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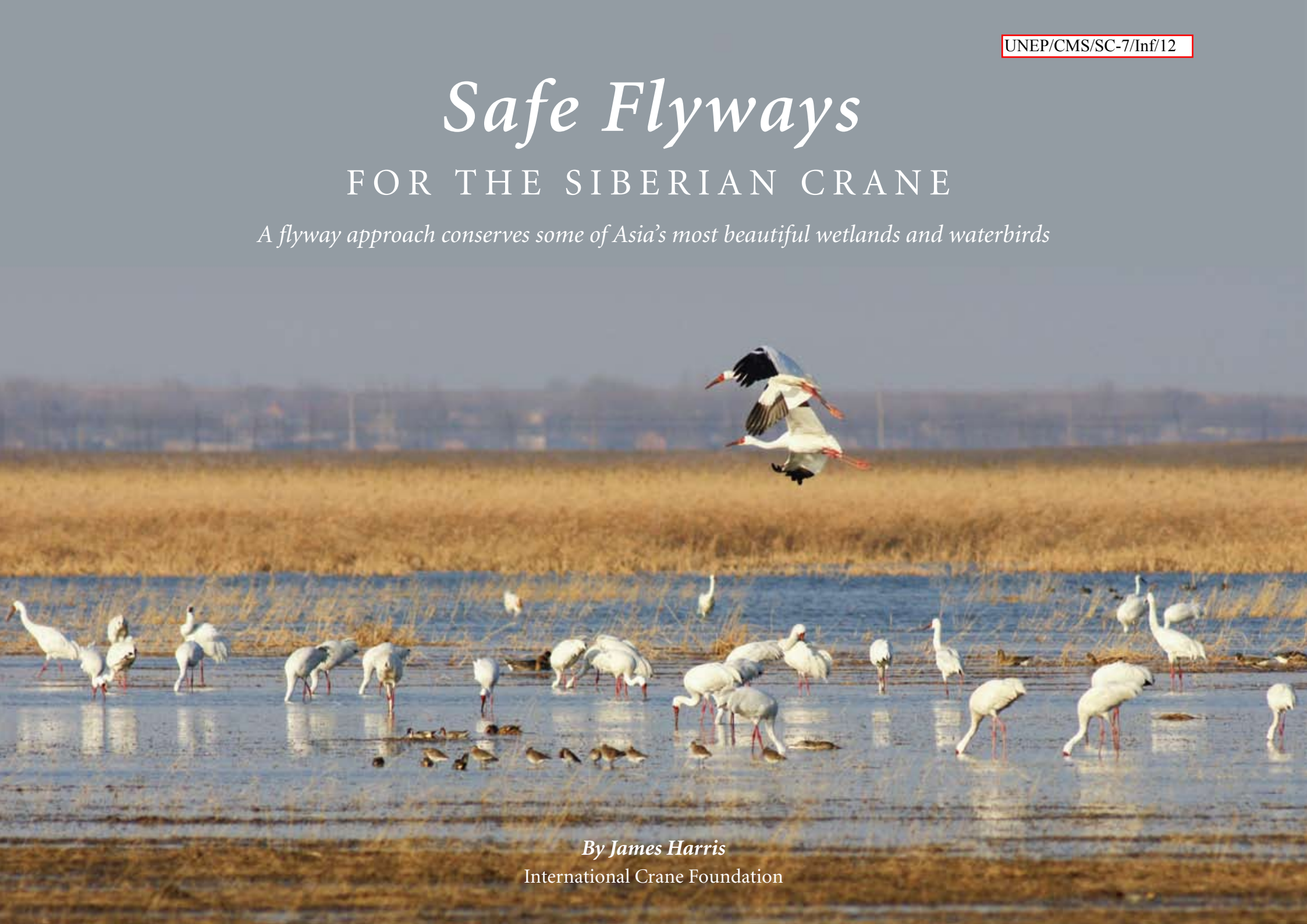
Safe Flyways

FOR THE SIBERIAN CRANE

A flyway approach conserves some of Asia's most beautiful wetlands and waterbirds



By James Harris
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Cover photo: Siberian Cranes rest during migration at Huanzidong Reservoir in Liaoning Province, China. Photo by Zhou Haixiang

Siberian Crane. Photo by I. Gavrilova
Red-breasted Geese. Photo by Crawford Prentice

Safe Flyways

FOR THE SIBERIAN CRANE

A flyway approach conserves some of Asia's most beautiful wetlands and waterbirds

By James Harris

Terminal Report of the UNEP/GEF Siberian Crane Wetland Project:
Development of a Wetland Site and Flyway Network for Conservation of the Siberian Crane and Other Migratory Waterbirds in Asia, GF/2712-03-4627

UNEP gef CMS INTERNATIONAL CRANE FOUNDATION SIBERIAN CRANE WETLAND PROJECT Department of Environment

Above: Siberian Cranes begin migration south from Huanzidong Reservoir in northern China. Photo by Su Liying

Right: Maya River and wetlands of Chabda Republic Resource Reserve in southern Yakutia provide important resting habitat for migrating Siberian Cranes. Photo by Crawford Prentice

Dedicated to Professor Wang Qishan
Who has tirelessly worked for cranes, wetlands, and conservation,
Who has taught so many of us so much,
Who continues to inspire.

Dedication

Professor Wang Qishan is an outstanding teacher, researcher, and conservationist. Through his teaching career in Anhui University, spanning more than 50 years, and through his active support of the China Ornithological Society, he has helped many young people become effective scientists and conservationists.

He has actively studied cranes and storks since the 1980s, starting from the early period of crane research in China. By leading the Crane and Waterbird Group of China and editing the China Crane News since 1996, he has touched almost all people involved in crane study and wetlands conservation in China and many from overseas. He has served as an ICF Advisor for many years.

Professor Wang has a strong sense of social responsibility. When there is need for scientific opinion on issues of conservation, he always uses straightforward, clear, and articulate language to explain the impacts human activities will have. He demonstrates for all of us a commitment to good science and to our environment.

Left: Dawn on the Maya River, Yakutia, Russia.
Photo by Crawford Prentice

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Eagle Owl. Photo by Zhao Jun

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Foreword from the United Nations Environment Programme (UNEP) & Global Environment Facility Secretariat

More than ever in human history, people need secure sources of water to survive. Civilizations have risen by the water's edge and wetlands in particular teem with life. Yet where water has been abused and lost, civilizations too have vanished.

As we highlight 2010 as the International Year of Biodiversity this publication highlights the inter-connections between water, wetlands, wildlife and our own welfare by showcasing an innovative project that has protected some of the world's most majestic creatures.

Cranes, a flagship species of waterbirds, have great cultural significance—and in particular the Siberian Crane. They delight us with their ritual dances, stunning plumage, and distinctive calls that resonate across miles of marshes. However, by the 1970s, seven of the world's fifteen crane species were threatened with extinction. Even with decades of conservation efforts, cranes remain threatened with 11 species at risk. Similar negative trends appear among other waterbird groups: in Asia 59% of known waterbird populations are declining, 27% are stable and only 10% increasing. Meanwhile escalating human demand on limited water supplies and land is accelerating the loss and degradation of wetlands on which both humans and waterbirds depend.

To help reverse these trends, the UNEP/GEF Siberian Crane Wetland Project was the first project of its kind to take a "flyway" approach to conservation. We looked to secure the ecological integrity of a network of 16 critical wetlands that stretched across two continents to protect the Siberian Crane and other migratory waterbirds. Through unparalleled international cooperation project managers tracked annual migration routes from breeding to wintering sites, across four countries: the Russian Federation, China, Iran and Kazakhstan for close to a decade.

Over this period the GEF invested $10 million which countries and other partners matched this commitment with another $37 million. What did we get in return? A pioneering new approach to help people thrive without generating further risks to habitat.

The list of those to be thanked is long, but we would like to single out the International Crane Foundation as well as country executing agencies for their dedicated and professional leadership of the project. The way forward is complex, and there remain persistent and emerging challenges ranging from climate change to continued human-induced pressures on these wetlands. However, this project has demonstrated that even in the face of seemingly insurmountable odds, transformational change is possible. It is our shared hope that our experience in flyways-based approaches to conservation will lead to further investments and impact.

Monique Barbut
Chief Executive Officer
Global Environment Facility
Washington, USA

Achim Steiner
Executive Director
United Nations Environment Programme
Nairobi, Kenya

Foreword from the Convention on Migratory Species (CMS)

The Secretariat of the Convention on Migratory Species has long been associated with efforts to protect the Siberian Crane, which is a flagship species for what this intergovernmental agreement strives to achieve: conservation of essential habitats for migratory species, development of innovative strategies to deal with recognised threats, exchange of vital scientific knowledge, and fostering cooperation among nations with a common natural heritage.

Beginning in the early 1970s, researchers and conservationists from Eurasia and North America forged ties to try to conserve the endangered Siberian Crane. These efforts were drawn together and given a more solid framework with the adoption in 1993 of a dedicated ***Memorandum of Understanding concerning Conservation Measures for the Siberian Crane.*** The so-called "Siberian Crane MoU" was the first instrument of its kind developed under CMS. Its pragmatic conservation approach was designed to stimulate practical cooperation among all of the countries that hosted these majestic birds.

Over the years, regular meetings of the 11 Siberian Crane Range States made important progress towards understanding the myriad of threats to this critically endangered species and designing remedial actions to address them. It became clear, however, increased emphasis was needed on the conservation and management of critical wetlands within an integrated flyway approach, and that more substantial resources were needed to reverse the populations' decline.

In response to these needs, CMS encouraged and supported the International Crane Foundation to apply through the United Nations Environment Programme for funding from the Global Environmental Facility. At a historic Siberian Crane MoU Range State Meeting held in the Islamic Republic of Iran in 1998, ICF began collaboration with the Governments of China, Iran, Kazakhstan, and Russia to develop this joint initiative, focusing on the Siberian Crane and a network of globally important wetlands along the species' flyways in Eurasia. These early discussions, underpinned by the CMS MoU, ultimately led to the creation of the UNEP/GEF Siberian Crane Wetland Project (SCWP).

Ten years later, this report recognizes and celebrates the accomplishments of this landmark project, which was showcased at the CMS Conference of Parties in Rome in December 2008. Indeed, the SCWP has achieved much in the course of its six-year operational phase. China demonstrated excellent progress throughout the project, with good prospects for internalizing and continuing many activities after formal completion of the SCWP. Iran made important breakthroughs in community involvement and participatory management at its SCWP sites, and plans to apply these approaches at other locations. Kazakhstan made very good progress in the designation of reserves, development of a vast array of public education materials, and very successful public participation initiatives. Some of these activities will continue through a newly created non-governmental organization. Russia created an important new protected area, developed strong community-based management plans, and has implemented monitoring activities carefully coordinated with other countries.

CMS takes pride in having been associated with this successful UNEP/GEF Siberian Crane Wetland Project since its inception. We must ensure that the project's important results are sustained, advanced and applied elsewhere. To that end, CMS is committed to working with the Siberian Crane Range States and other partners to strengthen and promote the long-term goals of the Siberian Crane MoU. Many challenges remain and it will only be through a redoubling of our efforts that the future of the Siberian Crane will be assured throughout its historical range.

Elizabeth Mrema
Executive Secretary
Convention on Migratory Species

Acknowledgments

The project would not have been possible without the contributions of a network of diverse and dedicated organizations and individuals. Although we cannot acknowledge each of you here, please accept our deep appreciation for all you have given to fulfill this shared dream. The contributions of the project will live on through your continued work.

The significant accomplishments under this project would not have been possible without the generous support of our donors. This project received $10,350,000 in funding through the United Nations Environment Programme and the Global Environment Facility. The project secured about $17 million in cash and in-kind co-financing during preparation and implementation, a total well exceeding our original co-financing budget of $13,334,370. In addition, the project had over $20 million in associated financing. A complete list of co-financing is provided in Annex 2. Sources of co-financing in excess of $10,000 are listed below. We are very grateful for this support.

We wish to thank staff of the Division of GEF Coordination, United Nations Environment Programme, for their support, and in particular the mentoring and constructive insights of our task managers Mark Zimsky (during preparation and during the first two years of the project) and Max Zieren (from 2004-2010). Sandeep Bhambra steered us through the complex financial aspects of the project. During project preparation Sheila Aggarwal-Khan provided invaluable guidance.

The vision and experience from the Convention on Migratory Species has been highly significant for this project and for Siberian Crane conservation more generally. We are grateful to everyone at CMS and particularly to Douglas Hykle for his commitment and leadership for the CMS MoU for the Siberian Crane and his insights throughout the project.

The executing agencies for the four countries played essential and important roles. The national executing agencies and national project directors during the project included: State Forestry Administration of China, Mr. Wang Wei; Department of Environment of Iran, Mr. Anoushirvan Najafi, Mr. Mohammed Ayatollahi and Dr. Delavar Najafi Hajipour; the Forest and Hunting Committee of the Ministry of Agriculture of the Republic of Kazakhstan, Mr. Khairbek Mussabaev and Mr. Bakytbek Duisekeyev; and the All Russian Research Institute for Nature Protection of the Ministry of Natural Resources, Russia, Mr. Andrey Peshkov and Mr. Valery Tikhomirov.

Staff members of the Regional Coordination Unit (RCU) and the four National Coordinating Units worked tirelessly toward the success of project operations and implementation. The individuals serving at the end of the project are listed in Annex 3. In particular, we wish to credit the four national project managers: Qian Fawen (China), Sadegh Sadeghi-Zadegan (Iran), Vera Inyutina (Kazakhstan), and Julia Gorelova (Russia). The national technical coordinators at the end of the project were: Jiang Hongxing (China), Azin Fazeli (Iran), and Alexei Blagovidov (Russia). Project activities in Yakutia in far eastern Russia were coordinated by the Institute for Biological Problems of the Permafrost Zone/Cryolithozone and led by Nikolai Germogenov. Within the RCU, Claire Mirande served as Project Director, Crawford Prentice as International Technical Advisor, and Patricia Gleason served as Operations Manager. We also wish to recognize the many dedicated people who served as staff in different functions in the NCUs, RCU and other parts of the project structure, some of whom moved on before the end of the project.

We wish to thank members of the Project Steering Committee and Project Advisory Committee and the National Project Steering Committees from the four countries. The project could not have been effective without the strong support from staff serving at the project sites, numerous consultants in all four countries, and conservation and other relevant staff at national, provincial and local levels of government. We regret that we cannot list all of them by name, but many of them appear in narratives of this report, in the proceedings for the Project Completion Workshop, and as authors of outputs that are listed in Annex 4. Many of these individuals assisted with preparation of this report, including Crawford Prentice and other technical and management staff of the RCU and National Coordinating Units. Sara Gavney Moore served as Photo and Graphics Editor and coordinated the design work with Next Level, Inc., of Baraboo, Wisconsin. We appreciate the generosity of many photographers in allowing us to use their images.

Finally, George Archibald, Co-founder of ICF, played a key role in initiating this project and in supporting conservation efforts, particularly along the Western and Central Flyways.

List of co-financing contributions over $10,000:

China: Heilongjiang Water Resource Department and Qiqihar City Government, Hungriness Prevention and Cure Center, Jiangxi Finance Bureau, Jiangxi Forestry Department, Jilin Forest Bureau, Jioujiang City Government, Keerqin Finance Bureau, Keerqin National Nature Reserve (NNR), Meteorological Bureau of Zhenlai County, Momoge NNR, National Bird Banding Center, Nanchang City Government, Poyang Lake NNR, Qiqihar Finance Bureau, State Development and Reform Committee, State Forestry Administration, Wildlife Protection Management Bureau of Jiangxi Province, Xianghai NNR, and Zhalong NNR.

Iran: Department of the Environment, and UNDP/GEF Small Grants Programme at UNDP-Tehran.

Kazakhstan: Ecosanitary-Energy-Ecology Project and Empowerment and Local Action Project, and Kostanay Region Society of Hunters and Fishermen/Kazakhstan Hunters Society.

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ICF/Regional Coordination Unit: Charlotte and Walter Kohler Charitable Trust, ConocoPhillips SPIRIT of Conservation Migratory Bird Program, Convention on Migratory Species, Cracid Breeding and Conservation Center, Doris Duke Foundation, Felburn Foundation, Henry Luce Foundation, ICF, Lufthansa Airlines, Moscow Zoo, National Committee on US-China Relations, National Fish and Wildlife Foundation, National Science Foundation-Integrative Graduate Education and Research Traineeship Program, North East Asia Crane Site Network, Terry and Mary Kohler, Trust for Mutual Understanding, and the Windway Foundation. Special thanks to:

List of Websites

Visit the following websites to learn more about Siberian Crane conservation:

www.scwp.info
UNEP/GEF Siberian Crane Wetland Project
Information on national and flyway-level project activities

www.sibeflyway.org
Siberian Crane Flyway Conservation
Clearinghouse for information on Siberian Crane conservation in Eurasia

www.savingcranes.org
International Crane Foundation
Siberian Crane fact sheet and information on international conservation programs for Siberian and other crane species and their habitats

www.cms.int
Convention on Migratory Species
Information on the Siberian Crane Memorandum of Understanding

www.unep.org
United Nations Environment Programme
Information on international environment and development programs

www.redlist.org
IUCN Red List of Threatened Species
Information on globally threatened species, including the Siberian Crane

I. Introduction

Can a flyway approach to conservation benefit wetlands scattered across a continent as well as the cranes and other waterbirds that depend upon them?

Humanity has great need of water, and our civilizations have risen by the shores of seas, where rivers come together, and upon the marshy edges of lakes. Wetlands, at the interface of land and water, are remarkably productive ecosystems. Yet where water has been abused and lost, civilizations too have dried up and vanished.

As people have lived in, around and near water, our companions for millennia have been waterbirds that in their size, diversity, and magnificence have stirred our love at the same time they have fed us. Waterbirds have great cultural significance, and none more so than the cranes that stand upright on two legs, as tall as many people. The cranes delight us with their threat displays and ritual dances, their simple but stunning plumage. Some species have long trachea coiled inside the sternum, giving the calls a resonance and power that carries miles across the marshes. These birds are voices and spirits of the wetlands.

Despite their special roles in culture, cranes, like most waterbirds, have declined dramatically. By the 1970s, seven of the world's fifteen crane species were threatened with extinction. Despite decades of conservation effort, the number of threatened cranes has now risen to eleven. Similar trends appear among the ducks, geese, swans, shorebirds, and other waterbird groups. Globally, 40% of known waterbird populations are declining, with 34% stable and only 17% increasing. For Asia the statistics are worse: 59% of known populations are declining, with 27% stable and 10% increasing (see Figure 1). The ratio of decreasing to increasing populations for Asia is 6:1, the worst of any region in the world (Wetlands International 2006).

