their own natural resources. In 2006, the project built on the work of the UNDP's Eastern Steppe Biodiversity Project, which ended in 2005, to build the capacity of a local NGO of herder communities called the Eastern Mongolian Community Conservation Association (EMCCA). A series of workshops and visits with communities has allowed WCS to train member communities from the EMCCA on the laws regulating community-managed areas, and the legal process for establishing community-owned or -managed protected areas, including how to fill out applications and delineate boundaries of the

community-managed areas. In total, WCS has worked with over 20 communities, helping them to establish their community areas.

Second, volunteer rangers from local communities have been trained and equipped to monitor wildlife within their communities and, in collaboration with government agency staff, in and around protected areas. In collaboration with the EMCCA, WCS held two training workshops, with a total of more than 100 participants, donated critical equipment and established a monitoring system and database with information on the communities and the wildlife within them.

Finally, WCS has compiled lessons learned from this community-based work and has worked to build the capacity of people and organizations implementing community-based conservation across Mongolia. To assess the effectiveness of these capacity building efforts, WCS personnel visited community groups, published a comprehensive review of the work with these communities under the USAID Translinks project, facilitated a workshop to inform local governments of EMCCA efforts, encouraged collaboration between EMCCA and local governments, facilitated two "lessons-learned" workshops in Ulaanbaatar and created a internet blog to share community conservation lessons across Mongolia.

Hunting and Trade Enforcement Capacity at the National Level

In 2008-2009, WCS worked to build governmental agencies' capacity to control hunting and enforce wildlife trade law. With funds secured from the World Bank's Netherlands-Mongolia Trust Fund for Environmental Reform Phase II (NEMOII) program, WCS facilitated the establishment of multi-agency wildlife trade crime units and organized a "Wildlife Trade Law Enforcement Study Tour" to Lao PDR. The wildlife trade crime units are now tasked with piloting active enforcement of the marmot hunting ban and overseeing patrols of Ulaanbaatar markets and regional trade points known for illegal wildlife trade. The units are comprised of representatives from the State Specialized Inspection Agency, Municipal Specialized Inspection Agency, National Police, Ministry of Nature, Environment & Tourism and the Airport Customs Veterinary Inspection Department. Working as a team provides the ability, which they do not have independently, to take action against illegal wildlife crime. The "Wildlife Trade Law Enforcement Study Tour" brought 13 members of the multi-agency wildlife trade crime unit team to Lao PDR, where the Mongolians met with their counterparts in the Lao Department of Forestry, Department of Forest Inspection and the Vientiane Capital City Wildlife Trade Law Enforcement multi-agency Committee. The Mongolian delegation reviewed relevant laws and wildlife trade law regulations, visited markets within and outside patrol areas, and met with staff from the Nam Kading Protected Area to discuss approaches to patrolling for illegal wildlife trade in the field and along transit routes. The establishment of multi-agency wildlife crime units and the focus on field-based training of wildlife law enforcement staff builds on WCS's efforts to improve the legal framework for wildlife law enforcement and hunting management in Mongolia.

Local Disease Management

For several years, WCS has enhanced local disease management on the Eastern Steppe by involving local veterinary personnel in wildlife disease-related projects, primarily through funds provided by the American Zoo and Aquarium Association (AZA) and the USAID-supported Global Avian Influenza Network for Surveillance. As a part of efforts to research foot and mouth disease (FMD), WCS has worked to increase the capacity of the Immunology Department of the Mongolian Institute of Veterinary Medicine to analyze serum samples from livestock and Mongolian gazelle calves for exposure to the FMD virus and have facilitated training in basic veterinary pathology for Mongolians at the State Central Veterinary Laboratory. Monitoring and assessing avian influenza has provided an opportunity to train young Mongolian biologists and veterinarians, improving their skills as field biologists, bird specialists and disease investigators. This field-based program provided students and young scientists with hands-on training that is often lacking in their formal education programs and skills which will contribute to Mongolia's capacity to address wildlife/human/livestock diseases in the future.

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A storm gathering over a Mongolian 'ger'

Alliances among Conservation NGOs: The Zuun Bus Partnership

WCS, TNC and WWF-Mongolia have all identified the Eastern Steppe, or sites within the region, as a conservation priority. The organizations have a common interest in improving coordination and establishing a long-term biodiversity conservation plan for Mongolia's Eastern Steppe (also known as the *Zuun Bus*). Representatives from the three organizations held a series of planning meetings and hosted joint activities throughout 2008 and 2009. Joint efforts included the TNC-initiated development of Conservation Action Plans for Toson Khulstai Nature Reserve and TNC- and WWF-led conservation initiatives in the region which build upon and strengthen those begun under WCS's ES-LLP project. Recently, WCS ES-LLP staff worked with TNC and WWF-Mongolia, through the Zuun Bus partnership, to develop a strategy for effectively engaging with PetroChina Daqing Tamsag LLC; meetings with oil company personnel working in Mongolia have resulted in company representatives voicing their interest in environmental issues and confirming that their company policy includes a ban on hunting wildlife. TNC has recently facilitated the formation of a working group, led by the Ministry of Nature, Environment and Tourism, which will address mining and development planning on the Eastern Steppe by working through the TNC "Development by Design" approach to conservation planning. TNC, WWF and WCS have signed a Memorandum of Understanding which outlines areas of mutual interest and a commitment to work together to address conservation priorities on the Eastern Steppe.