While the causes for these declines are diverse and vary among species, the common and dominant threat has been loss and degradation of the wetland habitats on which cranes and other waterbirds depend. Across vast portions of Asia, human populations have risen dramatically and placed escalating demands on limited water supplies and other natural resources. Rapidly developing economies, while they have expanded humanity's accumulations of wealth, have placed further demands on water. In Asia, where some 85% of the wetlands of international importance are threatened, rice cultivation has claimed 40 million hectares in the central plains of India and significant portions of natural wetland areas in Thailand, Vietnam, and China (Moser et al. 1996). Jiang (2009) indicates that 50% of wetlands in the Yangtze River Basin have been lost, while Zhang et al. (2009) reported that the area of marsh and meadow in Small Sanjiang Plain of northeast China decreased from almost 1 million hectares in 1976 to about 206,000 hectares in 2005. Even where wetlands remain, whether or not they have protected status, they are especially vulnerable to changes humans bring to the landscape. Changes in hydrology have occurred as the result of impoundments, water diversions and flood protection embankments, as well as land use changes in the catchment areas that feed the wetlands. These changes

Swan Geese take flight at Xianghai Nature Reserve, China. Photo by Zhao Jun

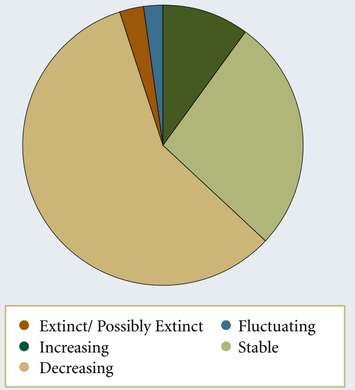

Figure 1. Waterbird population trends in the Asia Ramsar region

This chart illustrates data for the populations with known trends (44%) and does not represent trends for the remaining 56% of waterbird populations with insufficient data. Data compiled from Waterbird Population Estimates – Fourth Edition, Wetlands International (2006).

Fires sweep across wetlands in May 2005 at Zhalong Nature Reserve, China, destroying waterbird nests and habitat. Photo by Wang Wenfeng

to natural seasonal fluctuations in water supply can severely degrade the ecological functions of wetlands and their capacity to sustain diverse life. Intensifying use of the remarkable productivity of the wetlands themselves–harvesting of fish and reeds, the grazing of cattle, sheep, or domestic ducks, crab-farming, and mining of peat or sand–can also reduce biodiversity and affect overall wetland health.

The UNEP/GEF Siberian Crane Wetland Project[1] arose out of concern for the widespread loss of wetlands and the precarious status of numerous waterbird populations across Asia. The migratory habits of most waterbird species add great complexity to conservation tasks where wetlands essential for breeding, migratory stopovers, and wintering all need to be sustained as vital links in the annual cycle of these birds. Conservation of the Siberian Crane *Grus leucogeranus* is especially challenging due to its isolated populations that until the last decade undertook three separate migration routes thousands of kilometers in length; furthermore, the species is the most highly aquatic of cranes and the least flexible in terms of food and habitat requirements. The species is strikingly beautiful and beloved in traditions of all countries where it has occurred, and it has raised conservation awareness and concern among a remarkable range of people, from herdsmen and fishermen living on the land to the highest levels of government.

This project therefore has focused on the critically endangered Siberian Crane as a flagship species, and has taken a flyway approach to the protection of a network of wetlands along two of the Siberian Crane flyways. The complexity of the project required an unusually long period for development and design (2000-2003), and project implementation has lasted almost seven years (2003-2009). This project, the first GEF Full-Size project to take a flyway approach to conservation, has thus provided new experience regarding the effectiveness of this strategy to conserving an array of globally important wetlands. In turn, can a flyway approach that focuses on key wetlands bring tangible benefits to threatened species such as the Siberian Crane and at least 27 other waterbird species of global conservation concern that use these same wetland sites and flyways?

This report describes the successes and challenges experienced during the Siberian Crane Wetland Project, and shares lessons learned that may benefit other efforts to safeguard wetlands, waterbirds, and the long flyways across Asia and other parts of the world.

[1] Full project title: Development of a Wetland Site and Flyway Network for Conservation of the Siberian Crane and Other Migratory Waterbirds in Asia, GF/2712-03-4627

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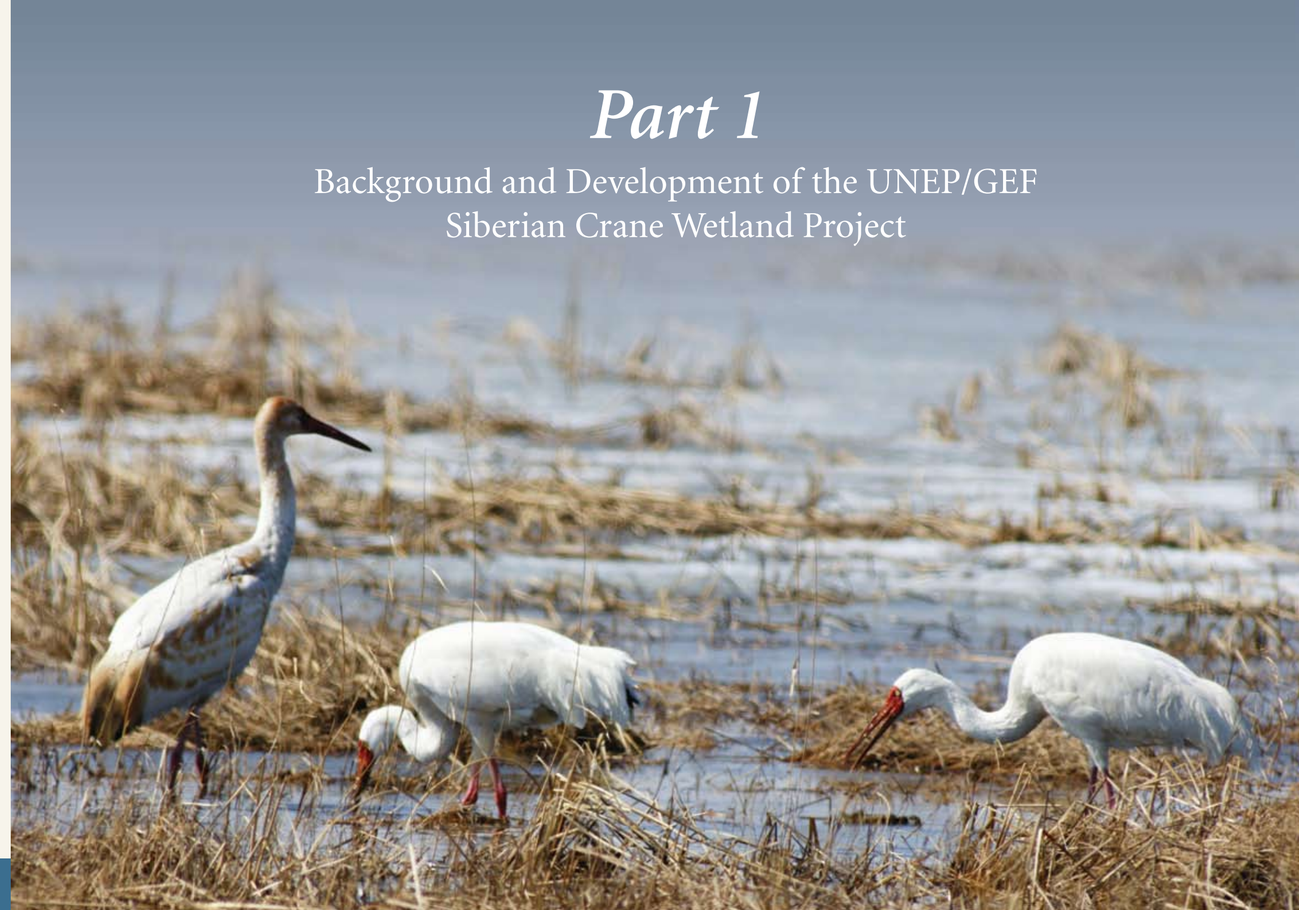
Part 1

Background and Development of the UNEP/GEF Siberian Crane Wetland Project



II. Story of the Great White Crane

Dr. Vladimir Flint (Russia), Ronald Sauey (ICF Co-founder), and Ali Ashtiani (Iran) start long-term cooperation on Siberian Crane conservation. Photo from ICF archive

Previous page: Siberian Crane family. Photo by Zhou Haixiang

Can we bring this "lily of birds" back from the edge of extinction?

The Siberian Crane historically bred over a wide swath of tundra and northern taiga across the breadth of Asia. Onset of winter forced long migrations south, where human populations were large and even a thousand years ago pressure on wetlands in places like the Ganges Plain and Yangtze River Basin had become intense.

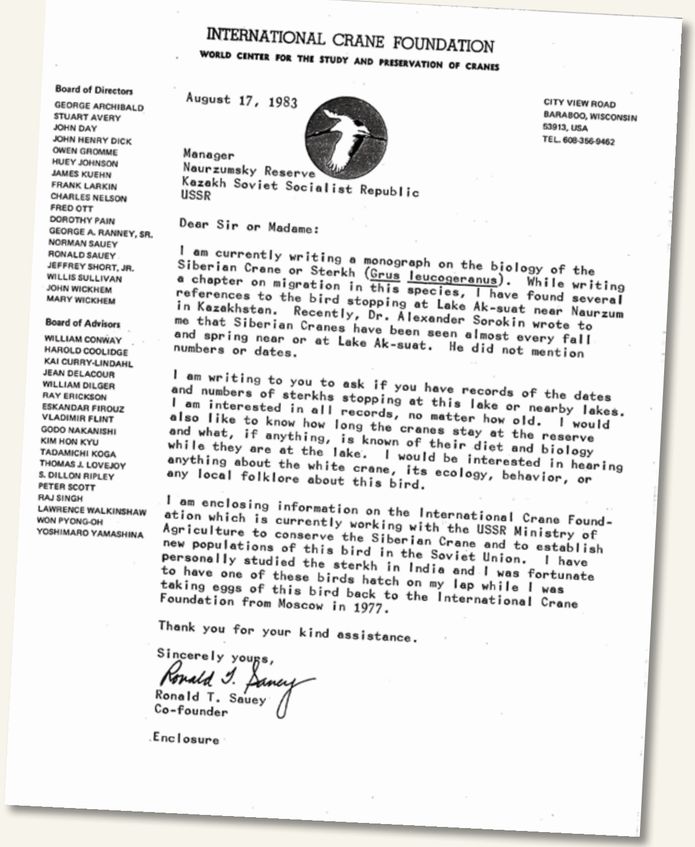
During the 1970s, when the International Crane Foundation (ICF) was established, communication was extremely limited among scientists across this vast range, and political tensions prevented travel. Both numbers and distribution of the species had shrunk dramatically, compared with early reports in the 1800s, but information was sparse and fragmented. A small flock wintered at Keoladeo in northern India, apparently the only Siberian Cranes surviving in central and west Asia, but their breeding grounds were unknown. A larger flock nested far to the east on the tundra of Yakutia, but the wintering grounds were unknown.

ICF recognized the species needed urgent help. ICF's Co-founder Dr. George Archibald first visited Moscow in 1976, where he met one of the Soviet Union's leading ornithologists, Dr. Vladimir Flint. A major part of their discussions centered on the Siberian Crane. Flint estimated only 300 birds survived in the eastern population. Since the number wintering in India had gradually decreased to less than 70 birds, that meant the world population was probably well under 500, making the species the second rarest of all cranes after North America's Whooping Crane *Grus americana*.

Flint, Archibald, and ICF's other Co-founder Ronald Sauey soon concocted an ambitious plan to save this imperiled species. Their first step was to establish a captive population and develop reliable breeding techniques for a species that had never bred in captivity. In 1977 and 1978, Flint collected eggs from nests on the Yakutian tundra, flew them back to Moscow (kept warm in special boxes with hot water bottles) and handed them over to ICF. The eggs flew all the way to Wisconsin for hatching, and began a captive flock that within a few years ICF was able to breed. Using similar techniques, the Russians started their own captive flock at Oka State Nature Reserve not far from Moscow.

As these captive flocks matured, ICF, Flint, his former student Dr. Alexander Sorokin, and other crane specialists experimented with release of captive-bred birds into the wild. A full-scale reintroduction could not be undertaken until the team gained experience with techniques in a daunting landscape with vast distances for birds to travel, no roads for the scientists, and minimal other facilities. Cranes, unlike many birds, learn where to migrate from their parents. The hope was to learn how to release chicks so that the young birds could join the remnant flocks wintering at Keoladeo, follow the older birds, and learn the ancestral migration pathways. If the remnant flocks vanished, the ancient knowledge would be lost.

During the mid 1970s, Ron Sauey did his Ph.D. research on the Siberian Cranes wintering at Keoladeo. The birds tolerated close observations so that Sauey, from 20 to 30 meters distance, was able to watch the cranes select food and eat. Their diet consisted primarily of tubers of aquatic plants. Unlike cranes of other species at Keoladeo, the Siberian Cranes spent all their time in



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WORLD CENTER FOR THE STUDY AND PRESERVATION OF CRANES

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August 17, 1983

Manager
Naurzumsky Reserve
Kazakh Soviet Socialist Republic
USSR

Dear Sir or Madame:

I am currently writing a monograph on the biology of the Siberian Crane or Sterkh (Grus leucogeranus). While writing a chapter on migration in this species, I have found several references to the bird stopping at Lake Ak-suat near Naurzum in Kazakhsten. Recently, Dr. Alexander Sorokin wrote to me that Siberian Cranes have been seen almost every fall and spring near or at Lake Ak-suat. He did not mention numbers or dates.

I am writing to you to ask if you have records of the dates and numbers of sterkhs stopping at this lake or nearby lakes. I am interested in all records, no matter how old. I would also like to know how long the cranes stay at the reserve and what, if anything, is known of their diet and biology while they are at the lake. I would be interested in hearing anything about the white crane, its ecology, behavior, or any local folklore about this bird.

I am enclosing information on the International Crane Foundation which is currently working with the USSR Ministry of Agriculture to conserve the Siberian Crane and to establish new populations of this bird in the Soviet Union. I have personelly studied the sterkh in India and I was fortunate to have one of these birds hatch on my lap while I was taking eggs of this bird back to the International Crane Foundation from Moscow in 1977.

Thank you for your kind assistance.

Sincerely yours,
Ronald T. Sauey
Ronald T. Sauey
Co-Founder

Enclosure

Ron Sauey helped build partnerships among scientists in western Asia studying the Siberian Crane, while at the same time he worked to start a captive Siberian Crane population. This letter from 1983 details Ron's inquiry to the Director of the Naurzum Reserve, today an SCWP site, about possible sightings of migratory Siberian Cranes. Letter from ICF archives

In 1981 researchers discovered the breeding grounds for the central Siberian Crane population at Kunovat in the Ob River Basin of western Russia. Photo by Yuri Markin

the wetlands, with a highly restricted plant diet. This highly specialized ecology of the species has made it especially vulnerable to habitat loss.

In 1979, George Archibald made his first visit to China, where he met Professor Cheng Tso-shin and colleagues at the Institute of Zoology in Beijing. They talked about the Siberian Crane: where in China did the species survive? Old reports from the mid Yangtze River Basin suggested where the search should begin. Archibald had brought color prints made from photographs of a Siberian Crane family at Keoladeo–prints donated by a friend, Danny Weaver, who specialized in photographing dairy cows in rural Illinois, but who had become intrigued by ICF and the cranes and the countries where they journeyed. The Chinese sent the photographs to contacts within the historic range. Several reports of cranes proved, upon investigation, to be other white birds. Finally, they received a response from Jiangxi Province.

The mid Yangtze Basin held vast spaces of lake, mud, water and potential crane habitat. The Chinese searched during three winters before finally seeing about 100 Siberian Cranes at Poyang Lake in Jiangxi Province. The next year, in 1981, they found 230 birds near the northwest corner of the lake, a number consistent with Flint's population estimate from the breeding grounds (Zhou and Ding 1987).

A second major discovery in 1981 revealed the breeding grounds of the central flock of Siberian Cranes at Kunovat in the Ob River Basin in western Siberia, where cranes nested where taiga mingled with wetland. This land belonged to the Khanty people, for whom the Siberian Crane was sacred. Just three year s earlier, in 1978, the Iranians had reported on the discovery of a third but tiny wintering flock of a dozen birds, located on the south shore of the Caspian Sea near the town of Fereydoon Kenar (Ashtiani 1987).

Discoveries of two "new" wintering grounds provided opportunity to learn much more about the species' ecology and conservation needs. Conditions at Poyang Lake were dramatically different than in Iran and India, although all three locations had wide expanses of shallow water. Poyang Lake itself extends across 400,000 hectares, and water levels drop as much as 11 meters from summer floods to the winter dry season. By the mid 1980s, hundreds of kilometers of dikes had been constructed around Poyang, but the tremendous fluctuation in water levels prevented reclamation of much of the lake basin for agriculture. For this reason, the cranes and dozens of other waterbird species had space to

In fall 2001, the last Siberian Crane pair returned to Keoladeo National Park, the central population's wintering grounds in India. Photo by Ralph Arwood

thrive during winter.

At this time waterbird hunting was a major threat. While geese were the main target (five species winter at Poyang, including most of the world's Swan Geese *Anser cygnoides*), cranes also fell victim. Not surprisingly, cranes and waterbirds were extremely wary at Poyang, in marked contrast to Keoladeo and Fereydoon Kenar.

In 1978, Ron Sauey had arranged to quickly move north as soon as the small flock of Siberian Cranes set out from Keoladeo on their northward migration. Reports indicated that Lake Ab-i-Estada in southern Afghanistan was a key link in the migratory chain of wetlands used by this species and many others. Fifty-seven Siberian Cranes had left Keoladeo, and within 10 days Sauey had reached Ab-i-Estada and counted 57 Siberian Cranes! But war in Afghanistan soon followed, and the small flock continued its steady drop. Too many firearms and too many desperate people lived where this flock journeyed to and from Siberia. By winter 2001-02, there was just one pair of Siberian Cranes left. Then a single bird was sighted on the Kunovat breeding grounds in August 2002. At the end of 2002, no Siberian Cranes returned to Keoladeo (Sorokin et al. 2009).

In addition to hunting, the loss and degradation of habitat appeared to be a severe threat for the species. Keoladeo itself included artificially impounded wetlands built by the Maharaja to support duck hunting. The last years for the Siberian Crane at Keoladeo experienced water shortages and shrinking wetlands within the sanctuary, to the extent that some experts thought the last Siberian Cranes may have sought wetland habitat elsewhere in the Ganges Plain. And again, to the north, the flocks were all the more vulnerable to hunters due to the scarcity of wetlands.