Strengthening Scientific and Higher Education Institutions

Since 2003, WCS has continually worked to provide practical training, field work experience and other opportunities, including internship and research positions associated with a variety of conservation initiatives, to Mongolian scientists and conservation biologists. This has primarily involved working with the National University of Mongolia (NUM), the Mongolian Academy of Sciences (MAS) and the Agricultural University to identify ecology, biology and veterinary students who will benefit from participation in ongoing WCS field research programs. Many Mongolians have taken advantage of the opportunities that WCS projects have provided, thereby increasing their scientific capacity. Participating individuals will be part of a growing cadre of dedicated and skilled Mongolian scientists equipped to contribute their knowledge and creative problem-solving capacity to conserving and managing the Eastern Steppe over the long-term. WCS has also worked to improve the quality of conservation biology education at NUM, linking the university with the Network of Conservation Educators and Practitioners, a program developed by the Center for Biodiversity Conservation of the American Museum of Natural History.

Law and Policy Development

In many cases, laws and regulations governing wildlife and natural resource use in Mongolia are in place but are not enforced due to a mix of factors, including limited inter-agency coordination, a lack of resources for patrol activities and limited information flow. In these cases, WCS has worked to build capacity within local or centralized agencies and communities to enforce laws, as described above. Additionally, WCS has focused substantial resources on three areas where existing laws and policies were weak or non-existent, to provide critical decision-making information and to work with the government to enact improved laws and policies.

Broad Hunting and Wildlife Trade Law Reform

In 2005, in an attempt to assess the severity of hunting and wildlife trade as a threat, WCS completed a wildlife trade study to quantify the types of, volumes of, values of and trends in Mongolia's wildlife trade. The study culminated in a watershed report published by WCS entitled *The Silent Steppe: the Illegal Wildlife Trade Crisis in Mongolia*, which concluded that: (1) the single greatest threat facing many species of wildlife in Mongolia is hunting for the commercial wildlife trade; (2) populations of both endangered and previously widespread species have declined dramatically in the previous 10 years; and (3) wildlife trade is not only devastating Mongolia's biodiversity, but is also threatening rural livelihoods. This report was a major stimulus for ES-LLP efforts to review and improve the basic laws governing wildlife trade and to build local capacity to enforce and monitor trade.

In 2006, WCS led, in collaboration with a Mongolian environmental law specialist, a detailed review of the legal framework for wildlife trade law enforcement and hunting management in Mongolia. The review first identified national and regional legislation which regulates hunting and trade, whether directly or indirectly,

or has a significant impact on trade and hunting. Secondly, the report summarized the gaps in the current laws and presented specific recommendations for additions and amendments to the Mongolian Law on Hunting. In March 2007, WCS presented the results to the Ministry of Nature and Environment, who then formed a working group that solicited further suggestions for additions and changes to the law from a broad range of stakeholders in the conservation, academic, research, government enforcement and private sectors. Changes in the Mongolian government in 2007/2008 delayed their further consideration and action on the 2007 draft of recommended amendments to the Mongolian Law on Hunting, but in 2009 the new Ministry of Nature, Environment and Tourism recalled the working group and the law revision process was reinitiated. A final draft of recommended amendments was circulated for submission to the Ministry of Justice by the end of 2009. If the Ministry of Justice accepts this justification for amending the law, it will be included on the agenda for the spring 2010 session of the Mongolian Parliament.

Improvements to Hunting and Management Policies for Brandt's Vole and Marmots

In the early part of this decade, two severe, species-specific threats prompted WCS to take immediate action and invest significant resources to avoid direct impacts on the species and cascading negative impacts on the entire steppe ecosystem.

A crash in Mongolian marmot populations was observed throughout the 1990s and into the first half of this decade. As the 2006 *Silent Steppe* report quantified, marmots are the most hunted species in Mongolia and the crash in their populations was certainly due in large part to the opening of trade with China (for marmot skins) and the consequent over-harvest of the species. In 2004, with the encouragement of WCS and other stakeholders, the Mongolian government wisely instituted a 2-year ban on marmot hunting. Since the ban was instituted, WCS's role has been primarily to monitor marmot populations for signs of continuing decline or recovery. From 2005 to 2007, surveys of marmots in the Eastern Steppe documented alarmingly low densities and did not indicate any sign of a recovery (possibly because of continued, though now illegal, harvest). On the basis of these results, WCS ES-LLP staff have led continued, collaborative efforts to lobby and encourage the government to extend the ban on marmot hunting. Thus far, these efforts have been successful, but continued monitoring is necessary.