In Iran, while several wetlands had been protected along the Caspian Sea, the remnant flock journeyed

Table 1. IUCN Threat Categories

The IUCN Red List Categories are a system for categorizing species at risk of extinction. The following definitions come from the Red List website, http://www.redlist.org/technical-documents/categories-and-criteria/2001-categories-criteria. This website provides detailed information on the criteria used for the classifications.

CRITICALLY ENDANGERED (CR). A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

ENDANGERED (EN). A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the medium-term future.

VULNERABLE (VU). A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

LOWER RISK (LR). A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable.

Lesser White-fronted Geese Share Flyways with the Cranes

While the Siberian Crane is our flagship species, many other threatened bird species share the same wetlands. Satellite tracking has revealed that the Lesser White-fronted Goose migrates along much the same flight paths as the Siberian Crane in both East and West Asia. In contrast to its widespread sister species, the Greater White-fronted Goose *A. albifrons*, the Lesser White-fronted Goose has a limited, although scattered breeding range and winters in only a few places. Its population has steadily declined primarily due to hunting along both flyways. Aside from autumn hunting, in Russia spring hunting is also popular, a practice which has a greater impact on waterbird populations (Reed et al. 2004). The world population is estimated at 28,000 to 33,000 and declining (Wetlands International 2006). Additional threats include loss of habitat and human disturbance. Climate change is expected to affect the tundra breeding grounds.

Improved protection of wetland habitats for Siberian Cranes will benefit Lesser White-fronted Geese and many other species. Yet habitat protection will not be sufficient. A future for this species-and for many other waterbirds, especially in West Asia-depends on awareness and support for conservation from hunters, and much better control of hunting seasons, methods, and harvest numbers. Even relatively numerous species like the Greater White-fronted Goose and Bean Goose *A. fabilis* have experienced 85% and 60% declines respectively for their East Asian populations since the mid-1980s (Syroechkovskiy 2006).

The threatened Lesser White-fronted Goose shares similar flyways with the Siberian Crane in both West and East Asia. Photo by Zhou Haixiang

to another set of artificial impoundments, locally called *damgahs*, near Fereydoon Kenar amidst large areas of cultivated rice. At the damgahs, duck trappers kept away more traditional hunters with their firearms and disturbance to birds. The trappers kept domestic ducks that served as decoys, luring wild ducks into the damgahs. When the wild birds tried to fly out, they were captured in nets. Siberian Cranes and other rare birds such as Red-breasted *Branta ruficollis* and Lesser White-fronted Geese *Anser erythropus* found refuge from disturbance and good feeding conditions.

The situation appeared better in the east. In 1984, 800 Siberian Cranes were counted at Dahu Chi to the northwest of the main lake in the Poyang Lake Basin. In 1985, a group from ICF counted 1,350. Additional counts in later years confirmed a total population of 3,000 (Meine and Archibald 1996; ICF unpublished data).

Such was the charisma of the cranes that Chinese authorities had declared the small lakes and wetlands at the northwest edge of the basin as Poyang Lake Nature Reserve. This period of the 1980s was an exciting time of discovery, or rediscovery, as Chinese and cooperating foreign scientists explored wetlands across the country, finding numerous waterbirds and setting up nature reserves.

The Siberian Crane migrated across the densely populated plains of eastern China relying upon a network of wetland reserves that gradually became established. Many cranes paused and rested on migration at Zhalong Nature Reserve. Other reserves were created in nearby Jilin Province (Xianghai and Momoge Nature Reserves) and Inner Mongolia (Keerqin).

Naurzum Lake System, Kazakhstan. Photo by Crawford Prentice

Most of the world's Swan Geese, a vulnerable species, winter at Poyang Lake where they often feed with cranes on tubers of Vallisneria spiralis. *Photo by Ji Weitao*

Also during the 1980s and 1990s, scientists from the Soviet Union undertook expeditions across sparsely populated expanses of Siberia where so many of the waterbirds of the Asian flyways breed. Altogether, six million hectares were designated as protected areas, benefitting cranes and multitudes of other waterbirds. In 1996, from a satellite radio transmitter attached to a crane on the wintering grounds in Iran, the migration route was traced along the west side of the Caspian Sea to breeding grounds in western Siberia, about 1,000 km directly south of the breeding grounds at Kunovat. On migration both populations rested at the Naurzum wetlands in northwest Kazakhstan. Also in 1996, the main breeding grounds in the east were designated as Kytalyk Resource Reserve.

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Siberian Crane chicks often beg food from their parents during fall migration and winter. Photos by Zhou Haixiang

The Siberian Crane's First Year

Siberian Cranes, like most other cranes, build a bulky nest out of wetland plants over or beside standing water. They lay two eggs, the second a couple days after the first. Incubation lasts about 30 days and begins as soon as the first egg is laid. Thus one chick hatches before the other and has a head start on growth and life. During the early weeks, the chicks fight ferociously. The older chick often gets most of the food. If food is scarce, as happens regularly in wetlands with their fluctuating waters and productivity, the older chick may get all, so that the younger chick starves. In addition, spring comes late to the tundra and weather can turn cold any time during summer, reducing available foods. Unlike Red-crowned *Grus japonensis* and Hooded Cranes *G. monacha* also of East Asia, Siberian Cranes seldom succeed in raising two chicks.

Shortly after the chick's first flight, the family starts the arduous migration south, the chick still with brown juvenile feathers and a weak voice that will distinguish it during early winter until the feathers gradually lighten and the voice changes in late winter. Chicks frequently beg food from their parents. Unless the chicks get separated, the family will migrate north together the following spring. Once back on the tundra breeding grounds, the parents no longer tolerate the chick, and start over again. One of the mysteries of the species is where the one-year-old birds spend their second summer. Do they or the lands they inhabit have special conservation needs?

III. Eleven Nations Come Together

Creation of the Siberian Crane Memorandum of Understanding, under the Convention on Migratory Species, and the genesis of the Siberian Crane Wetland Project

It is difficult to imagine the immensity of the Siberian Crane's overland journeys. Asia is vast indeed. The western population migrates 3,000 kilometers each spring and fall, and the eastern population 5,000 kilometers. The cranes must cross some of the highest mountains on Earth, and some of the bleakest deserts.

They cross lands inhabited by vastly different peoples. Any unified effort to address conservation of these small flocks must somehow involve all these nationalities, cultures and outlooks. As difficult as the challenges could be for a small organization, the International Crane Foundation recognized the future of this species depended on a concerted effort that would involve entire flyways. While Keoladeo and Fereydoon Kenar had significant threats that needed to be addressed, the decline in these flocks did not seem due to conditions on these wintering grounds per se, nor were immediate, significant threats evident on the remote breeding grounds where few people lived. The long journeys themselves, and the dangers these birds encountered as they migrated, seemed to underlie the declines.

The network of concerned scientists and government officials was thus one of the great accomplishments of the first two decades of work for this species. Yet there were important gaps, with no

Diverse people–from indigenous groups in northeastern Russia (the left photo shows the Head of the Evenk Nation, Ivan Atlasov, with an Evenk maypole, near Chabda Republic Resource Reserve) to students at Xianghai Nature Reserve in Northeast China (right)–are linked through Siberian Crane conservation efforts. Photos by Crawford Prentice and James Harris

Yuri Martin and Anastassia Shilina demonstrate the "Sibe in a Suitcase" education kit at the sixth meeting of the CMS MoU in Almaty, Kazakhstan. The crane model is used to introduce the public to Siberian Crane conservation projects along the western flyway. Photo by Crawford Prentice

representation from significant countries like Afghanistan. Even where our colleagues were active and strongly committed, as in Russia, a strong government role would be necessary to tackle the hunting threat.

The Convention on Migratory Species (CMS) was concluded in 1979 expressly for the purpose of conserving migratory species across their ranges. This objective is achieved in large measure by developing and implementing specialized international agreements for particular migratory species, with a secretariat administered under the United Nations Environment Programme. By the early 1990s, various agreements were under consideration, and the time was opportune to consider what might be done for Siberian Cranes.

The turning point came at a wetland symposium held in Karachi, Pakistan, in December 1991, which brought together many like-minded conservationists including ICF's George Archibald and CMS' Douglas Hykle, who promoted the idea of developing an agreement under CMS that would bring all of the range states together under a common umbrella.

In 1992 ICF collaborated with CMS to produce a first draft of a legally-binding agreement. Somehow, this formal approach didn't seem to suit the urgent need to get the countries working together without political or bureaucratic delay. A more practical, pragmatic formulation was needed. Douglas Hykle led a small working group of the CMS Scientific Council to produce an alternative text of a simpler 'memorandum of understanding' in May 1993, which was further refined, and ultimately the Memorandum of Understanding Concerning Conservation Measures for the Siberian Crane (Siberian Crane MoU) was concluded on June 16, 1993, in Kushiro, Japan.

The Siberian Crane MoU was the first instrument of its kind developed by CMS and has since served as a model for numerous other agreements that guide international action for migratory species. Significantly, for the very first time, the new CMS agreement provided for the participation of a non-CMS Party (the Russian Federation), as well as a number of non-governmental partners. When it took effect on July 1, 1993, the Siberian Crane MoU initially covered only the central and western flocks, but its scope was eventually modified in 1998/99 to incorporate the eastern flyway.

Since 1995 six meetings of the range states have been organized (see UNEP/CMS 1995, 1996). The number of Signatory States to the Siberian Crane MoU has grown from four in 1995 to a full complement of 11 (including Afghanistan, Azerbaijan, China, India, Islamic Republic of Iran, Kazakhstan, Mongolia, Pakistan, Russian Federation, Turkmenistan and Uzbekistan). In recent years steady progress has been made towards implementation of the Conservation Plans for the Western, Central and Eastern populations of Siberian Cranes. These Conservation Plans have become a central feature of the MoU. At each meeting of the range states, progress on the plans is updated, new issues discussed and revised plans created to guide and coordinate action over the coming three years (see UNEP/CMS 2008, or visit http://www.cms.int/species/siberian_crane/sib-meetings.htm).

The MoU has effectively served to unite all the range states and cooperating organizations in a common purpose, and has indirectly helped to secure substantial resources for essential conservation measures. Over the years, innovative techniques have been developed and employed to reintroduce Siberian Cranes into the wild and to enhance public awareness and education in many of the range states. Enormous strides have advanced the rearing of Siberian Cranes in captivity, to the extent that the availability of chicks for reintroduction is no longer a limiting factor.

A major obstacle to implementation of the Conservation Plans has been lack of funding. Beginning in the late 1990s, ICF and CMS began discussing the possibility of developing a major project through the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF). Through contacts Douglas Hykle made at UNEP, we learned that GEF would be interested in a project using the Siberian Crane as the flagship for protecting a network of wetland sites of international importance to migratory waterbirds and other biodiversity. Since its beginning, ICF had placed priority on using the charisma of cranes to implement broad protection measures significant to thousands of other wetland species. Hence, we embraced the exciting opportunity to design a project that would address one of the two major types of threat identified through the conservation plans–loss and degradation of habitat needed by Siberian Cranes along their flyways.

Siberian Cranes, Poyang Lake Basin, China. Photo by Crane Wu

Other work under the CMS MoU–concerning hunting, and development of reintroduction methods to bolster the remnant flocks in central and west Asia–would continue in parallel with the UNEP/GEF project that began to take shape in 2000-2001.

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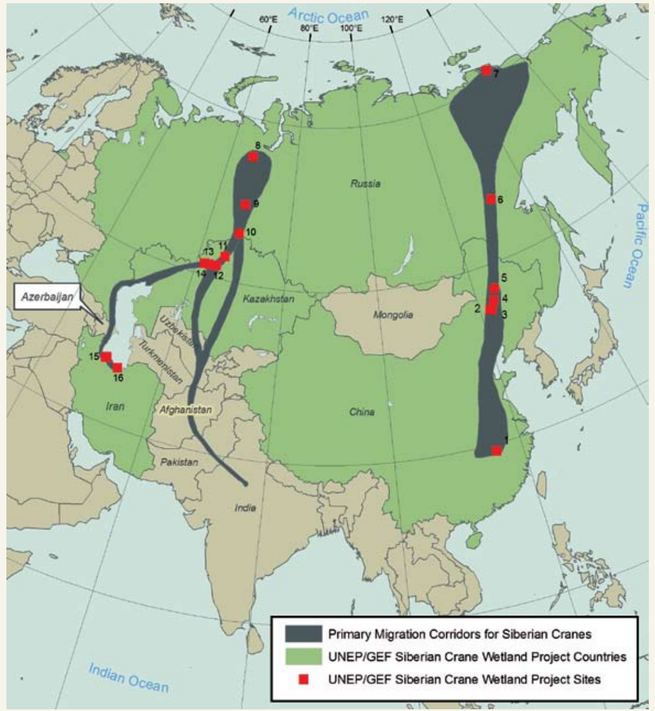

***Figure 2.** Locations of project sites (see Table 3 for site information)*
Map by Zoë Richenbach

IV. Introducing the Siberian Crane Wetland Project

How this project was designed to coordinate action across two flyways, four countries, and three scales of activity (regional, national, and site)

The UNEP/GEF project, "Development of a Wetland Site and Flyway Network for Conservation of the Siberian Crane and Other Migratory Waterbirds in Asia," was developed with support of a project preparation (PDF-B) grant during 2000-2001. Revisions to the project documents took place during 2002, with the final document submitted to the GEF Secretariat CEO on 6 February 2003. The project was launched in March 2003 and scheduled to end in March 2009. A project extension was granted in July 2009, so that the project officially concluded in December 2009.

The opportunity for GEF funding offered those concerned with the Siberian Crane MoU a scale of support far beyond anything previously available. Yet this Siberian Crane Wetland Project (SCWP) involved great complexities of biology (the cranes and the wetlands), of geography (including the immense length of the flyways), and politics (the countries were extremely different from one another).

One of the first decisions during project design concerned how many flyways to include. If the project undertook all three flyways, it would involve 11 range state countries as well as the International Crane Foundation as the International Executing Agency in cooperation with CMS. Yet even as project design commenced under the preparatory grant from GEF, the central flock had dwindled to a single pair–that vanished before the project formally began. The western flock was precariously small.

To simplify a complex project, and to focus resources on two immense flyways rather than three, only the eastern and western flyways were included. We did not believe we could address the severe hunting threats to the few birds remaining along the central flyway. For these countries, activities on behalf of migratory cranes and their wetlands would continue under the CMS MoU.

Whooper Swans take flight at Naurzum in northern Kazakhstan. Photo by Vladimir Potansky

Concurrent with SCWP, ICF and partners in Asia have continued to work on reintroduction techniques that would enable the western, and perhaps eventually the central flock, to be restored.

While the recovery of the critically endangered Siberian Crane was an important objective for the project, SCWP primarily used the crane as a flagship species for inspiring concerted action to safeguard a network of wetlands along the two flyways to the benefit of all migratory waterbirds. The eastern flyway had a viable population of over 3,000 Siberian Cranes and would receive the greater part of the project's resources. But the western flyway also had extremely important wetland sites. Our project would develop networks of sites essential for waterbird conservation in both flyways, with success measured in terms of the improved protection status of the sites and a mix of threatened waterbird species rather than simply numbers of Siberian Cranes (see Table 2). The results of this project would provide a basis for the expansion of the wetland site networks and wider application of the approaches that have been developed in each participating country.

The project area thus targeted the flyways and key wetland sites located in China, Iran, Kazakhstan and Russia (see Table 3 and Figure 2), and the governments of these four countries would have the central roles in executing the

***Table 2.** Globally significant migratory bird species occurring at project sites**

Globally Threatened Waterbirds at SCWP Sites (19)

- Siberian Crane *Grus leucogeranus* CR
- Sociable Lapwing *Vanellus gregarious* CR
- Slender-billed Curlew *Numenius tenuirostris* CR
- Oriental Stork *Ciconia boyciana* EN
- Black-faced Spoonbill *Platalea minor* EN
- Baer's Pochard *Aythya baeri* EN
- Red-crowned Crane *Grus japonensis* EN
- Red-breasted Goose *Branta ruficollis* EN
- White-headed Duck *Oxyura leucocephala* EN
- Lesser White-fronted Goose *Anser erythropus* V
- Swan Goose *Anser cygnoides* V
- Hooded Crane *Grus monacha* V
- White-naped Crane *Grus vipio* V
- Swinhoe's Rail *Coturnicops exquisitus* V
- Saunders's Gull *Larus saundersi* V
- Dalmatian Pelican *Pelecanus crispus* V
- Marbled Teal *Marmaronetta angustirostris* V
- Baikal Teal *Anas formosa* V
- Steller's Eider *Polysticta stellerii* V

Globally threatened wetland related birds (not waterbirds) at SCWP sites (8)

- Saker Falcon *Falco cherrug* EN
- Imperial Eagle *Aquila heliaca* V
- Greater Spotted Eagle *Aquila clanga* V
- Great Bustard *Otis tarda* V
- Japanese Marsh Warbler *Megalurus pryeri* V
- Aquatic Warbler *Acrocephalus paludicola* V
- Streaked Reed Warbler *Acrocephalus sorghophilus* V (this species is potentially present)
- Jankowski's Bunting *Emberiza jankowski* V

**See Table 5 of the Logframe Tracking Form in Annex 1 to this report for more information on populations*

CR CRITICALLY ENDANGERED
EN ENDANGERED
V VULNERABLE

Table 3. International significance of wetlands selected as project sites

Country (nos. refer to location in Figure 2)	Site Name	Selected List of Rare or Threatened Bird Species of International Importance (see Table 2 for scientific names of threatened species)
China-1	Poyang Lake Basin	Oriental Stork, Black-faced Spoonbill, Lesser White-fronted Goose, Swan Goose, Mandarin Duck *Aix galericulata*, Baer's Pochard, Siberian Crane, Hooded Crane, White-naped Crane, Swinhoe's Rail, Grey-headed Lapwing *Microsarcops cinereus*, Saunders's Gull, Great Bustard, Japanese Marsh Warbler
China-2	Keerqin Nature Reserve	Oriental Stork, Swan Goose, Baer's Pochard, Siberian Crane, Hooded Crane, Red-crowned Crane, White-naped Crane, Grey-headed Lapwing, Far Eastern Curlew *Numenius Madagascariensis*, Asian Dowitcher *Limnodromus semipalmatus*, Great Bustard
China-3	Xianghai Nature Reserve	Oriental Stork, Swan Goose, Baer's Pochard, Siberian Crane, Hooded Crane, Red-crowned Crane, White-naped Crane, Grey-headed Lapwing, Far Eastern Curlew, Asian Dowitcher, Great Bustard, Jankowski's Bunting
China-4	Momoge Nature Reserve	Oriental Stork, Swan Goose, Baer's Pochard, Siberian Crane, Hooded Crane, Red-crowned Crane, White-naped Crane, Grey-headed Lapwing, Far Eastern Curlew, Asian Dowitcher, Great Bustard
China-5	Zhalong Nature Reserve	Oriental Stork, Black-headed Ibis *Threskiornis melanocephalus*, Swan Goose, Baer's Pochard, Siberian Crane, Hooded Crane, Red-crowned Crane, White-naped Crane, Grey-headed Lapwing, Far Eastern Curlew, Asian Dowitcher, Japanese Marsh Warbler
Russia-6	Middle Aldan	Siberian Crane, Hooded Crane, Baikal Teal
Russia-7	Kytalyk Resource Reserve	Siberian Crane, Lesser White-fronted Goose, Baikal Teal, Spectacled Eider *Somateria fischeri*, Steller's Eider, White-tailed Eagle *Haliaeetus albicilla*
Russia-8	Kunovat River Basin Wetlands	Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose
Russia-9	Konda and Alymka Rivers Basin	Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose, Slender-billed Curlew, Great Snipe *Gallinago media*, White-tailed Eagle, Imperial Eagle, Aquatic Warbler
Russia-10	Trans-boundary Wetlands in Tyumen and Kurgan Regions	Dalmatian Pelican, Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose, White-headed Duck, Corncrake *Crex crex*, Sociable Lapwing
Kazakhstan-11	Tantegir Hollow – Zhanshura Lake	Siberian Crane, Dalmatian Pelican, Lesser White-fronted Goose, Red-breasted Goose, White-headed Duck, Ferruginous Duck *Aythya nyroca*, Little Bustard *Otis tetrax*, Sociable Lapwing, Black-winged Pratincole *Glareola nordmanni*, Imperial Eagle, Great Spotted Eagle
Kazakhstan-12	Naurzum Lake System (including Sarykopa Lake System and Lake Kulagol)	Siberian Crane, Dalmatian Pelican, White Pelican *Pelecanus onocrotalus*, Lesser White-fronted Goose, Red-breasted Goose, White-headed Duck, Ferruginous Duck, Sociable Lapwing, Black-winged Pratincole
Kazakhstan-13	Zharsor and Urkash Lakes	Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose, White-headed Duck, Ferruginous Duck, Little Bustard, Sociable Lapwing, White-tailed Eagle, Imperial Eagle, Great Spotted Eagle and Saker Falcon.
Kazakhstan-14	Kulykol Lake	Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose, White-headed Duck, Ferruginous Duck, Sociable Lapwing, Black-winged Pratincole, Little Bustard, Imperial Eagle, Great Spotted Eagle, Saker Falcon
Iran-15	Bujagh / Sefid Rud Delta	Dalmatian Pelican, Pygmy Cormorant *Phalacrocorax pygmeus*, Lesser White-fronted Goose, White-headed Duck, Ferruginous Duck, Great Spotted Eagle, and Sociable Lapwing
Iran-16	Fereydoon Kenar, Ezbaran & Sorkhe Rud Damgahs	Dalmatian Pelican and Pygmy Cormorant (occasional visitors), Siberian Crane, Lesser White-fronted Goose, Red-breasted Goose, White-tailed Eagle, Imperial Eagle, Greater Spotted Eagle, Great Snipe, Ferruginous Duck
Iran*	Amirkelayeh & Rud Posht	Pygmy Cormorant, Marbled Teal, Ferruginous Duck, White-tailed Eagle

* This site was withdrawn after the project Mid Term Review

project. The western flyway also passed through Azerbaijan, but at the time we were developing this project Azerbaijan had not joined the Convention on Biological Diversity (CBD) and therefore was ineligible for GEF funding. Azerbaijan has since joined CBD, and has been active under the CMS MoU.

The project intervention strategy reflected the life history of the Siberian Crane, in that selection of project sites covered the main breeding, wintering and staging areas for both western and eastern populations. Those sites that were of greatest importance for the species (the eastern population's main breeding grounds in Kytalyk and main wintering site at Poyang Lake) and/or sites under most immediate threat (staging areas at Zhalong and Xianghai in China), and the western population's main wintering site at Fereydoon Kenar in Iran, staging areas at Naurzum and Zharsor-Urkash in Kazakhstan, and breeding grounds in Konda-Alymka Rivers Basin Wetlands and Kunovat River Basin) were given priority in the first three-year phase of the project. Targeted research designed to fill gaps in our knowledge of migration routes and identify further significant sites would also happen in the first phase. Less urgent sites and activities would be addressed in a second three-year phase.

The wetlands identified as sites for project intervention all met the Ramsar Convention's criteria for Wetlands of International Importance and many had existing international designations. The flyways used by the Siberian Cranes were shared with many other species of migratory birds, including at least 27 globally threatened species, and thus had significance far beyond conservation of the Siberian Crane alone (see Table 2). These flyway site networks sustain millions of migratory waterbirds along their migration routes, which span the Asian continent between northern breeding grounds and southern wintering areas. These wetlands are also of considerable socio-economic and cultural importance, supporting the livelihoods of local communities as well as contributing to regional and national economic development in many cases.

The project was designed to operate at three levels, all considered essential to successful flyway conservation.

(a) Site level

The project addressed threats to wetlands of international importance that are of major importance for the conservation of the Siberian Crane and other migratory waterbirds (see Table 3). A range of measures was undertaken at each site in relation to its specific conditions in order to ensure its future ecological integrity. These measures involved stakeholder participation, and contributed to local community development through pilot sustainable livelihood projects where these were a

SCWP activities targeted conservation action at three levels, focusing on site (Crane Celebration in Russia, near left), national (waterbird survey at Zhalong Nature Reserve, China, above), and regional activities (launch of the Western Central Asian Site Network in Almaty, Kazakhstan, far left). Photos by Elena Efimova, Alexander Sorokin and Wang Wenfeng

priority. Site activities included strengthening legal protection and enforcement, developing and implementing site management plans, capacity building for site management, environmental education and public awareness programs and alternative livelihood projects. Due to the critical importance of securing essential water inflows to our project sites in semi-arid regions, assessments of water needs, water planning, and development of agreements with river basin authorities were undertaken for sites at risk. These measures were significant in setting national precedents related to water management.

(b) National level

The project undertook specific actions to strengthen the national legislative, policy and planning framework for wetland and waterbird conservation, enhance capacity for international cooperation, and undertake national activities that support site conservation such as monitoring, training, education and public awareness programs. These activities were coordinated with other national wetlands projects and programs and have strengthened mechanisms for integrated wetland management through inter-sectoral collaboration. In China, flyway coordination within the country was also a priority.

(c) Regional level

The project focused on building capacity for the coordination of flyway networks of wetlands along the Western/Central and East Asian flyways for migratory waterbirds, led by sites of importance for the flagship species. These networks

have been carefully coordinated with other flyway conservation initiatives–such as the Asia Pacific Migratory Waterbird Conservation Strategy 2001-2005 (APMWCS) and the ensuing East Asian - Australasian Flyway Partnership, Central Asian Flyway initiative, African – Eurasian Waterbird Agreement (AEWA) under CMS, and the Crane Working Group of Eurasia. We thus sought to form an integrated program, contributing significantly towards the implementation of international conventions and in delivering activities under the Conservation Plans of the CMS *Memorandum of Understanding Concerning Conservation Measures for the Siberian Crane*. The regional component was accompanied by applied field research in support of flyway conservation.

More specifically, a regional coordination center was established in Moscow, which has linked with the above-mentioned initiatives. The project also strengthened capacity for coordination of the North East Asia Crane Site Network's activities in China and Yakutia, and facilitated an enhanced level of flyway conservation activities in line with existing plans and institutional frameworks.

SCWP was the first GEF Full-sized Project with a flyway focus, and hence had to address several design issues for which little precedent existed. For example, given the strong emphasis under GEF on ecosystem approaches to conservation and the lack of inclusion of species-oriented projects within the GEF portfolio, we put major emphasis on interventions at 16 major wetland sites along the two flyways. It is often said that a flyway is only as strong as its weakest links. Accordingly, SCWP aimed to strengthen management of key sites for Siberian Cranes and other waterbirds, as a strategy to enhance the integrity of the flyway as a whole. This approach also reflected the very hands-on nature of previous decades of conservation effort on behalf of the Siberian Crane, where field activities had taken strong precedence.

Given the central role of the national governments in site management, SCWP also had strong national components, with a National Coordination Unit (NCU) in each country that administered funds provided to that country and supervised the site work. The NCUs also worked on important policy matters at the national and international levels.

The regional component received $2 million out of the $10 million GEF part of the budget, and these funds included ICF's costs as the International Executing Agency responsible for managing the project. Thus funding for the regional component of the flyway work was relatively small compared to the site and national levels, although ICF did raise significant co-financing and the project achieved significant regional outcomes.

The situation for the flyways we had chosen also favored strong emphasis on national and site interventions. Despite the length of the flyways, only four countries were involved. We were able to invest in the more intensive and expensive work that site conservation entails, and these project sites served as important models and test cases for methods applicable to many other sites along the flyway within the same countries.

Our project situation was vastly different from a second flyway project developed during the same period as our project through UNEP/GEF funding, "The African-Eurasian Flyways Project" (GEF ID 1258) that is being implemented directly in 18 countries, with benefits to all 118 countries within the range of the African Eurasian Waterbird Agreement. This project is in late stages of implementation. Given the scale and number of countries involved, a larger share of resources have been allocated in that project at the regional level, and site level interventions could only occur within a limited number of participating countries. Because of these differences in context and in design, the two projects offer interesting, comparative lessons with regard to flyway conservation (Zandri and Prentice 2009).

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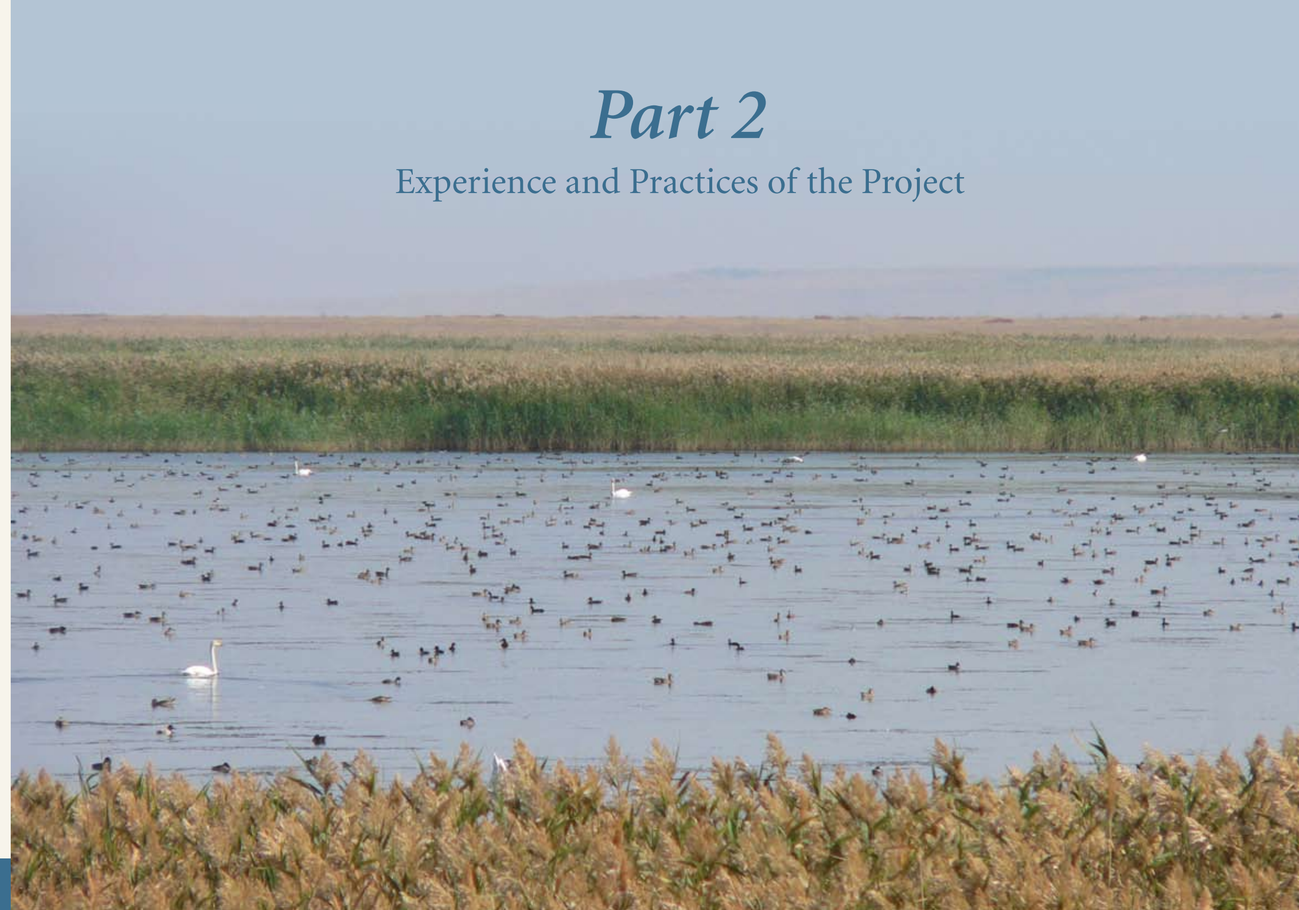

Part 2

Experience and Practices of the Project

V. Threats and Our Strategies to Overcome Them

How can a single project best achieve impacts across large parts of Asia?

From a broad perspective, the primary threat to Siberian Cranes and other migratory waterbirds arises from destruction and degradation of the wetlands upon which these birds depend. The growth in human populations across Asia, coupled with escalating economic development, have placed great pressure on almost all wetlands in tropical and temperate parts of Asia, while oil and other development even affect the particularly fragile wetlands of the far north where few people live.

As waterbirds find fewer places available to them for breeding, migratory stopovers, and wintering–and as remaining places, often degraded, offer less food and safety–their populations become increasingly vulnerable to direct causes of mortality such as disease and severe weather. Hunting has been a major threat to cranes and other waterbirds for the past two centuries at least, and continues to be a major factor in central and western Asia, and in far eastern Russia. Other human-related causes of mortality can be significant especially for bird populations already in decline, including collisions with powerlines and poisoning by agricultural and industrial chemicals and lead shot.

This project has aimed to safeguard or restore a network of ecosystems essential to migratory waterbirds. The four countries within this project offer remarkable diversity of wetlands and of human activity affecting those wetlands. The crane flyway across eastern China, for example, and the five project sites in China lie within rural areas heavily populated, where subsistence agriculture

Left: Wetlands along both flyways endure intense development pressure. Photo by Su Liying
Previous page: Large numbers of waterbirds pause on migration at the Naurzum Lake System, Kazakhstan. Photo by Crawford Prentice

and wetland resources are essential to local human livelihoods. Heilongjiang Province has a population of nearly 38 million, with a density of 84 people/ km^2. Average rural income in Heilongjiang was about US$300 per capita in 2002, and somewhat less in Jilin and Inner Mongolia (Simonov and Dahmer 2008). Nearly eight million people live within Poyang Lake Basin, where almost the entire eastern population of Siberian Cranes winter (Jiujiang City 2008, Nanchang City 2008, Shangro City 2008).

Our project in Iran focused on wetlands in the South Caspian Lowlands, along a narrow coastal plain intensively used for rice and other cultivation. Fereydoon Kenar City is part of Fereydoon Kenar District, with an area of 9.03 km^2 and a population of 30,489 persons (density of 3,376 persons/ km^2) (Department of Environment in preparation). Nevertheless, important wetlands remain with outstanding numbers of wintering waterbirds. The crucial area for Siberian Cranes consists of artificial wetlands at Fereydoon Kenar in the midst of elaborate trapping operations, but where disturbance and shooting of waterfowl is strictly controlled. The cranes themselves are not caught and seem able to avoid the gauntlet of nets.

The project sites in Kazakhstan lie among major steppe lake systems in the north of the country. These wetlands are highly important for waterbirds during migration and are quite remote, so that human pressure is relatively low. The economy for decades had relied on state-supported intensive, large-scale grain production that collapsed with the Soviet Union. Without subsidies, cultivated areas shrank rapidly, many people were forced to move away, and entire villages abandoned. Although reduced, hunting remains a significant issue. Long-term drought and variations in annual

As human populations increase throughout Asia, remaining wetlands face greater development pressure. In Songnen Plain of northeast China, livestock grazing can degrade wetlands and disturb nesting or feeding cranes. To address these threats, pilot community programs have been established to help herdsmen better manage the numbers of animals on the grassland, and give natural forage a rest by feeding goats or sheep within enclosed yards for parts of the year. Photos by Hao Bing and Sara Gavney Moore

Oil exploration threatens Siberian Crane breeding habitat in West Siberia, where the majority of Russia's known oil and gas deposits are located. In response to this threat, Russian scientists worked to have this exploration rig (right) near a Siberian Crane breeding site removed and the site cleaned up. The Sterkh Foundation, with support from the SCWP, has successfully built support for conservation efforts in this region through a public awareness program (above) targeting students, local communities, and government decision makers. Photos by Crawford Prentice and Elena Ilyashenko

water levels required protection of a complex of wetlands to provide migratory birds with safe haven in different years. Our project came at an opportune time, with human pressures low and the chances good to strengthen and expand protected areas.

The Russian sites include breeding areas in the far north where human populations and pressures are minimal compared to other parts of Asia. The breeding sites in the north of Tyumen Oblast in western Siberia, however, lie within the most important oil and gas regions in the Russian Federation, with more than 95% of Russian gas and 80% of oil production, so continued exploration and development is a priority. Climate change likely presents the greatest threat to wetland habitat suitable for nesting Siberian Cranes in Yakutia (see Pshennikov and Germogenov 2008). The staging areas to the south lie in the forest-steppe zone with rich black soils that formerly supported major agricultural production before the economic changes with the end of the Soviet Union. Recent years have presented a special opportunity for conservation, although economic development will increasingly impact wetlands in years to come. As lands have changed from state to private ownership, conflicts have grown over waterbird damage to crops.