Brandt's voles are viewed by many as an agricultural pest that, at peaks in its population cycles, strips the steppe of productive grasses and out-competes livestock for food. In the early part of the decade, this reputation resulted in a broad campaign, encouraged and funded by the government, to poison voles with a chemical called Bromadiolone. Unfortunately, while the use of the poison appears to do little to control vole outbreaks, it has killed significant numbers of at least 37 non-target species of wildlife, including saker falcon and other raptors, cranes, small carnivores including the Pallas' cat, and even livestock and people (according to written reports from WWF, WCS, and the Ministry of Food and Agriculture). Beginning in 2002, WCS collaborated with partners including WWF, ESBP and NUM to ban the use of Bromadiolone and encourage the use of more effective and safer techniques to manage the species, including working to control overgrazing by livestock which apparently encourages outbreaks. Building on the efforts of a working group (WCS, ESPB and NUM) and a large international workshop that WCS co-led with UNDP and WWF in 2004, WCS and partners presented the Mongolian Government with a report that recommended policy changes and improved management techniques. Based on this, the government discontinued the use of Bromadiolone in 2005 and, in 2006, the Mongolian Parliament passed a law that placed further restrictions on the use of wildlife toxins in Mongolia. Subsequently, both the ban and law have been upheld and little, if any, use of Bromadiolone has been reported.

Creation and Adoption of Species Management Plans

Species that are extensively harvested as a natural resource (e.g., the Mongolian gazelle), range widely, or are highly threatened (e.g., the saiga antelope) often require direct, individualized management to avoid population declines or to affect recovery. The creation, and governmental adoption, of strategic management plans for these species is a key step which guides subsequent funding efforts and implementation. Unfortunately, the agency tasked with species management in Mongolia, the Ministry of Nature, Environment and Tourism (MNET), lacks an official process for adopting and implementing species management plans. Since 2003, WCS has been addressing this issue, leading the process to develop a Mongolian Gazelle Management

and Action Plan. This effort represents the first time that government officials, conservation NGOs and the Mongolian academic community have worked collaboratively on a species management plan for government acceptance and implementation. Through several workshops and the production of several drafts over the course of five years, WCS and partners recently produced a near-final version of the plan in Mongolian. The plan, currently under review by species specialists at the Institute of Biology (IoB), Mongolian Academy of Sciences (MAS), will be submitted to the MNET for official adoption. The process of adopting the Mongolian gazelle management and action plan is hoped to have provided the experience necessary to enable the development and adoption of future species management plans; in fact, several other plans are currently under development, including those for the Mongolian saiga (*Saiga tatarica mongolica*) and the Takhi or Przewalski's horse (*Equus ferus Przewalskii*). It is hoped that the process will encourage MNET to dedicate a department and staff to wildlife management.

Wise Development

Since the collapse of communism in 1991, the Mongolian government has encouraged large infrastructure projects and efforts to extract natural resources across Mongolia. These include: efforts to build a paved highway, the "Millennium Road", across Mongolia and the Eastern Steppe; the construction of a new bridge near the Numrog Protected Area that will link this Millennium Road to China; the expansion of intensive cropland development; and the opening of much of the country to mining, oil exploration and oil extraction. The USAID/GCP-funded Eastern Steppe project spent considerable resources to discourage certain decisions that will have large negative consequences for biodiversity, to encourage decision-making processes that consider the needs and location of biodiversity and to encourage the use of best-practices that minimize or mitigate negative impacts. In general, LSA-focused conservation planning efforts have been geared, at least in part, towards encouraging governmental agencies to undertake formal, transparent and participatory processes for planning development, and to include biodiversity in their considerations. WCS has made three specific and direct

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WCS-Mongolia staffperson O. Lkhamjav and Numrog SPA Administration Specialist N. Gangerel, discussing the distance from this iron-mining site to the Numrog SPA boundary and how mining activity here may threaten wildlife. This iron mining site is very close to the protected area and, in fact, lies within its buffer zone.

efforts to influence specific government or industry decisions: (1) attempting to discourage the government from constructing the Millennium Road such that it would bisect valuable steppe regions and cross into China at a point close to Numrog SPA; (2) evaluating the possible impacts that increased crop production might have on biodiversity and influencing cropland development in Mongolia, and the Eastern Steppe in particular; and (3) engaging oil and mining sectors in Mongolia in an effort to try to minimize the impacts of these industries on the biodiversity of the steppe.