In designing the project, we also examined carefully the planning and policy framework within each country. All four countries have completed national biodiversity strategy and action plans that highlight the importance of conserving wetlands and migratory waterbirds. China has a strong legal and policy basis for wetland protection. Catastrophic flooding in 1998 in both the Songhua River Basin in the northeast and in the Yangtze Basin in the south (all our project sites lie within these two basins) led to major support for wetland restoration for both regions. China also has recognized the importance of involving local communities with sustainable use of resources and biodiversity protection, and seeks to develop successful demonstrations in nature reserve settings. For China, Iran and Kazakhstan, concurrent GEF projects have supported broader wetlands conservation measures including development of national policies, strategies and plans for each country. By integrating our work with these national wetlands projects, our sites and activities have provided demonstrations to promote best practice more widely in these countries. In Russia, with its vast wetland resources, we designed our project to complement the National Wetland Strategy developed in 1999 together with its Action Plan draft.

In all cases, our flagship species the Siberian Crane provided a dramatic story highlighting the importance and threats for wetland resources. This tall, white crane served to interest people in conservation initiatives to the benefit of wetlands and other wildlife that lack charisma and the strong cultural significance attached to cranes throughout Asia and much of the rest of the world.

Our threat analysis during the preparation of this project identified three major classes of threat to the wetlands, which applied to the diverse situations found in these four countries:

- unsustainable use of water resources
- unsustainable use of biological resources
- global and regional environmental changes

For these major classes of threat, our project identified root causes and developed activities to mitigate those threats.

For water, three root causes have been addressed: lack of integrated approaches to water resource management, including consideration of biodiversity conservation interests; **lack of coordination between relevant agencies regarding water resource management; and lack of capacity for water pollution control.** These root causes did not apply to all sites, nor did they all apply to each country. We worked on water issues primarily at the site level, but in so doing set national precedents for how to solve such issues. A major effort in northeast China for securing water supplies to maintain ecological functions for wetlands in four national nature reserves will be described in the next chapter. We also made an analogous effort to secure water needed to sustain Naurzum, a complex of lakes and wetlands in Kazakhstan that provide stopover habitat for cranes and a remarkable array of other waterbirds.

For biological resources, we identified multiple root causes that this project has addressed through a variety of activities. One root cause was **lack of information available for conservation management.** In some cases, targeted research involving multiple organizations over a decade or longer has been necessary. The largest research effort, supported in part by this project, has involved a study of the relationships linking cranes, their aquatic food plants, and water levels at Poyang Lake. Poyang Lake is the largest lake in China, key to the provincial economy, and of major significance to water management and flood control for the Yangtze River Basin. Given the confluence of high economic and biodiversity values of Poyang, understanding the ecological significance of changing water levels for waterbirds and for wetland function is an essential condition for integrating wetland conservation with development for this region in the heart of China. We

New Kunovat Reserves

Unforeseen problems arose during implementation of our project that forced us to devise new strategy and actions for Kunovat Federal Reserve (*zakaznik*), one of our 16 project sites. Responsibility for the federal system of zakazniks in Russia was transferred from one ministry to another; in the process of transfer, all funding for the federal nature reserves was stopped and the staff dismissed indefinitely. In addition, project monitoring indicated that no Siberian Cranes were breeding within the Kunovat Federal Reserve, although regular sightings came from nearby unprotected areas.

Project staff had a long-standing cooperation, preceding SCWP, with the local NGO Sterkh Foundation, based in Salekhard, and with the Administration of Yamalo-Nenetsky Autonomous Region (*Sterkh* means Siberian Crane in Russian). Based on this collaboration, several important measures were successfully implemented to secure the protection of this breeding area (Blagovidov et al. 2009).

Additional territory was added to the planned regional Synsko-Voikarsky Nature Park, located along the Kunovat Federal Reserve boundary (see Figure 3). This territory functioned as a buffer for the reserve. When the Nature Park was established in 2008, the local Administration was able to monitor and effectively protect the Kunovat Federal Reserve through management of the new park.

Three new regional reserves were created to protect the most important and promising sites near existing reserves at Kunovat, including the areas with recent sightings of Siberian Cranes.

Through support of the Yamalo-Nenetsky Autonomous Region, a habitat selection model was developed for the Siberian Crane. The model helped to guide proposals to optimize protected areas boundaries, including Kunovat itself.

The project, together with the local Administration, developed a management plan for the Kunovat project site. This plan was approved by the Russian Ministry of Natural Resources.

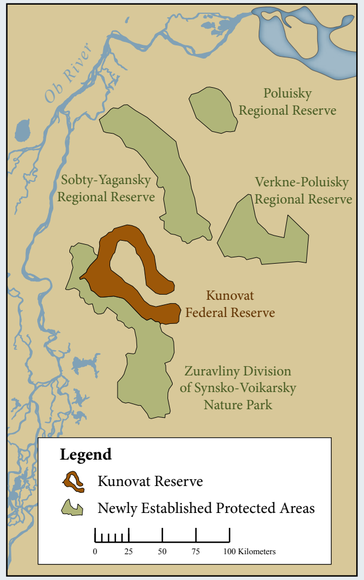

***Figure 3.** Kunovat protected area system*
Map by Dorn Moore, Green Space GIS

describe this effort in Chapter VII.

For many areas, especially along segments of the migration corridors, conservation authorities have lacked the most basic of information about where birds stop and for how long. As with most wetlands, water conditions vary among years, and hence this monitoring during breeding, migration and winter periods spanned multiple years and diverse hydrologic conditions, and will now serve as a basis for protected areas expansion and management. Select results of our monitoring efforts are summarized in Chapter XII.

Additional root causes for wetland loss have included **lack of integrated approaches to wetland conservation and development planning, and lack of sustainable alternative economic opportunities for communities that depend on wetland resources.** We have responded to the first of these root causes with several strategies, including demonstration efforts that minimize impacts where transportation or oil development, for example, impinge on protected areas. But our main effort has been development of management plans for protected areas that address cross-sectoral activities and local communities. The plans we created for the Yakutian Republic in far eastern Russia, for example, are being used as models for development of similar plans for all protected areas within Yakutia. In Chapter VIII, we feature our management planning effort for Naurzum in Kazakhstan.

Local community involvement is especially vital for safeguarding wetlands, given the significance of wetlands for water needs of people, livestock, and crops, and given the vulnerability of wetlands to changes in their catchment areas. We have set up Site Management Committees and other mechanisms for community input at our project sites. Development of alternative economic strategies can be essential to reduce resource conflict and to motivate communities to work together to solve some of their resource problems (often development of cooperation and community-wide solutions to problems is more important than any initial economic assistance that helped start the process). We developed pilot projects at sites in all four countries, with mixed results. Chapter IX describes our most successful and unusual effort with the duck-trappers at Fereydoon Kenar, while Chapter XIII summarizes lessons learned from this and other components of the project.

Lack of awareness of the importance of the functions and values of wetlands and their biodiversity is another root cause of wetland loss. We undertook diverse education and awareness programming in all four countries. The most successful and innovative of these efforts are described in Chapter X. Perhaps the biggest challenge has been to change the perspectives of protected areas leadership and staff so that they make the connection that education programming is not simply tourism and public relations but a vital component of solving resource management problems.

Lack of capacity and financial resources for protected area management and species protection, as well as inadequate legal protection for sites and national legislation for the conservation and sustainable use of wetland resources, were identified as additional root causes, and led to multiple activities under SCWP. Capacity-building efforts are summarized in Chapter XI. This chapter and Chapter XII deal in part with national and regional activities under SCWP. During the period when SCWP was designed and approved, the flyway approach–especially regional scale projects to address flyway issues–was new and untested through GEF. For that reason, and because of ICF's strong involvement and experience with site-level conservation efforts, SCWP put most resources into site-level interventions. Support for activities at the national level, and the regional component of the project, were relatively small.

Chapter XII will assess some of the successes and limitations with this approach. Effective flyway conservation needs multiple scales of action. SCWP has occurred at the same time that sizable undertakings at national and regional levels were occurring within these same parts of Asia, and our site orientation helped us to complement these broader-scale efforts. As one example, our project and the CMS MoU for Siberian Cranes provided the mechanism for the Central Asian Flyway (CAF) initiative to develop a Western/Central Asian Waterbird Site Network, as the MoU had already been signed by all the countries in the region and could thus provide a platform for setting up this network-which initially includes sites that have been important to Siberian and other crane species but will later be expanded to other sites and species. The site approach thus can link closely with regional initiatives, and the concerns and challenges shared by sites form a strong basis for discussion and collaboration at the international level.

The third class of threats-global and regional environmental changes-primarily concerned **impacts of climate change on wetland ecosystems.** Our project did not implement activities specifically designed to respond to this root cause, but climate change concerns affected many of our efforts (especially those related to water management) and in particular our strategies to mainstream our activities and to sustain project outcomes into the future. We will discuss these issues in Chapters XIV and XV.

The primary focus of this central section of the report is the presentation of a series of case studies that illustrate the challenges, successes, and lessons learned through SCWP. The annexes to this report provide a more comprehensive listing of project accomplishments.

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VI. Safeguarding the Waters That Give Life to Wetlands

Siberian Cranes depend on wetlands at Keerqin Nature Reserve and elsewhere on the Songnen Plain in northeastern China during both spring and autumn migrations. Photo by Yu Youzhong

Restoring water supply and wetland function in the Songnen Plain of northeast China

The greatest threat to waterbirds across Asia is loss or degradation of wetlands essential to the birds. For flyway conservation, the challenge is multiplied many times. Highly migratory species like Siberian Cranes, many geese and shorebirds depend on wetlands for rest, food and safety all along their long journeys.

Wetlands are especially sensitive to changes in water, for water is the lifeblood of wetlands, and transforms dry ground into an extraordinary mix of moisture, nutrients and sunlight–wetlands are among the most productive ecosystems on earth, with waterbirds one part of that productivity. While wetlands in some high rainfall areas receive most of their water from precipitation, most wetlands depend on run-off from their catchments either directly over the land or more often by the inflow of streams or rivers. This intimate relationship between wetland and upland has made wetland protected areas especially difficult to manage since the vital ingredient of water comes from elsewhere, usually outside the control of protected area managers. The most crucial factor is the amount of water. But timing is also critical, since major flood events sweep through river and wetland systems, with water levels soon falling; the impact on wetland ecology is far different than the steady intermittent flow from numerous rainfalls. Water quality is also highly significant. Changes in watersheds–for example, conversion of grasslands to croplands–can greatly increase erosion and send sediments into wetlands with impacts that grow with time. Industrial development results in chemicals, many of them poisonous, degrading the waters even within protected areas.

For the eastern flock of Siberian Cranes, Poyang is the only winter home. As the crane flocks move north in March–in time to escape the rising of waters with spring rain across southern China-the cranes are opportunists, using multiple sites along their route that tend to change with time and fluctuating water depths that are so characteristic of wetlands. Yet the cranes cannot travel too quickly, as their tundra nesting grounds will be frozen until June. Even then, aquatic life is still blocked by the melting ice. Newly arriving cranes forage for dried berries from the previous year and hunt lemmings.

Close to halfway north along the flyway, 2,000 km north of Poyang, the crane flocks cross Songnen Plain where Heilongjiang, Jilin and Inner Mongolia come together. Historically, Songnen Plain was rich in wetlands that graded into grasslands. Songnen has for millennia been a frontier between farming and nomadic ways of life. Rainfall declines dramatically as one moves east to west across northern China, and this plain lies where farming is difficult and risky. Livestock and herdsmen dominate the western parts of the plain.

Historically, the crane flocks descended on Songnen wetlands and stayed for weeks at a time, refueling for the second half of their journey north and preparing for the arduous effort of breeding. For many birds, foraging conditions during winter and migration and the accumulation of fat tissues within adult birds are a major determinant of breeding success (Krapu et al. 1985, Graf et al. 2005). This link may be especially true for species that must breed on tundra that is just thawing. In 1988, for example, Li Fangman observed as many as 800 Siberian Cranes in Lindian, in the marshes on the east side of Zhalong during the first half of May (Li and Li 1991). Just south, at Momoge, 300 to 400 cranes stopped for 30 to 40 days in the mid-1980s (Wu et al. 1991).

Much of northeast China was settled more recently than other parts of the country, during the twentieth century. As pressures grew to convert wetland to farmland, there was still opportunity to set aside large areas to protect wetlands and their abundant wildlife. Six species of cranes can be found here and in surrounding areas, the greatest diversity of cranes on Earth. The largest and most famous of these nature reserves is Zhalong, which extends across 210,000 hectares in western Heilongjiang. In developed countries, very few wetlands of such great size remain. Other major reserves include Momoge (144,000 hectares), and Xianghai and Keerqin Nature Reserves, adjacent to each other at the border of Jilin and Inner Mongolia (with a combined area of 232,000 hectares). As human development has intensified, large areas of former wetlands now grow crops. Some additional remaining wetlands still have considerable value for biodiversity, such as Tumuji, and have been protected. The value of most unprotected wetlands for waterbirds is now greatly limited by human disturbance, as for areas just north of Daqing City in Heilongjiang.

Diversion of floodwaters creates an opportunity to restore wetlands at Xianghai Nature Reserve. Photo by Crawford Prentice

The Chinese Government has shown remarkable commitment to wetland and waterbird conservation, establishing a network of protected wetlands across the country, yet effective management of wetlands is particularly challenging because the wetlands are so vulnerable to changes in hydrology originating outside the protected area. This challenge is especially great in northeast China, where water resources are scarce and human needs have rapidly been growing. The catastrophic floods in 1998 in both north and south China highlighted the high value of wetlands for flood control and water management generally, but the past decade especially has seen an escalation of engineering projects designed to reduce flood dangers and also supply human needs.

By the time SCWP began, all four of the national nature reserves in Songnen, and most other wetlands here and to the west, were receiving such dramatically reduced waters as to threaten the many waterbird species that depend on these wetlands at the midpoint in their migrations to the tundra. The effect was even more devastating on birds with breeding ranges centered on northern China such

Water releases help to sustain the wetlands of Zhalong Nature Reserve. Photo by Sara Gavney Moore

as the Red-crowned Crane, charismatic and beloved among cultures of East Asia. The problem reached national news when Zhalong Marsh, the most famous of the crane reserves in China, burned for months beginning in fall 2001. And in May 2005, fires swept across the marshes of Zhalong at the height of the breeding season, destroying nests of cranes and most other birds.

Given the significance of Songnen Plain, the threats from water scarcity were more than site threats but undermined the entire mid-point stopover region for cranes and many other waterbirds traveling from the Yangtze Basin to the tundra. SCWP identified water supply for these four national nature reserves as one of the central issues we would address. Our objective was to restore the natural or environmental flows to all four nature reserves through development of water management plans, based on study of the hydrology of these wetlands and historic water flows, and through creation of mechanisms to deliver water to maintain the global value of these wetlands for biodiversity. In this way also, the entire array of ecosystem services of the wetlands could be restored, with considerable benefit to local communities that depended on the wetlands for fish, reeds, and other harvests.

As with many countries, in China responsibilities for water reside in a different agency than responsibilities for nature reserves, wildlife, or wetlands, which fall to the State Forestry Administration. In the early stages of our project, the China NCU (within the National Bird Banding Center, and acting under auspices of the State Forestry Administration) contacted the Songliao Water Resources Commission, which operates under the Ministry of Water Resources and is responsible for planning use and development activities related to water in the northeast part of the country.

The timing was good for our project. Recently, the Ministry of Water Resources had expanded the scope of its water management efforts, so that ecological values of water should have equal consideration with economic values. The Songliao Water Resources Commission had been given the task of developing a water management plan for Zhalong, and also for the Huolin River that historically provided most water for Keerqin and Xianghai Nature Reserves. One of the commission's senior hydrologists agreed to work with us. He could provide a long period of experience based on extensive hydrological data while we could provide ecological expertise that the agency was eager to acquire.

During the early years of the project, we involved international consultant Ton Geensen, as we wished to ensure that ecological perspectives helped to guide water management–with an emphasis on maintaining or restoring natural flows rather than constructing water control mechanisms that further disrupted the natural hydrology in order to place water where it was needed, and when. One such example had just occurred at Xianghai Nature Reserve, where funding had been provided to build a dike across the Huolin River as it crossed from Keerqin into Xianghai. High waters would flow over the dike and fill the extensive wetlands down river. But the first waters would be diverted into a canal running to a reservoir at the center of the reserve, managed not by the reserve but by another agency to produce fish. While water released from the reservoir could feed marshes important to waterbirds, these releases were dependent on the other agency that wished to maximize fish production.

We also involved an outstanding hydrologist from the Northeast Institute of Geography and Agro-ecology, located in Jilin, and two wetland ecologists, from the China Forestry Academy in Beijing and the Institute of Limnology in Nanjing. The interaction between Ton and his Chinese counterparts was highly important in setting directions for maintaining and restoring wetland function. Later parts of the project have been conducted solely by the Chinese scientists with NCU and Regional Coordination Unit (RCU) oversight (ICF formed and led the RCU to manage the overall project).

For Zhalong, the major cause for drying of the marsh appeared evident. In 1958, a small dam was constructed at the upper end of the marsh, holding back waters of the Wuyuer River into Dongsheng Reservoir. A canal directly across the north part of the marsh carried water from nearby Nen River to the reservoir, and from the reservoir southeast to Daqing City. In the 1990s, the dam and canals were enlarged. In addition, Canal #8 was constructed along the entire west side of Zhalong. Again, the purpose was not to drain the marsh itself, but simply to carry water from the Nen River past Zhalong to distant human uses. But the canal, 30 meters wide, had a dike with road on either side and formed an impermeable barrier; –no water could cross these obstructions to feed the marsh from the west. During the time our project was commencing, a third canal (Canal #9) was being constructed along the east side of the marsh–with the ultimate result that the marsh was surrounded on all sides by barriers impenetrable to water flow. The one exception was a small, heavily polluted stream that was able to enter the marsh by passing under the canal.

While this system of canals had not been designed to drain Zhalong, in combination they meant that the historic flows of water across the landscape, from the Wuyer River and the flooding of the much larger Nen River, could no longer occur. Zhalong would depend on rainfall. Yet the average annual rainfall of 419 mm was far less than the annual evapotranspiration of 1,308 mm (Liu et al. 2007).

Fortunately, the system of canals surrounding Zhalong included five water gates located on the upper parts of the marsh, on its northern and northwest sides. Construction would not be needed to facilitate water releases into the marsh. The scientists had simply to determine the amounts of water needed. So many people thought.

The spring of 2005 was a turning point for our work on water. Aside from the devastating spring fires and national attention the media brought for the changes needed at Zhalong, project staff had opportunity to fly over Zhalong, conducting aerial counts of breeding Red-crowned Cranes. ICF's Dr. Su Liying accompanied the team. In the 1980s, she had worked as a biologist at Zhalong and knew conditions of the marsh intimately. From the plane, she observed numerous roads, dikes and ditches extending across the marsh and extensively through the core area where no construction was supposed to occur. Much of this construction had happened in the 1990s, long after the reserve was established.