The Millennium Road route that the government announced in 2003, a nearly straight line from Ulaanbaatar to a point north of Numrog Protected Area, was found by WCS's quantitative analysis to bisect and fragment Mongolian gazelle range south of the Kherlen River and, furthermore, the crossing point near Numrog was predicted to encourage hunting and habitat destruction within the Numrog SPA and its Buffer Zone. In addition, WCS analysis demonstrated that the intended route would entirely bypass major settlements in the Eastern Steppe (e.g., Choibalsan) and would cross at a small village, choices which would bring few economic benefits to steppe residents. As a result, WCS was able to suggest two alternative routes that would have fewer effects on biodiversity and would benefit more steppe residents, and lobbied the government to change the route and crossing point accordingly. Unfortunately, in May 2007, WCS received a copy of the official agreement between the Mongolian and Chinese governments to build the Numrog Bridge and received reports that the planned route of the road had not changed. Since these decisions were made, WCS has focused its efforts on mitigating the impacts of the bridge by building the capacity of border guards and protected area staff to prevent or reduce the negative impacts that the road may bring (e.g., increased hunting and trade).

In 2008, to increase the nation's self-sufficiency, the government announced plans to increase the amount of land being used for intensive crop production. Soon thereafter, WCS implemented a study to evaluate the history of crop production in Mongolia and evaluate the possible impacts that crop production as planned might have on biodiversity. In 2009, a preliminary WCS report summarized the potential negative impacts that poorly implemented cropland development may have on biodiversity, making recommendations to incorporate biodiversity concerns into planning and management activities.

WCS-led threats assessment and mapping activities demonstrated that nearly the entire steppe, outside of protected areas, has already been leased to oil and mining industries for exploration purposes and that new extraction sites are continually appearing. Growing concerns about the impacts of these activities on land, fresh water and wildlife make this threat a priority for conservation action. The ES-LLP's strategy for combating these threats thus far has been to work with conservation partners through the Zuun Bus partnership, directly engaging the oil and mining industries and encouraging them to implement a set of best management practices that minimize impacts on biodiversity (e.g., outlawing hunting at active sites). WCS Eastern Steppe staff plan to continue to explore ways of offsetting unavoidable negative impacts on biodiversity and encouraging companies to fund conservation initiatives offsite.

Education and Awareness

Unfortunately, the sectors of Mongolian government and society that make development decisions have traditionally been unaware of biodiversity and conservation issues, and this lack of awareness has been a key factor contributing to the decline of biodiversity in Mongolia. WCS has worked at local, national and global scales to increase awareness and build capacity, striving to connect with and include the widest degree of stakeholders possible. In addition to the efforts mentioned below, WCS staff organized and participated in a symposium at the 23rd Annual Meeting of the Society for Conservation Biology (July 11-16, 2009) which included three Eastern Steppe-focused

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A test site for flooded rice production, in Dornod Aimag

presentations (Distribution & Movement Patterns of the Mongolian Gazelle, the Eastern Steppe's Living Landscape, and Community-based Wildlife Conservation in Eastern Mongolia). WCS also hosted the President of Mongolia at the Central Park Zoo in September 2009, briefing him and his delegation on the Society's activities in Mongolia. This led to a pledge of commitment to sustain wildlife and livelihoods in Mongolia's grasslands through a Presidential Conservation Commission for the Eastern Steppe.

Monthly Conservation Network Event

A major factor contributing to the lack of conservation awareness in Mongolia is the insular nature of those agencies and academic and scientific institutions that work in fields related to natural resource management. Consequently, conservation-minded people may not know what others in the field are doing, resulting in a lot of redundancy, inefficiency and a failure to incorporate relevant, up-to-date information in management activities. In 2003, a monthly series of WCS-sponsored conservation information and networking events was initiated, the facilitation and organization of which is now led by the Steppe Forward Programme operating out of NUM. The event provides a forum for discussing current environmental and conservation issues facing Mongolia and draws participants from academic and research institutions as well as the government, NGO and private sectors. Recently, participants have initiated the process of forming a Mongolian chapter of the Society for Conservation Biology.

Nomadic Trunks for Conservation

WCS began partnering with the NGO Conservation Ink and the Denver Zoo in 2007 to develop Eastern Steppe conservation-related educational and outreach materials, packaged into trunks which travel from community to community through the rural school system. Moving forward, the Eastern Steppe PAA and the EMCCA will continue to circulate the trunks through Eastern Steppe schools and communities, while the WCS Mongolia program, Conservation Ink and the Denver Zoo will continue to raise funds to replace and update trunk contents.

RARE Pride Campaign

In 2008, WCS began collaborating with RARE, a U.S.-based conservation NGO with a proven model for changing awareness, attitudes, and behaviors toward conservation at the local level. This collaborative effort is aimed at: (1) working more effectively with communities of livestock herders on the Eastern Steppe; and (2) training a Mongolian WCS staff member to use social marketing methods to communicate conservation messages. The RARE approach uses a "Pride" campaign, designed to inspire people to take pride in the natural assets that make their communities valuable and take action to protect them. The focus of the Eastern Steppe Pride campaign, which will begin in January 2010, is the Mongolian gazelle, as an umbrella species for the grassland steppe and the wildlife it supports.

Collecting Critical Ecological Information for Species and Land Conservation

Without a certain amount of information on the ecology, population dynamics and distribution of wildlife species, it is difficult, if not impossible, to make appropriate decisions about how to implement management, where and how to invest in conservation or development resources and which conservation strategies to implement. Beginning prior to the inception of the Eastern Steppe's USAID/GCP-funded program, WCS partnered with universities and local research institutions to collect critical ecological information on Landscape Species, other key species, important places on the steppe (e.g., "Important Bird Areas") and important diseases. In particular, WCS has focused on collecting information on Mongolian gazelle and Siberian marmot, because these two species are the icons of the steppe, are the largest contributors to herders' livelihoods and are true keystone species without which the entire steppe ecosystem would change immensely.

Mongolian Gazelle Research

The Mongolian gazelle, an Eastern Steppe Landscape Species, is important to Eastern Steppe livestock herders' livelihoods and the ecological integrity of the steppe ecosystem. WCS has conducted research to understand the ecology and population dynamics of the Mongolian gazelle since the late 1990s. Over the course of USAID/GCP-provided support, WCS has focused on answering five questions critical for the species' conservation and management: (1) what is the size of the gazelle population; (2) where are gazelle calving areas; (3) what are the rates of calf survival and causes of mortality; (4) how far do gazelles migrate; and (5) what kinds of habitat are they relying on?

From 2003-2004, WCS conducted a survey of the main part of the gazelle range, a 223,000 km^2 region east of the Beijing-Ulaanbaatar railroad, by driving a total of 5,184 km of transects. This survey produced the most reliable population estimate to date; the estimation of 1,290,000 (+16% CV) Mongolian gazelles east of the railroad suggests a near 50% decline in population size within only a decade (since a 1994 range-wide aerial survey).

Due to female gazelles' strategy of gathering over the same 1-2 week interval to give birth in large groups concentrated in relatively small areas (presumably "swamping" predators and thereby increasing the overall rate of calf survival), calving areas have often been suggested as priority places for establishing fixed protected areas. To answer the question of whether calving areas were consistently located in the same place from year to year, WCS completed an aerial transect survey across the steppe during the 2003 calving season, covering nearly 4,300 km of transects. The results indicated that those calving sites that were previously considered to be "traditional" were not used in 2003, and regions where gazelles were not believed to be during that time were used in high concentrations, suggesting that the establishment of small, fixed protected calving areas may not be an effective strategy for conserving gazelle.

To test the assumption that low levels of calf survival were contributing to declining gazelle populations and to examine causes of calf mortality, WCS monitored the status and survival of gazelle calves from 2002-2004. Contrary to previous beliefs, calf survival was found to be quite high (71%) compared to that of other ungulates living in northern latitudes, and therefore the data suggested calf mortality is not the best explanation for the perceived long-term decline in the gazelle population. Rather, adult mortality is likely unnaturally high, probably due to unsustainable levels of hunting and poaching.

Since 2005, WCS personnel have collaborated with partners from the Universities of Maryland and Massachusetts, the Smithsonian Institution, Tokyo University and the Mongolian Academy of Sciences to track and better understand the migratory movements of gazelle, fitting them with GPS receivers coupled with satellite transmitters. These data have shown that individual gazelles move constantly, with no consistent pattern of movement from year to year, and that they can move enormous distances (covering over 18,000 km^2 over the course of a year). This information is important for demonstrating that the existing and planned protected areas in the steppe are alone insufficient to adequately protect such a wide-ranging species and that conservation actions beyond protected areas, such as work with herder communities, are critical components of gazelle conservation.

Also since 2005, and in collaboration with the Universities of Maryland and Massachusetts and the Smithsonian Institution, WCS has used the satellite transmitter gazelle location information, as well as driving-surveys, ground-based vegetation data and satellite-based vegetation quality data to better understand what kinds of habitat gazelles are selecting as they move, creating models of gazelle habitat preference for spring, summer and fall (more recently, winter survey driving-transects have also been added). Gazelles were found to select grazing sites based on how the site is affected by local weather conditions (e.g., local rainfall), the presence of herder livestock, the presence of biting-insects and broader-scale environmental patterns (e.g., grass green-up) that are not necessarily consistently located from year to year. These results highlight the need to ensure that the Eastern Steppe remains as unfragmented as possible, so that gazelles can continue to migrate freely in search of the habitat they need to survive.

Siberian Marmot Research

The Siberian marmot is an Eastern Steppe Landscape Species, important to the livelihoods of livestock herders living on the Eastern Steppe (via the meat and fur trade) as well as to the ecological integrity of the steppe itself. Their dramatic decline, recorded across the country, is due primarily to over-hunting for the fur trade. From 2005-2007, WCS performed a survey of marmots across the Eastern Steppe to determine the size of the population, estimate the distribution of the species and examine factors affecting their distribution. In total, WCS surveyed more than 6,300 km of transects spread across the steppe and compiled a database of more than 4,000 observations of marmots, including sightings of live marmots and active and inactive marmot burrows. According to these surveys, the steppe's density of live marmots varied between 0.123 marmots/km^2 and 1.038 marmots/km^2, indicating a catastrophic decline in many regions of the Eastern Steppe compared with prior published density estimates. In 2008 and 2009, WCS further utilized data from field surveys,

together with statistical modeling techniques, to map the distribution of marmots across the steppe (see Figure 4) and examine factors that may be affecting this distribution. Factors that appear important include rural hunting, winter temperatures, grassland productivity, precipitation and competition from livestock.