As a result, the marsh was heavily fragmented, so that water could not flow freely from the north spreading south across the wetland. The aerial survey occurred as water was being released into Zhalong, a large release of water in response to the very dry spring conditions and fires. Due to the network of ditches and roads, this water flooded some areas deeply, no doubt washing out nests of birds; other adjacent areas received no water at all. The water management plan would need to take into account the flows of water around these obstructions.

These events highlighted the need for on-going monitoring of conditions of the wetland. Water is valuable and in heavy demand. Therefore data are needed from the ground to demonstrate the need

Canals surrounding the Zhalong Nature Reserve, which carry water around the wetland and away for human uses, have caused an increase in spring fires that destroy crane nests in the drying wetlands. Photo by Su Liying

for and impact of the water releases. We established on-going programs of water, plant, and waterbird monitoring so that managers could evaluate conditions of the marsh, changes in these critical components of Zhalong, and provide guidance on effectiveness of water releases and adjustments in those releases. In addition, Su Liying with colleagues and students has conducted walking transects across the entire marsh each May from 2007 through 2009. See Su et al. (2009) and posters on the monitoring at Zhalong in Prentice (2009) for preliminary results.

During the latter part of SCWP, ICF worked with the Northeast Institute of Geography and Agro-ecology to map fragmentation of the wetland, as a baseline for enforcing a ban on further encroachments. Based in part on this mapping, a wetland restoration plan has been developed, with specific recommendations for measures to reduce fragmentation, such as putting culverts under roads, or enlarging those present, and breaking down dikes that serve little purpose or that have been built illegally.

The Songliao Water Resources Commission adopted features of our water management plan for inclusion within regional water management plans that have since been endorsed by the State Council of China, the top decision-making body. A remaining challenge, the lack of funding to pay for the water to be released, has been met by the Heilongjiang Provincial Government that has allocated 2 million yuan annually for water for Zhalong. In addition, the cities of Qiqihar and Daqing have each committed 1 million yuan annually. These decisions, and the provision of environmental (e-) flows of water for Zhalong, provide a national precedent and represent a major contribution by this project.

Water management plans have also been adopted for Xianghai and Keerqin Nature Reserves. For Keerqin, however, additional water is not readily available. Furthermore, the heavy flooding of 1998 dumped sediments into the wetlands along Huolin River, reducing their water-holding capacity. Now they will be seasonal wetlands and unsuitable for crane breeding in most years, because steady flows on the Huolin River cannot be maintained. Xianghai also has yet to solve its water supply problem. With support from the Jilin Government, Xianghai was able to purchase rights to the smaller of two reservoirs at the center of the reserve and thus can manage its water to benefit adjacent wetlands. Options exist to send water from the Taoer River to Xianghai. But the canals need to be repaired to reduce water loss, the reservoirs need reconstructed water gates to allow water releases to the wetlands even when well below full capacity, and an agreement is needed with the larger reservoir to ensure that water sent to restore the wetlands is actually released at the proper times.

Based on the progress for Zhalong and the other two reserves, SCWP extended this activity at the time of the mid-term review (2006) to include development of a water management plan for Momoge, which is now the main stopover for Siberian Cranes in spring and fall due to the better water conditions. Numbers of Siberian Cranes, and many other water birds, at Zhalong are far less than in previous years.

More work is needed to ensure the major successes for Zhalong can be converted and sustained, to result in a healthier marsh over the long term. A further tool for monitoring has been the availability of high frequency satellite images (MODUIS, two per day if there is no cloud cover) free-of-charge over the internet. This system has been designed to assist in fire control around the world. The images are highly suitable for detecting active fires and areas recently burned. The images also allow simple mapping of water distribution in the marshes. They provide the opportunity to evaluate the impact of fire, which is essentially a symptom of water shortage, and of the effectiveness of water releases.

Out of the last five years, fires have burned Zhalong extensively during the bird breeding season in three years. At least in 2005 and 2009, water releases have occurred that have substantially improved conditions in late May (for a small area) and summer (larger parts of the marsh). But the releases have come after fires have destroyed most nesting attempts, and water releases from just one or two water gates have filled small parts of the marsh-about 10% of Zhalong, for example-by mid June in 2009.

Based on these monitoring results, we have the following recommendations for water management at Zhalong. These comments are also highly relevant for Xianghai and the other sites.

- The timing of water releases is critical. It should occur in autumn, in August and September so that water can disperse through the marsh before temperatures reach freezing; spring water releases come too late for nesting birds and can actually flood nests.
- Water releases should occur at multiple locations to provide a more balanced flow through the wetland.
- Additional construction in all parts of Zhalong Marsh should be stopped (no new roads, canals, ditches, polders, etc).
- Existing construction should be removed, or its impact mitigated, by placing or widening culverts under roads, breaking dikes, and providing alternate ways for water flow, thus restoring connectivity between fragmented compartments of the marsh.
- Monitoring is essential to future success of water management at Zhalong, and should include water, fire, plants and birds, with special attention to breeding of cranes and other key species.
- Annual meetings should be convened with relevant agencies to evaluate monitoring results, the water releases, and restoration of the marsh, as a guide to next year's releases of water and other actions.

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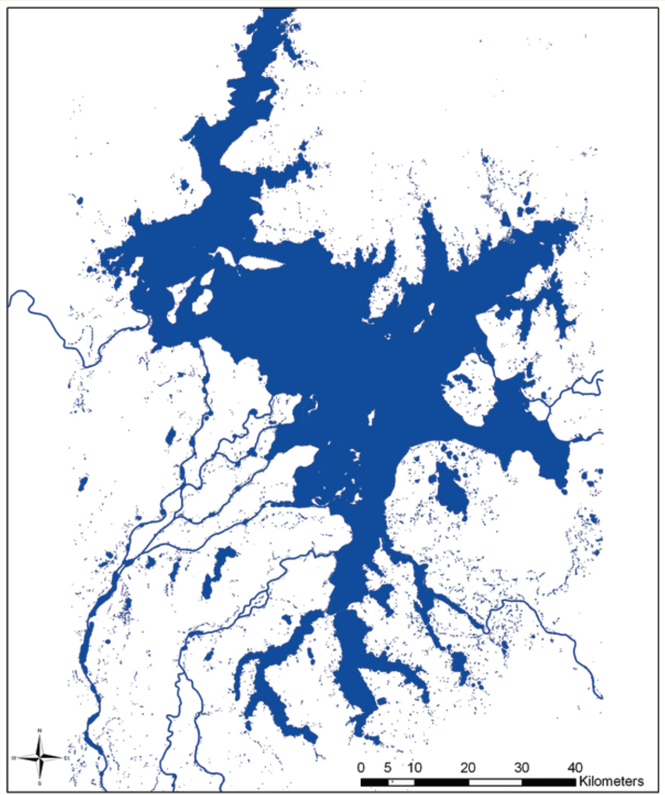


VII. *Science as a Guide to Management*

Applied research into the linkages among cranes, water levels and food plants at Poyang Lake, China

Effective conservation requires a sound foundation in science. Decades of work by conservationists in a dozen countries had already taught much about the ecology of Siberian Cranes and other waterbirds relying on wetlands of the Asian flyways, although many of the threats listed in Chapter V have awaited political support and funding to be addressed. Yet in those cases, we knew what needed to be done. Other threats–for example, the problem of lead shot poisoning in Yakutia, and hunting on the wintering areas at Fereydoon Kenar in Iran–could only be addressed by developing understanding and support among the people involved–conservationists must know how and why people hunt, and must consider numerous feelings and constraints regarding what people do, before an effective conservation response can be devised.

Conservation programs should include a carefully crafted means of monitoring–to set a baseline for current conditions–and should regularly collect comparative data over time so that impacts of conservation actions (or no action) can be documented. The previous chapter explored the role of monitoring in the case of restoring water to Zhalong Marsh.

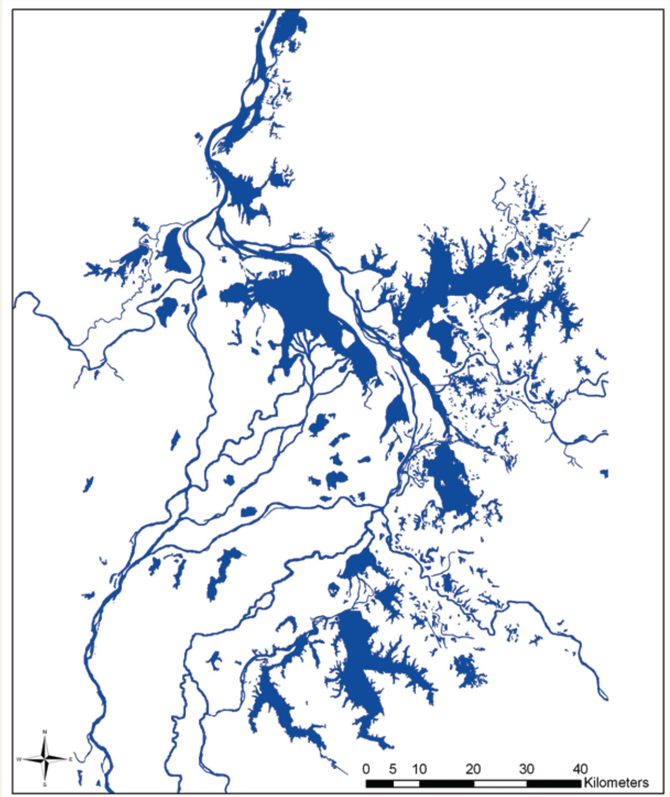
To understand some threats, however, in-depth research is needed. This chapter summarizes our work at Poyang Lake as an example for how research becomes integrated with conservation planning and policy.

Poyang Lake is an extraordinarily complex system. A tourist who strayed from the normal destinations and arrived at Poyang Lake in winter would find extensive meadows of grass and sedge surrounding shallow lakes and wide mudflats. Boat traffic is limited to the rivers and the shrunken main body of the lake, while vast shallows cannot be navigated and may be too submerged for walking. One can drive all the way from the capital city of Nanchang to Wucheng, on the high ground where the Gan and Xiu Rivers meet in the northwest corner of the basin. Yet in the summer flood season, Wucheng is an island. Looking out to the north and west, open water stretches infinitely, all the way to mountains. To the east, moving waters surround the diked polders. Two different worlds exist here: dry winter and flooded summer.

This dramatic fluctuation in water levels from winter to summer can amount to as much as 11 meters under normal conditions. The scale of change, and the strength of summer flooding, has prevented reclamation of major parts of this wetland. In 1998, especially severe floods damaged or destroyed many of the villages and reclaimed farmlands, and the Chinese Government invested millions of yuan in relocating people out of the lowest areas. The flooding itself is complex, because the five tributary rivers from the south flood early in summer while the Yangtze River floods in late summer. At that time, the Yangtze flows back into Poyang Lake and waters continue to rise. By mid autumn the rains have stopped both to the south and west, and Poyang waters gradually drop, with mud flats emerging just as the Siberian Cranes and other bird hosts begin arriving from the north. Water continues to drop through the winter season until March, as the birds leave and spring rains begin.

The changes in water, and the vast extent of shallow wetlands in winter, have provided abundant habitat for wintering waterbirds. Water levels change within winter, and wind literally pushes the shallows across the lake basins, so the habitats shift week by week. The birds always seek new feeding places. Variation between years can be as great as within years. The terrifying floods of 1998 came five years after severe drought left major stretches of waterbird habitat utterly dry, the tubers buried in hard mud and inaccessible to the birds. Yet under both flood and drought, the birds had other suitable places to

The water levels within the Poyang Lake Basin fluctuate by as much as 11 meters between high water levels in summer (left) and low water levels in winter (right). Maps by Mike Engels, International Crane Foundation



Over 98% of the eastern Siberian Crane population winters in the Poyang Lake Basin, along with more than half of the world populations of endangered Oriental Stork, vulnerable White-naped Crane, and vulnerable Swan Goose. Photo by Ji Weitao

go within Poyang Lake Basin.

Poyang Lake and the other wetlands in the Yangtze River floodplain have extraordinary importance for cranes, waterfowl, and other waterbirds. Recent counts indicate that about 1.1 million individuals of 24 species of ducks, geese and swans are known to winter in eastern China, with about 80% in the Yangtze floodplain (Cao et al. 2008). Poyang Lake is by far the most important of these wetlands for waterbirds. Over five years (1997-2001), Poyang Lake had the largest winter count in all of East Asia, according to the Asian Waterbird Census: its 1997 count of 353,737 birds was 73% higher than any other location during this five-year period (Li et al. 2004). Counts conducted by this project in 2005, 2006, and 2008 have exceeded 400,000 waterbirds (Qian et al. 2009).

Poyang is irreplaceable for threatened and declining waterbird species. With loss or near loss of the central and western flocks of Siberian Cranes, the future of the species depends on safeguarding the eastern flock. Over 98% of the eastern flock winters at Poyang Lake. More than half of the world populations of endangered Oriental Stork *Ciconia boyciana*, vulnerable White-naped Crane, and vulnerable Swan Goose have wintered here in recent years. Poyang Lake is truly a keystone for conservation of East Asia's waterbirds.

Beginning in the early 1980s, Chinese and other researchers have been counting waterbirds in the Poyang Lake Basin. ICF began work at Poyang early in 1985 and has done fieldwork most winters ever since. Waterbird numbers were significantly higher than today (most waterbirds have declined across Asia during this time), but even in the mid 1980s the feeling of vast space and shallow habitats stretching beyond horizons truly meant that finding these "huge" flocks could be very difficult. Accurate, complete counts were impossible. The distances were daunting to hike, even within the Poyang Lake National Nature Reserve (PLNR) that covered just 6% of the lake basin. When water was low, the largest of lakes within the reserve, Dacha Hu, was too shallow for boating and impossible to see across; sometimes sizable flocks of cranes simply vanished from human observation.

Through repeated ground and aerial surveys, we know the world population is roughly 3,500 Siberian Cranes. But by the mid 1990s, and especially after the 1998 flood, these treks and surveys made clear several conservation needs. PLNR has global importance for its cranes, geese and other wintering waterbirds, but in any given moment large numbers of the waterbird flocks are outside the nature reserve. Often, one cannot find any Siberian or White-naped Cranes, and few Swan Geese. During the drought of winter 1992-93, there were no cranes within the reserve (Harris et al. 1995). For the waterbirds to be effectively conserved, a much larger part of the wetlands of Poyang needed protection. In addition, even with an expanded network of nature reserves, waterbirds would often fly and feed outside their boundaries. While these species were protected everywhere by law from hunting, wildlife agencies needed much greater capacity for enforcement. Finally, it was evident that surveys and aerial counts could not tell us why the birds moved, or what conditions were necessary for their survival. Urgently needed was a research program to determine the linkages among winter bird distribution and movement, water levels, and distribution of the aquatic food plants on which many of the birds depended.

SCWP took shape through years of effort for the Siberian Crane, and for Poyang Lake and other sites along the flyways. The Chinese Government had already taken major steps to address these conservation needs. By the time SCWP began, 14 nature reserves had been established, and 15 county level wildlife protection stations, one for each county around the entire lake basin.

During 1997-98, ICF developed a research project in collaboration with PLNR to determine those linkages among cranes, water levels, and aquatic food plants. While the cranes do eat a variety of foods during winter, studies in India and Poyang indicate the primary food is tubers of aquatic plants that the birds dig from the mud with their long, powerful beaks. With the coming of winter, these plants store starch in the tubers buried in the bottom mud with the plant roots. A group of birds, what scientists call the tuber-foraging guild, feed on these tubers at Poyang, including Siberian, White-naped and Hooded Cranes, Swan Geese, Tundra Swans, and others (Barzen 2008). The most important of the food plants is *Vallisneria spiralis*. While this species has not been carefully studied, its close relatives in Europe and North America have; they are all highly important as food for many waterbirds.

ICF began this research in 1999, focusing on four representative lakes, three of them within PLNR and one just outside the reserve boundaries. Unlike many research projects, this project was designed to last a decade or longer due to the highly fluctuating environment. We were concerned about the growing conditions for *Vallisneria* in summer. Turbidity, or the amount of particulates in the water, was a key variable, for it determines how deeply sunlight penetrates the water, and thus the depths at which *Vallisneria* can grow. Water cloudy from soil erosion prevents the plants from growing in deep water, while flooding with turbid water might make large areas of lakebed unsuitable for the plant. Yet winter water conditions also would determine where cranes and other birds would feed. The birds could not access the buried tubers in deep water, nor could they dig in hard, dry mud. Cranes need shallow water or soft mud to access their food. This need explains the importance of wind in winter. As it blows the shallow waters around, different areas become wet and new beds of tubers are available.

Starting in 1999 and every winter since, ICF has supported PLNR in collecting weather and water level data, turbidity, water plant abundance (in the growing season) and tuber abundance (in the dormant period), and bird numbers and distribution. Transects across each of the four study lakes have allowed us to relate bird distribution to abundance of *Vallisneria*. We collected data on diverse members of our foraging guild, to provide a more complete picture of the significance of *Vallisneria* and other tuber-producing plants.

The SCWP has provided stable funding for most of those years, supporting the field work and data purchase at PLNR. It has also provided staff and travel support during the data collection phases, and during the last two years as we have begun to analyze and disseminate our results. ICF, for example, has worked with other organizations actively studying wetlands at Poyang Lake to convene two meetings of researchers to compare information, enhance collaboration, and identify research gaps and future needs. The last meeting, in 2007, involved 18 different institutions.

The various species of the tuber foraging guild require different water depths in winter. Tundra Swans–most of the East Asia flyway populations winter at Poyang–forage at depths of up to two meters. Their winter distribution within lakes correlated closely with distribution of *Vallisneria*. Siberian Cranes, in contrast, usually forage at depths no more than 30 cm, although they will go into water up to 50 cm in depth. Our initial analysis did not find a significant correlation between winter water depth and crane distribution. Yet when we analyzed crane distribution with water depth together with *Vallisneria* distribution, we found a strong relationship. Thus the cranes depend on suitable water depths for foraging in winter, and also need suitable water in summer so that *Vallisneria* can grow abundantly. The cranes can only find suitable feeding areas where both these conditions are met in a given year.