Important Bird Areas

The Eastern Steppe provides key nesting and breeding grounds for multiple species of migratory birds, many of which are critically endangered; in fact, two of the eight Eastern Steppe Landscape Species are birds (the white-naped crane and saker falcon). In 2004 and 2005, WCS, in collaboration with the Royal Society for Birds, completed three field surveys of the Eastern Steppe to re-evaluate the existing Important Bird Areas (IBAs) and identify and propose new IBAs. In 2006, this information was used to complete a map of currently identified and proposed IBAs.

Disease Monitoring

Over the course of GCP funding, WCS was able to leverage funds from other resources to support critical wildlife disease monitoring activities across the Eastern Steppe and Mongolia as a whole. A range of diseases, many of which are endemic on the Eastern Steppe, threaten wildlife, livestock, local livelihoods and the national economy. WCS projects designed to minimize outbreaks, prevent widespread impacts of disease and influence wildlife health policy have focused on researching and monitoring two diseases in particular: foot and mouth disease (FMD) and avian influenza (AI).

*Ruddy shelducks (*Tadorna ferruginea*)*

In 2007, WCS also began banding and marking birds, as part of the effort to understand the spread of Highly Pathogenic Avian Influenza. This program has increased the understanding of migratory movements of wild birds in the three flyways that crisscross Mongolia. In 2007, the WCS AI team began a relatively small effort to mark captured birds; an effort that was expanded in 2008 and 2009. This initiative has been used as the impetus for building a Mongolian National Bird Banding Program that will be sustained well beyond the length of the avian influenza project and will provide information critical to the conservation of many of the Eastern Steppe's avian species.

Livelihood, Economic, and Other Incentives

Economic and Ecological Valuation of the Siberian Marmot

In 2008, WCS completed a review of the ecological function of marmots in the Eastern Steppe and their economic value to the people of the region. The study examined the ecological and economic importance of marmots on the Eastern Steppe and explored how changes in marmot populations might affect ecosystem services and local livelihoods. The functions and values of marmots were considered in the context of three scenarios: pre-1940 populations; present populations; and populations that continue to decrease below present levels.

Mobile Pastoralists and Sedentary Resources (Siberian Marmot)

In 2008 and 2009, WCS examined the governance structures available to manage and protect natural resources on the Eastern Steppe. Broadly, this increased the core knowledge and understanding of how natural resource governance systems influence security, benefit sharing and sustainability on the Eastern Steppe. The study built on the experience of WCS's engagement with pastoralists in the region. The central question was whether pastoralists (mobile livestock herders organized as community-based wildlife conservation groups, community partnerships or "*nokhorlols*") on the Eastern Steppe can effectively manage and protect what are essentially sedentary resources; for example, the Siberian marmot and other wildlife. ESLLP staff visited livestock herder community partnerships or *nokhorlols* to collect information on herders' perceptions of the abundance of wildlife resources in their community-protected areas and their capacity to

protect and manage those resources. Data from these field visits were analyzed in order to make a series of conclusions about the legal and practical mechanisms in place on the steppe to provide for the protection of natural resources. The study highlighted what happens when community group members are absent (e.g., when grazing their livestock on summer, winter or spring pastures), the variability present in community governance structures across the steppe, how "ownership" of natural resources is defined, and how national laws (hunting permits/seasons) and the rights of communities are enforced. The current system does not guarantee communities' exclusive rights to the natural resources within community managed areas, and therefore resource use (hunting, collection of firewood, use of pastures, etc.) by non-community members occurs on a regular basis (such use by outsiders was only found to be limited in situations in which the area is only populated by members of the community partnership or where communities are highly motivated and have the resources to protect natural resources from harvest by outsiders).

Sustainability

Throughout the ES-LLP project, staff focused on ensuring that the project's accomplishments lay the foundation for future wildlife conservation work on the steppe. Significant resources have been devoted to building the capacity of local wildlife managers, government staff and community members and equipping them with the skills to carry on wildlife monitoring and protection activities into the future. WCS has engaged a broad group of stakeholders in the Landscape Species Approach, ensuring a broad, and hopefully long-term, commitment to the conservation priorities identified during the development of the Eastern Steppe Conservation Landscape map. While implementing the LSA in the grasslands of the Eastern Steppe, "lessons learned" were compiled so that the knowledge gained during the process will be available to inform future conservation planning efforts on the steppe and across the region. ES-LLP staff will continue to engage local communities (e.g. through continued support of livestock herder community-managed and -protected areas) and to liaise with national-level stakeholders on landscape-level conservation planning across the steppe. The ES-LLP team supported the development of the Eastern Mongolian Community Conservation Association (EMCCA), a local NGO that will remain in place, continuing to work with livestock herder community groups that manage and protect natural resources on the steppe. Community-based work will continue to be the cornerstone of WCS's conservation efforts in the steppe as the program transitions after the end of GCP funding.

In order to address the threats of over-hunting and illegal wildlife trade, local government support of community-led wildlife protection initiatives was necessary, as was the effectiveness of multi-agency teams in enforcing wildlife law on the steppe. While facilitating collaboration across agencies, the ES-LLP team realized the benefits and efficiencies associated with supporting a culture of information sharing; the mechanisms necessary to share information and coordinate across projects will remain in place beyond the close of the USAID-funded Eastern Steppe Living Landscape Project.

In addition to working with traditional conservation partner agencies to identify the principal actors able to address threats on the Eastern Steppe, WCS has followed the Mongolian government's efforts to attract private sector investment to the region. Throughout the ES-LLP, project personnel have worked to influence development plans and direct private sector and government investment in ways that limit negative impacts on the environment, wildlife and livestock herder livelihoods. Although this policy of showcasing the ES as a "premium investment destination in Mongolia… with huge possibilities to attract foreign investment in mining, construction, tourism and agricultural sectors"[1] raises concerns about the negative impact that this development might have on the environment, it also highlights the potential opportunity to direct funds from private sector development to support conservation and the management of wildlife and natural resources on the steppe.

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1 Advertisement for the "Eastern Region: Investors' Forum – 2009" appearing in *The Mongol Messenger*, No. 31 (943), Wednesday, July 29, 2009, p. 9.

Throughout the five years of USAID/GCP funding, WCS continually applied the LSA's strategic planning steps and adapted strategies as new information became available. However, not until recently did the opportunity arise to formally consider priorities for WCS's future strategies and areas for ongoing work in the steppe. Recognizing the need to prioritize conservation areas and strategies as the ES-LLP team prepared to transition into a new phase, a series of provincial-level, participatory stakeholder workshops was held in the Eastern Steppe in 2008, to build on the first steps of the LSA. These workshops highlighted Eastern Steppe priority conservation areas, those places important for the Eastern Steppe's conservation as a whole (not just those areas that are a priority to WCS), and identified the critical strategies to be implemented in these areas. The final map of priority areas for implementing conservation strategies identified the following priority strategies: (1) strengthening collaborative wildlife protection and law enforcement efforts; (2) improving pasture management; (3) expanding community-managed conservation areas; (4) expanding and upgrading the Protected Area system; (5) completing critical wildlife surveys; (6) preventing and controlling outbreaks of wildlife and livestock disease; (7) developing wildlife tourism opportunities; (8) developing practical wetland conservation strategies; (9) managing and mitigating activities associated with oil development; (10) ensuring the adoption and implementation of the Mongolian Gazelle Management Plan; (11) ensuring the recovery of Siberian marmots; and (12) encouraging and supporting conservation planning and implementation aimed at other Landscapes Species and biodiversity as a whole. These strategies represent the priorities for conservation writ-large across the steppe and are not necessarily all strategies that WCS will prioritize for intervention in upcoming years. Future priorities for the WCS program will depend on available resources and which strategies WCS is best-equipped to implement.

Measures of Success

Although funding restrictions have prevented the WCS program in Mongolia from implementing a formal strategy for monitoring threats or monitoring the populations of Landscape Species, some information has emerged regarding the effectiveness of the strategies that were implemented to address five major factors that contribute to the existence and severity of threats to biodiversity in the Eastern Steppe. Additionally, some information has emerged on how populations of gazelles, marmots and various bird species have responded since the beginning of the ES-LLP.

Changes in Threats

Unsustainable Hunting and Wildlife Trade

Unsustainable hunting and wildlife trade remains one of the most urgent threats facing wildlife on the Eastern Steppe, as dwindling resources significantly impact the security of livestock herders' livelihoods. The ES-LLP was very effective in raising the awareness of the way in which wildlife trade, much of it destined for markets outside the borders of Mongolia, is decimating native wildlife populations. This, in turn, has led enforcement agencies to become more willing to monitor wildlife trade and take action against illegal wildlife trade. The project has also seen an increase in community interest in mechanisms for self-monitoring and self-enforcement of hunting rules and regulations within community managed and protected areas, with successful implementation through a system of community rangers.

Toxin Use

The government discontinued the use of Bromadiolone in 2005 and, in 2006, the Mongolian Parliament passed a law that further restricted the use of wildlife toxins in Mongolia. This legislation appears to have been quite successful; little, if any, use of Bromadiolone has been recently reported. This example is indicative of a growing awareness in Mongolia of the negative impact that industrialization can have on the environment and highlights the need to have a legislative structure and guidelines in place to prevent or mitigate environmental damage. The reaction to the use of Bromadiolone served as an example of the strength of civil society organizations working together toward a common goal, in this case safeguarding the environment, thus advocating for policy which protects a public good.