The eleven years of data collection have included summer drought and wet winters, summer floods and winter droughts and other combinations of winter-summer conditions. Given the importance of Poyang Lake to the economy of Jiangxi Province, and to the water management system for the Yangtze Basin as

a whole, water management that in turn determines conditions for waterbirds has become increasingly complex and pressured by diverse interests. ICF and PLNR intend to continue the basic monitoring in future years, and also to work together with other institutions to extrapolate results from within PLNR to the Poyang Lake Basin as a whole. While PLNR has the greatest concentration of wintering waterbirds, it lacks certain features found elsewhere within the lake system–specifically the main lake itself that always retains a sizable extent of water, and the river delta in the south part of the lake where Nanjishan Nature Reserve is located.

Inclusion of ICF's long-term research within SCWP was predicated upon its practical significance in guiding decisions concerning the management of water and other resources at Poyang. Early in 2007, ICF contacted senior officials in the Yangtze Water Resources Commission, responsible for planning water management and development throughout the river basin. Under this commission, the Hydro-Ecology Institute in Wuhan wished to have assistance from our project in evaluating impacts of a dam proposed for the outlet to Poyang Lake. The dam would be open during the high water seasons but closed during winter to prevent the waters of Poyang Lake from going below a certain elevation. ICF was asked to assess impacts of the dam on waterbirds if the dam were operated to maintain minimum water levels at 16 meters above sea level (Wu Song system), or at14 meters or 12 meters. The latter number is close to the average minimum water depth of 11.7 m in recent years.

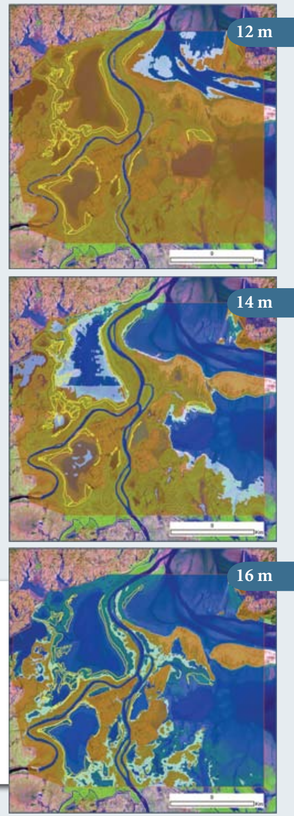
Based in large part on the SCWP-supported study of water levels, food plants and crane distribution, ICF prepared two reports for the Hydro-Ecology Institute (Barzen 2008, Barzen et al. 2009). The first report evaluated the sensitivity of the diverse foraging guilds at Poyang to changes in water level. Even within guilds, water level changes would have varying impacts because of specific foods required for each species. This report indicated that the grazing guild, consisting primarily of five species of geese as well as Hooded and White-naped Cranes and some duck species, would be especially vulnerable because they feed on the perennial, emergent communities dominated by grasses and sedges that grow out of water in winter. These communities extend in narrow bands running around the upper edges of the lake basin, and would be flooded if high water levels were maintained by a dam.

Our second report evaluated impacts of the proposed management scenarios for the outlet dam. Aside from our long term study, we relied upon mapping vegetation communities and zones of water depth corresponding to suitable foraging depths for different species on a highly detailed elevation map for the northwest part of Poyang Lake including PLNR (see Figure 4). Our research indicated that construction of an outlet dam would have major,

Left: Large numbers of Tundra Swans winter at Poyang Lake. Photo by Ji Weitao

Figure 4. Siberian Crane foraging areas in the Poyang Lake Basin

This series of maps illustrates projected maximum Siberian Crane foraging areas (water level 0-50 cm, shown in light blue) at 12, 14 and 16 m (Wu Song) minimum water elevations in the Poyang Lake Basin. The dark blue water is deeper than 50 cm. Maps by Mike Engels, International Crane Foundation, from Barzen et al. (2008)



negative impacts on wintering waterbird populations, potentially irreversible. If minimum water levels were maintained at 16 m (Wu Song) most shallow water areas historically used by waterbirds would be inundated so deeply that they would be lost as waterbird habitat. Consequently, many species could no longer access food resources within the lake basin. Of the remaining shallow water areas at 16 m, plant communities would be forced to shift extensively across elevation gradients where historically they were not found. During this period of vegetation change, that would take several years if it could happen at all, entire populations of birds that depend upon emergent plant communities (e.g., geese and other grazers) would be severely impacted, and might be extirpated.

Impacts with minimum water levels at 14 m would be similar and almost as severe. With minimum water levels at 12 m, extensive areas of foraging habitat would remain, but the areas now utilized during drought years would no longer ever be available. More importantly, the system would lose a significant element of diversity and flexibility, in terms of habitats available to the waterbirds. The abundance of waterbirds, and the remarkable biological productivity of the entire wetland, derive in good part from strong fluctuations in water within and between years. Reducing that fluctuation could cause profound changes to the entire wetland complex, fundamentally altering its ecological character.

This assessment of dam impacts on waterbirds has been a significant contribution as the Chinese Government evaluates this proposal that is strongly advocated by the Jiangxi Province Government. A presentation based on our research led to an article in *Science* regarding the dam and its impacts (Li 2009). Our research provides the best quantitative basis for understanding waterbirds in the basin, their ecology, and needs for conservation. Yet the dam proposal also reveals a great need for further research addressing waterbirds and the entire ecology of this lake system, unique in Asia.

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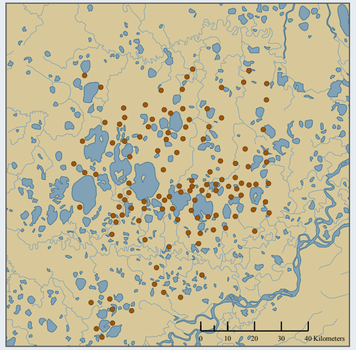
Research Expands at Kytalyk

Since the early 1990s, the Institute of Biological Problems of the Cryolithozone (IBPC) in Yakutia has conducted monitoring at the Siberian Crane breeding grounds. Thanks to the SCWP, during the most recent years the annual monitoring of breeding grounds has been expanded (Germogenov et al. 2008). Currently the monitoring system includes a model study area (36 x 36 km); they call this area "square 42," with the highest Siberian Crane densities within Kytalyk Republic Resource Reserve (RRR). Due to logistical constraints, the annual observation takes place only in two areas within square 42: Yelon Camp and Jukarskoe Lake environs, covering about 20-25% of the model study area. Annual ground survey coverage of the entire study area is nearly impossible due to difficult landscape conditions, whereas annual air surveys would be too expensive to sustain. Meanwhile, there are numerous, although not regular, data on the adjacent territories in Kytalyk, some of which demonstrate the same Siberian Crane abundance as the model study area (Stishov and Bysykatova 2008).

By 2006, within the main study area in Kytalyk RRR, the individual sites for 102 crane pairs had been located within an area totaling 7,884 km². Figure 5 shows locations of breeding pairs for a part of the core area of Kytalyk. In 2008, 11 and 5 new pairs of the Siberian Crane were discovered in model areas 41 and 42, respectively. The breeding success of the population varies broadly (from 6% to 70%) and depends primarily on the weather conditions during the beginning of the egg-laying stage (late May-early June) (Stishov and Bysykatova 2008).

The breeding grounds of the East Asian population are relatively undisturbed, but one of the main threats is the reduction of Siberian Crane nesting habitats. Long-term monitoring and analysis of satellite imagery for Kytalyk RRR have revealed an increase in the area of large lakes, inundating surrounding lowland used as breeding habitat by the Siberian Crane. As a result, some breeding habitats located near the lakes have disappeared and this process is continuing (Pshennikov and Germogenov 2008). While this process is natural due to annual thawing of permafrost and movement of water in the lakes, researchers from the Institute believe habitat deterioration has been increasing, as a result of warmer temperatures in recent years.

***Figure 5.** Locations of Siberian Crane breeding pairs at Kytalyk 1999-2009*



IBPC researchers have identified over 100 Siberian Crane breeding sites in the main Kytalyk study area, where the breeding density reaches five crane pairs per 100 km². Studies on the breeding grounds indicate that lakes are expanding, reducing adjacent wet meadows that serve as nesting habitat for Siberian Cranes (below). These lake changes appear to result from warming temperatures, increased wave action eroding shorelines, and soil ice thaw. Map data provided by Nikolai Germogenov, IBPC; Map by Dorn Moore, Green Space GIS; Photo by Crawford Prentice

VIII. *Strengthened Management for the Sites*

A process that links learning and action

Managing nature reserves is a complex and ever-changing task. Reserve management is especially challenging for wetlands.

The ecology and functions of wetlands derive from water. Change the inflow of water, and the wetland itself changes. As we found while working on water at the northeast China sites and at Poyang Lake, water issues extend far beyond the amounts of water the wetland receives within a year. The timing of water is vital as well, as are its fluctuations within and between years, and from where the water comes. While local rainwater can be significant for some wetlands, for most the primary sources of water are incoming streams and rivers that empty from large catchment areas. Changes to the vegetation and land use of the watersheds, usually beyond boundaries of the nature reserves, can transform the hydrology for the protected wetlands. Even groundwater is affected by changes in the catchment.

The most extensive or biologically diverse wetlands that have survived development are often in remote areas where human livelihoods have lagged behind. The local communities, often poor and with limited opportunities, rely heavily on the wetland for water and often for its harvests of fish and plants–and for waterbirds in regions where hunting is common.

Hence, wetland managers are coping with a management task where they usually cannot control the determining factor–water–and where the areas they protect are often vital to local economies; perhaps these natural resources were used by people for decades or centuries before any nature reserve existed.

For all these reasons, management planning is basic to the success of nature reserves at effectively safeguarding biodiversity and the ecosystem services upon which humanity as well as wildlife depend. So essential are management plans to long-term protection of the landscapes within protected areas that our project aimed to develop or expand the scope of management plans for most of the project sites. These activities usually began during the early years of the project.

Karazhar Lake in the Naurzum Lake System, Kazakhstan. Photo by Timoshenko Aleksey

All these problems confronting nature reserve managers are compounded in arid regions. The margin between water availability and water needs is slight. Such landscapes experience great fluctuations in rainfall month by month and year by year (or even among decades or longer cycles of wet and dry that span 30 years or more). Growing human communities have generally not recognized the constraints of limited or fluctuating water supply. Confronted with water shortages, they turn to dams, canals, and other engineering solutions that degrade natural systems that include rivers, lakes, wetlands, and vast regions downstream that include protected areas.

The long migrations of Siberian Cranes traverse extensive arid regions, dotted with wetland staging areas, along both flyways. In northeast China, as we have seen, all wetlands within a critical mid-point region of the flyway face severe threats of water shortage and ecosystem change. As vital as water is to the future–even to the survival of these sites and their waterbirds–these sites lacked any planning that addressed their ecological water needs. Our project undertook to fill these gaps, as described in Chapter VI.

The West and Central Asian Flyways converge on the vast steppes of northwest Kazakhstan (see Figure 6), where millions of waterbirds of 115 species rely on lakes and wetlands that nourish these dry landscapes (three species of migrating cranes occur here, and 70 waterbird species that breed). The Kazakhstan portion of SCWP has had major achievements for four project sites within the Kostanay Region. We shall describe this work as an outstanding example of how the project has

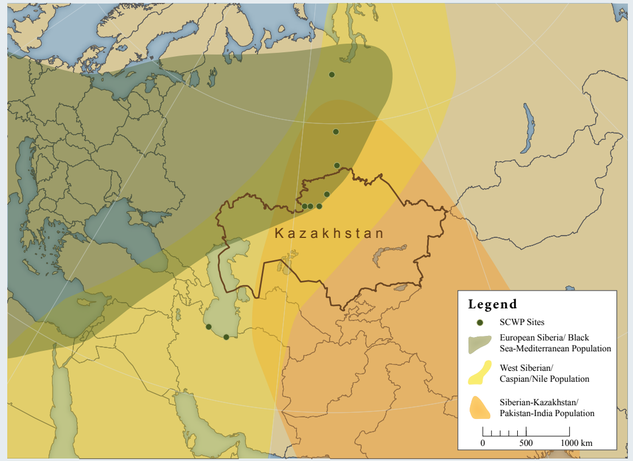


***Figure 6.** Waterbird flyways in northwest Kazakhstan*

As identified by Isakov in 1967, Kazakhstan is a crossroads for waterfowl flyways, linking Siberian breeding grounds and wintering areas to the south and west. Isakov's work laid the foundation for current research on waterbird flyways in this region. Map adapted by Dorn Moore, Green Space GIS from UNEP/CMS Secretariat (2008)

Wetlands of northwest Kazakhstan attract a high diversity of threatened waterbirds, including the critically endangered Sociable Lapwing. Photo by Torsten

Figure 7. The five major objectives to strengthen site management in Kazakhstan

1. *Raise national and international status of sites*
2. *Conduct scientific studies for all project sites*
3. *Establishment of a new protected area encompassing Zharsor-Urkash State Natural Zakaznik*
4. *Expand Naurzum Nature Reserve*
5. *Develop management plans for Naurzum Reserve and Zharsor-Urkash Zakaznik*

enhanced protected status and management planning for protected areas (Inyutina and Bragin 2009).

These landscapes had long been recognized for their biodiversity, and Naurzum Nature Reserve had been established in 1931, one of the oldest reserves in central Asia. Yet during the period of virgin and fallow lands development in the 1950s and 1960s, the reserve boundaries were redrawn, fragmenting the reserve into four isolated components and removing 76,800 hectares from the reserve's territory. Nearly all steppe and a group of globally important lakes were left out of the reserve. The other three SCWP project sites in Kazakhstan lacked any protection status, and remained vulnerable to many human activities including fire and hunting in autumn.

During our project, five major objectives have served to strengthen management of wetland, steppe and migratory waterbird conservation in Kostanay (see Figure 7). The first objective was to raise the national and international status of all four sites. These designations would directly lead to stronger mandates and protection authority for the management agencies, and open up new sources of funding for conservation. Equally important, national and international recognition would demonstrate the significance of local landscapes in the eyes of local communities and government, heightening the prestige of Naurzum and other sites. This recognition would inspire more support for the protected areas and more visitors from outside that could lead to creation of tourism income.

Over the past five years, our project has succeeded in raising the profile of Kostanay wetlands. In May 2007, all four sites were designated by the Kazakhstan Government to be part of the newly formed Western/Central Asian Site Network for the Siberian Crane and Other Waterbirds, under the auspices of the Convention on Migratory Species. Two months later, all four sites were officially included within the international network of Important Bird Areas (IBAs). In 2009, all four sites were nominated and accepted for inclusion in the Ramsar Convention's List of Wetlands of International Importance. These included Kulykol-Taldikol Lake System (8,300 ha), Koibagar-Tyuntyugur Lake System (58,000 ha), Zharsor-Urkash Lakes (41,250 ha), and Naurzum Lakes (139,714 ha).

Most remarkably, Naurzum was a major component of the "Saryaka Steppe and Lakes of Northern Kazakhstan" that joined the List of the World Heritage Sites under UNESCO on 7 July 2008. Naurzum and Korgaldzhin National Nature Reserves, within this site, became the first reserves in Central Asia to receive this global recognition.

These successes depended upon progress toward the second objective: to conduct scientific studies for all the project sites, to review existing information, identify gaps in our knowledge, and develop strategies that would implement research to fill those gaps.

The third objective resulted successfully in the establishment of a new protected area encompassing Zharsor-Urkash State Natural Zakaznik. The zakaznik protects 29,334 ha of sand-feather grass steppe including many hollows that contain fresh and saltwater lakes attracting tens of thousands of shorebirds on migration, large numbers of geese, and up to 15,000 Eurasian and Demoiselle Cranes. Four reliable reports of Siberian Cranes have come from Zharsor Lake in the past seven years (Yerokhov et al. 2009). Nesting species include Demoiselle Cranes, Little Bustard, White-headed Duck and the critically endangered Sociable Lapwing. The national government of Kazakhstan provided this formal designation on 11 June 2008, a step that could not have happened without strong scientific basis.

The fourth objective was to expand Naurzum Nature Reserve. This expansion occurred early in the project and added 103,687 ha, bringing the total area to 191,381 ha. A buffer zone was added to connect the three core areas, a sizable expanse of steppe (116,726 ha) in order to safeguard the lakes and wetlands from degradation of surrounding uplands by controlling the numbers of livestock and other human activities. Reserve boundaries moved out and away from lake shores and forest edges. Expansion enabled the reserve to protect the full range of steppe, wetland and other ecosystems with their remarkable array of biodiversity. The southernmost lakes of Naurzum came under protection, including Kulagol Lake, which provides critical habitat for Siberian Cranes and other waterbirds during low-water periods when large water bodies shrink or dry up. These lakes had been removed from the reserve during the agricultural expansion.

Noteworthy was the careful process of consultation with local residents and governmental bodies during the development of plans for expansion. Discussion within Naurzum District alone occurred over the course of a year, and only after this year of dialogue were negotiations started with other stakeholders and the regional government. Preliminary plans for protection zones and their management guidelines were discussed and agreed upon with each land user before official maps were prepared. Such involvement of the people provided a new model for protected area establishment for Kazakhstan. The experiences at Naurzum have already been applied to the expansion of Barsa-Kelmes and Aksu-Dzhabagly Reserves, and to the preparation of proposals elsewhere.

The fifth objective was to develop management plans for Naurzum Reserve and Zharsor-Urkash Zakaznik according to Kazakhstan's regulations and international standards. The management plans provide clear objectives and strategies for the managing agencies, the long-term integrity of ecosystems and their functions together with recovery from past human activity and integration of biodiversity.

The early stages, already described, included the gathering of past data and records of the natural components of these areas, completion of additional studies, and a listing of priorities for further work. The community involvement process for the expansion of Naurzum and establishment of Zharsor-Urkash Zakaznik included discussion of the resource concerns of local people and other stakeholders. As these landscapes are important for livestock production, impacts of reserve management on herders' livelihoods received much attention. One need was to create awareness among the grassland users of the importance of maintaining appropriate numbers and mixes of the different types of livestock, to avoid damaging the grassland so that soil and water would be lost. Without such restraint, the reserve ecosystems would suffer, and so would the herdsmen.

The management plan at Naurzum includes a workplan for protection activities, a system for efficient patrolling and enforcement of regulations, provision of financial, technical, and human resources for fulfilling management objectives, improvement of the technical capacity of staff through training, and a framework for facilitating tourism compatible with nature reserve management and raising awareness among local communities and visitors about conservation needs. The plans for both the reserve and the zakaznik are supported by GIS maps of the protected areas, with layers including surrounding land use, the hydrological systems, ecosystems, and so on.

This process recognized the importance of monitoring to measure progress in implementing the plan, further management needs, and identification of corrective measures and adjustments where needed. Specific recommendations guided development of the monitoring program, while inspectors and technical staff were trained in ecosystem monitoring methods. In 2008, the reserve developed a database for holding the accumulating information on ecosystems and waterbirds.