Wildlife Disease

In Mongolia, as is the case in many regions of the world, information about the occurrence and impact of disease in wildlife populations is limited. This lack of data often leads to uninformed decision making and policies which can negatively impact wildlife populations. During the course of the ES-LLP, WCS was able to work with

partners in the veterinary sector to collect important information on disease occurrence in Mongolian gazelle, confirming the lack of evidence that Mongolian gazelle act as reservoirs for Foot and Mouth Disease. This information had a direct impact on disease prevention and control policy in the region; now the focus is on surveillance and vaccination of livestock rather than strategies which involve the destruction of gazelle.

Overgrazing

A major accomplishment of the ES-LLP has been raising awareness of the global importance of the grasslands of the Eastern Steppe. These grasslands provide critical habitat for the steppe's wildlife and are an essential resource for the region's livestock herders. This effort was well-timed as the forces behind the drivers of habitat loss and rangeland degradation across Mongolia continue to increase; for example, a July 2009 study[2] warned of a significant decline in the quality of Mongolia's pastureland as a result of growing numbers of goats and other livestock, as climate warming and lower rates of precipitation further stressed the system. The study team concluded that improved pasture and livestock management strategies and wildlife conservation initiatives were necessary components of a successful pastureland rehabilitation program. The ES-LLP has addressed overgrazing through the implementation of a process for developing ES community groups' livestock herder management plans. Unfortunately, however, the prevention of landscape-scale overgrazing is hindered by poor planning and management at the central government level and deficits in the local capacity to develop and enforce rangeland management plans, a situation not limited to the Eastern Steppe.

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Sheep on the Eastern Steppe

Mining and Infrastructure Development

The development of mining and infrastructure has moved forward rapidly across Mongolia as the country has put policies in place which attract foreign investment and pave the way for harvesting the economic potential of the country's mineral and oil resources. On the Eastern Steppe, this rapid development has primarily occurred in the form of oil exploration and extraction and planning for a network of road and rail. Although the ES-LLP was unsuccessful in halting the construction of the Numrog Bridge or securing a commitment to change the course of the Millennium Road to avoid bisecting important Mongolian gazelle habitat, there is evidence that, overall, as a result of the ES-LLP project's efforts, biodiversity is being considered in development planning within the region. Recently, TNC facilitated the formation of a working group within the Ministry of Nature, Environment and Tourism to use the results of an eco-regional assessment in the design of development projects. This project aims to restrict development on the Eastern Steppe to sites and projects which avoid, limit or offset impacts on biodiversity. The acceptance of this approach was paved, in part, by stakeholder participation in the WCS-led Landscape Species Approach which signaled, in some cases for the first time, the conflict between planned development and conservation goals for the region.

Changes in Conservation Targets

Siberian Marmot

Siberian marmot populations have demonstrated signs of recovery in multiple community-managed areas across the Eastern Steppe where local livestock herders have committed their own resources to enforcing the region-wide ban on hunting marmots. Resources to assess the status of the marmot population outside of community-managed areas have been limited but anecdotal evidence suggests that a full recovery of the marmot population to pre-1990 levels has not yet been achieved.

2 A World Bank-funded study led by Dr. Dennis Sheehy from the US-based International Center for the Advancement of Pastoral Systems: "Mongolian pasture quality decline" *The Mongol Messenger*, No. 31 (943) Wednesday, July 29, 2009.

Mongolian Gazelle

The population of Mongolian gazelle was estimated to be 1.2 million in 2005, but a range-wide survey has not been repeated since then. Large congregations of Mongolian gazelle continue to be seen across the steppe but evidence suggests that their movements are being curtailed by the distribution and density of human activities including livestock herding, oil and mineral extraction and agricultural development.

Saker Falcon & White-naped Crane

Systematic surveys to assess the population of saker falcons and white-naped cranes on the Eastern Steppe have not been completed. Although both species of birds are frequently observed, threats to individuals and their habitat are also continually documented. The saker falcon is captured in the wild and exported to meet the demands of the international falcon trade. Wetlands, which serve as critical breeding and nesting habitat for white-naped cranes, are inundated by grazing wildlife, negatively impacting fledgling survival and nesting success.

Value of the GCP Program

USAID/GCP funding to the ES-LLP project supported the application of the Landscape Species Approach which provided the framework for developing the first participatory landscape-level plan for conserving this vast, globally important grassland. Stakeholders set population goals for each of a core set of conservation targets (the Landscape Species) and identified those critical actions which are necessary to address threats to wildlife and livestock herder livelihoods and reach the established conservation goals. GCP support for explicit outreach, participatory workshops and conferences facilitated the development of a vast network of national-, provincial-, and local-level stakeholders with a commitment to conserving the grasslands and wildlife of the Eastern Steppe. WCS-Mongolia is confident that the strong stakeholder network and the LSA-guided conservation plan for the Eastern Steppe will provide the foundation necessary to build effective and comprehensive conservation programs which will sustain and attract other sources of funding and support for grassland and wildlife conservation on the Eastern Steppe into the future.

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