The Zharsor-Urkash Zakaznik has limited staff and field capacity at present. The zakaznik is now being administered and protected by staff of the Naurzum Reserve, an innovation between these adjacent sites that may have applicability to other protected areas in Kazakhstan where staff numbers may otherwise limit effective protection. Naurzum is also administering two other nearby reserves.

A substantial part of the planning process has

The Naurzum Water Management Plan provides guidance for removing or repairing damaged dams that are not operating correctly and may cause significant erosion (right). The repaired dams provide vital sources of water for both wildlife and nearby communities (above). Photos by Crawford Prentice

focused on water resources. Due to the significance of water, its interconnections and economic role within the larger region, and the need for specialized expertise, development of water management plans for the Naurzum Lakes Basin was a major, separate activity for SCWP in Kostanay (Inyutina et al. 2009). Again, the planning effort depended on careful, expert assessment of past hydrology, gathering of current information, estimation of changes through time, cataloguing and evaluating impacts of past water control projects, and identification of information gaps.

The lakes in the Naurzum Basin rely heavily on spring flooding from snow melt, and have experienced high natural variability in the past. Such fluctuations are vital to the ecosystem health of the wetlands, and the dry periods allow for decomposition of material on the lakebed and germination of many plants that need air to begin life but that will continue growth underwater as an important source of food for waterbirds. Due to variations in rain and snowfall, and the different sources of water feeding the lakes, these lakes provided highly variable habitats for migratory birds. Some lakes, such as Kulagol, were primarily important during dry periods; as Kulagol was fed by springs, it retained shallow water while many other wetlands became dry.

Kostanay appears affected by gradually drying conditions associated with climate change, but other transitions to the wetlands result from the construction of many small earth dams and creation of ponds and watering holes for livestock–vitally important to the herdsmen and small agricultural settlements. In the absence of active maintenance, the small dams on the streams feeding the Naurzum lake system have resulted in significant downstream erosion taking place during extreme spring floods, with the sediments being deposited along river stretches and on lake beds. Evaporation increases once the riverbed is raised, and shallower lake depth is a major problem for fish survival in winter when the lakes freeze over.

The water plans for Naurzum brought together human concerns and needs for water with strategies to restore and safeguard the shallow waters vital to waterbirds. In order to involve local people in conservation, support Naurzum Reserve and attract additional funding, the "White Crane Resource Center" was established by SCWP. This center in turn helped organize a non-governmental organization of water users, under the name Burevestnik. This group has already received funding and completed rehabilitation work on a dam; including removal of silt from its associated impoundment in Burevestnik Rural District, and installation of water release facilities.

Based on consultations and technical assessments, an inventory has been created of dams that serve important human needs and must remain (and in many cases, be reconstructed or repaired) and other dams that serve little good use and should be removed. The reserve recognized that while it might be easier to remove all the damaged dams than to repair some dams, that order of activity might result in public opposition to the reserve and the water management process. A balanced approach has instead been chosen, which has involved removing a few dams that were of little use to local people, and building capacity among local water users to repair and maintain the remaining dams and impoundments so they can be utilized, while minimizing risks to the lake system from erosion and downstream sedimentation during spring floods.

The measures adopted for implementation show ingenuity and diversity in approach. The plans attempt to reduce obstacles to the natural flow of waters to fill the lakes. Considerable attention has focused on optimizing efficient use of water, and on looking at the system as a whole when considering individual dams and ponds. Operators of the dams have been trained in strategies to minimize soil erosion. Users are learning ways to rely more on surface water sources rather than groundwater. A basin agreement has been negotiated for water users, through the work of the Tobol-Torgay Basin Council that was established in 2006 (the Naurzum Lakes Basin was immediately included in its workplan). A representative of the water users NGO Burevestnik has been included on the Basin Council. The basin agreement comprehensively addresses human and ecological water needs, and ensures on-going monitoring of the condition of water bodies, changes in hydrological regime, and observance of compliance within the basin. The agreement allows Naurzum Nature Reserve to participate in the decision-making process for all surface-water projects within the Naurzum Lake Basin.

The management planning for Naurzum has introduced new strategies to Kazakhstan, particularly the processes for involving resource users. Yet the effectiveness of this process, and the resulting management plans, will only be realized to the extent that these plans are living documents, informed and modified through the monitoring of ecosystem change and the results of management activities. Through our project, all participants have had opportunities to learn as they talked with other stakeholders whom they have never listened to before, and together they have identified solutions. The effort to implement these shared ideas will continue the learning, so that limits and flaws within the original solutions become clear. Planning and action are an iterative process. If successfully fulfilled, this process will steadily improve the management of protected areas.

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Trappers Associations were developed at Fereydoon Kenar in northern Iran to encourage participation of community members in the management of the FDK Non-Shooting Area, promote improved livelihoods for the trappers, and support conservation of the Siberian Crane and other rare waterbirds. Photo by Crawford Prentice

IX. *Working with the People Who Live With Cranes*

Our project involves communities with wetland management and protection

Few of the visitors to the great crane marshes have ever lived beside a wetland. Even if they have visited repeatedly, or have had professional training in ornithology, ecology, or management, they do not know the wetlands in the deep ways experienced by communities residing by the water. The same is true, for the most part, of wetland managers and professional staff of nature reserves. Many of them are new to the wetlands.

The productivity of wetlands, which makes them havens for so many bird species, has likewise served humanity well for longer than we have recorded history. Even the oldest protected areas are remarkably new, relative to the human history of the sites, and are often almost a surprise to people who struggle to make a living in places difficult to access, which also flood at inconvenient times and are far from markets.

As incomes have grown through many parts of Asia, the tasks of wetland protection and how to address needs and concerns of wetland users have become more difficult and complex. Urban people have money to invest, and wetlands can make attractive locations for creating fishponds, or tourist resorts. Thus the peoples relying upon wetlands for making their livelihoods have become highly diverse as well. Often interests of these diverse stakeholders-individuals or groups who use the wetland's resources or whose actions impact the wetlands-are conflicting. Stakeholders who lack understanding of conservation, and who pursue their own interests, can undermine or completely negate the best intended efforts by managers of wetland reserves.

Our project recognized this fundamental challenge to protecting the sites along the flyways. None of our project countries had traditions or widespread experience with involving stakeholders or local communities as participants in nature reserve management. Since our project aimed to strengthen management at all of the project locations, we also introduced stakeholder involvement and co-management. We emphasized community processes throughout our work on management planning and implementation.

In all four countries, we introduced stakeholder committees, comprised of representatives of local agencies and organizations with interests or influence over wetlands. For each site, composition of the committees was uniquely tailored to the resources and to the players relevant to wetland use. At Momoge in northeast China, for example, oil companies have a significant role within the experimental zone of the reserve and hence are important players–whether we wished it or not–in land management.

These committees met at least twice a year, and offered the opportunity for nature reserves to explain activities to be conducted with SCWP funding in order to gain support, or at least understanding, of the interventions intended. Reserve managers for the most part have been well practiced at telling others what will be happening, but they haven't had such extensive experience with listening to others, particularly those with less power or education. Effective communication requires both skills.

Listening is one of the simplest but most difficult skills to acquire, and only one aspect of a participatory process. Our project offered training in community involvement and participatory process at our sites in Iran, Kazakhstan, and China (Russia also implemented effective stakeholder committees, but did not provide formal training sessions).

At Fereydoon Kenar local trappers use trained ducks (above) to lead wild ducks into net traps. The trappers use flooded rice fields, or damgahs, landscaped with trees, shrubs and reed screens to attract the wild ducks. Shooting is not permitted in the damgahs, where Siberian Cranes and other waterbirds find refuge during the winter. Photos by Crawford Prentice and George Archibald

Public awareness activities targeting local communities at Fereydoon Kenar support programs to involve local people in wetland management and protection in Iran. The local NGO Ayandegane Sabz (Green Future) developed this poster.

Good communication with local stakeholders – also vital to achieve–often depends on visual elements, such as mapping resources with simple drawings, rather than abstract talk. Managers need to find alternative ways to communicate that can enable villagers to express their knowledge and views. Another element for success depends on planning joint activity with truly open-ended outcomes; one cannot engage the community in meaningful discussion if the managers already have the endpoint set. Yet effectiveness with all of these necessary skills comes with experience. The fundamental change in relationships comes only through time if at all.

Reserve managers achieve their positions with a variety of backgrounds, sometimes technical but often they have risen through the local government and acquired the adeptness and habits important for complex bureaucracies, such as having a good sense of power relationships and of alliances. Few nature reserve managers have the inclination for empowering the poorest residents within their reserves, or have clear ideas on how to do so.

Given this challenge, and the lack of strong, living traditions for participatory management in the four countries of the project, it is not surprising that this component of SCWP was perhaps the most challenging. We met with mixed success, especially in China where we started pilot efforts for changing the economic activities of residents to reduce impacts on wild resources at four of our five sites. Indicative of the lack of local experience with participatory approaches, the consultants for the work in northeast China had to be imported from the far southwest of the country. Only one of the four sites had sufficient success that we can now expect the project will be long lasting, while another village at a second site itself provided leadership almost despite nature reserve involvement. At the other sites in northeast China, the process seemed to go top down – antithetical to participatory process–or the most vocal and persuasive of the villagers happened to be the richest and most powerful, and thus benefitted most although they had least need.

Nevertheless, in each country participatory approaches and community involvement enabled significant achievements. Fereydoon Kenar is perhaps the least likely place for success, given a history of conflicts between local communities and the government, yet our project made significant progress that provides an essential foundation for conservation of this site (Neshat 2009).

Fereydoon Kenar is the last known wintering site for Siberian Cranes in Central or West Asia. At the time of its discovery in 1978, the tiny flock had only a dozen birds. Numbers have shifted up and down but then mostly down until only a single bird has been present the last two winters (Sorokin et al. 2009).

Fereydoon Kenar is located in Mazandaran Province along the lowlands on the south side of the Caspian Sea. The area protected as Fereydoon Kenar Non-shooting Area consists of four main damgahs, a Farsi word meaning, “trapping site.” Damgahs are rice fields that have been specially landscaped with trees,shrubs and reed screens, and are flooded through the winter to attract waterfowl. While the site is globally famous for its Siberian Crane, other rare species such as Red-breasted Goose occur here together with internationally significant numbers of more common species.

This valuable site exists for wildlife precisely because of the peculiar form of trapping that has been practiced for five to six centuries. This traditional method utilizes trained ducks released from the trappers’ hides, so that tame ducks lead wild ducks into net traps where they are taken for eating and for sale on the local market. The success of this method depends on the peace and tranquility of the damgahs, for otherwise the wild birds will not approach. Therefore the trappers strictly prevent any use of firearms, although firearms are abundantly employed throughout the surrounding rice fields for duck hunting.

The Siberian Cranes, various raptors and other birds find refuge within the damgahs where they avoid the waterfowl traps. Even the waterfowl reside in large numbers, flying out by night to feed on the rice fields and resting by day in the quiet of the damgahs.

The damgahs are privately owned and operated by the local community of damgah owners and trappers, who maintain these sites as wetlands and rigorously exclude outside poachers or disturbance. Without the damgahs, the Siberian Cranes would have no safe place for winter, and likely the flock would long ago have gone extinct. Yet the damgah operators are known to use legal and illegal methods for catching their birds, and in any event their hunting should be overseen by the Department of Environment (DOE) that has jurisdiction. The damgah operators, however, are reclusive and suspicious of outside interference. Relations between them and the DOE staff have not been easy.

As in most rural areas, change is sweeping across the Caspian lowlands, and the delicate balance at Fereydoon Kenar that links trapping, local livelihoods, tradition and a safe haven for the cranes and other birds could easily be upset. A major objective for the Iran component of our project has been to stabilize the favorable situation at the damgahs by providing more formal means of protection while safeguarding local practice and the traditional role of the trappers. Yet any intervention would carry high risk, for a single mis-step could lead any one of the trappers to kill the last crane, as well as other protected birds, and plunge the global biodiversity value of the site.

A careful dialogue was needed, a gradual set of conversations involving SCWP personnel, local officials and the trappers to enhance communication and build trust. It became apparent the damgah operators faced significant challenges. The economics that favored traditional trapping within the rich ricelands of northern Iran were changing, with growth in tourism and other development. Here was common ground, between the local residents who loved their tradition and the DoE staff and international participants who also wanted the damgahs to survive and prosper – although a little less independently than before. In addition, the trappers wanted the area more effectively protected by DOE from shooters from surrounding lands. This mutual discovery of common interest is a pivotal

Siberian Crane family at Fereydoon Kenar, Iran. Photo by Sadegh Sadeghi Zadegan

moment in any such project, although only the beginning of an on-going effort to achieve shared vision and cooperation.

The project wanted to provide economic benefits, but to realize some of the hopes of the trappers, and of DOE, the ability of the trappers to work together and take on new activities had to be enhanced. Furthermore, while DOE had legal authority to control the different types of trapping, external control could easily lead to conflict and heightened risk to the birds. The project needed to involve the trappers themselves in managing their sites and in particular their hunting practices. Thus the project set out to establish "Trappers Associations" and "Trust Funds" for each damgah. These associations provided a mechanism especially for communication and for educating the trappers about wetland management and the conservation values of the sites. Each association had a charter or constitution outlining its objectives and ways for operating, including conservation among its priorities. These charters were negotiated with the members and had their agreement. The official registration of these associations enabled them to access loans, insurance, and other benefits not available otherwise.

In 2007, DOE brought in experienced consultants, Dr. Saeid Nouri Neshat to guide the community participation, and Mr. Mohammad Reza Shafiee to facilitate the growth of the trappers associations. Mr. Shafiee led the groups through a participatory assessment of needs and problems from the community's point of view, and provided relevant training in establishing and managing the trust funds. The consultants also helped strengthen management of the associations themselves. During this time, Dr. Neshat also worked with DOE officials at local and provincial levels so they could support the participatory strategies for co-management of the sites, and effectively interact with the associations.

The goals of establishing the Trappers Associations and Trust Funds included:

- to encourage local duck trappers to be involved in the management and development of the Non-Shooting Area (a formal government designation for protecting the site);
- to support the work of DOE in managing the Non-Shooting Area especially by developing a management plan and establishing a Site Management Committee;
- to create sustainable development opportunities for the local community, and help the reserve achieve co-management with the local community;
- to support improved livelihood for the trappers and to improve the sustainability of traditional duck trapping practices; and
- to support conservation of the Siberian Crane and other endangered waterbirds.

Through these efforts, two of the associations are now fully functioning and their trust funds have become operational, providing their first loans for small business development or personal needs, while the other two associations are approaching readiness to begin. The project is helping the associations review proposals for income generating projects and services such as purchasing wheat or rice for the damgahs, and identifying feasible investments that might include duck rearing or agricultural products produced through integrated pest management. Continued assistance to the associations has been essential in promoting democratic structures to ensure full participation. Conflicts within the communities are now being reduced through a strengthened community process.

Since people other than trappers in the nearby villages can have an important influence on conservation, Dr. Neshat facilitated the start of other community based organizations in the surrounding villages such as Sooteh and Roudbast. Young educated people initially formed groups interested in integrated pest management as well as conservation and educational activities which can later evolve into broader concerns. In addition a group of local artists named themselves *Friends House*, and they also work on environmental issues.

The success of this unusual joint protection effort by the government and the local community provides an example for wildlife protection that is new to Iran. A core activity has been the participatory effort to develop a management plan for the site, and written agreements between the trappers associations (representing the land owners and users) and the DOE that legally controls the Non-Shooting Area. Through the experience at Fereydoon Kenar, DOE staff members have seen the value of participatory approaches that they plan to use in working with communities near other protected areas.

DOE is investing in the Non-Shooting Area, constructing an office, education center, and guard quarters. Community members have been trained as guards and will now become employees of DOE, a tangible way to secure the partnership between the community and government for this special waterbird refuge.

Participatory process takes time to achieve results and requires a different mindset among all involved. Given that protected areas interact with so many other stakeholders at local and provincial levels, the government agencies responsible and the communities themselves must continually re-examine and improve their skills and practice. Just as management plans should be a living process that grow and improve through learning by doing, so community management is a dynamic process that must be re-iterated over and over so that vision and objectives among the different players can better align, and so that all become more adept and articulate practitioners.

Thus process and practice at Fereydoon Kenar will need continued nurturing and support after SCWP ends. Co-management also depends on other aspects of a comprehensive approach to wetland conservation. Vital are efforts to raise public awareness of the ecological values and vulnerabilities of the site that relate directly to their biodiversity significance, and to their values for local livelihoods. At Fereydoon Kenar, these awareness programs have been closely linked to community management, perhaps one reason for the success here in comparison with some of our other locations along the flyways. Management and awareness activities depend on a strong science basis for management, something that the local community is not well equipped to provide. Application of science, and implementation of on-going monitoring of birds and other key parameters of the wetlands will be essential, and effective only as trust among the different players continues to grow. Opportunities should be developed for the community to participate, and be paid for, implementing significant parts of wetland monitoring.

While conservation programs developed at local or national scales can effectively promote participatory management at wetland sites, this effort at Fereydoon Kenar benefitted from its place in a flyway program extending thousands of kilometers to the north. The awareness and attitudes of trappers and local officials, broadened beyond immediate concerns. They developed a sense of pride, because birds that traveled thousands of kilometers, and the interests of concerned people all along the flyway, all depended on the future of four damgahs outside Fereydoon Kenar.

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X. Talking Together

Through SCWP education activities, students from Yakutia, Russia (above), and Xianghai Town in northern China (right) have learned how others are conserving cranes and wetlands along their shared flyway. Photos by Maria Vladimirtseva and James Harris

Education and outreach efforts support conservation at the sites and along the flyways[1]

Yakutia is a vast land and forms the Sakha Republic in the northeast of Siberia. It is the largest sub-national entity in the world, with a land area similar to India's, but with a population of less than 1 million compared to more than a billion. Yakutian tundra is famous among crane people as the breeding grounds for the eastern population of Siberian Cranes. In July 2008, a group of children set out from Chockurdakh (in central Allaikhovski Ulus) by boat, traveling down the Indigirka River across the tundra toward the crane breeding grounds within Kytalyk Resource Reserve. They soon had lessons about life on the tundra. Despite it being midsummer, they needed wood for warmth and for cooking, but the land where they would camp near the breeding cranes had neither trees nor wood. So the boat paused again and again along the Indigirka and small children wrestled with the trunks of trees that the river's strong current had carried from the south, to drag the timber onto the boat. When the boat reached the camp site, the children again hauled the wood up onto the land because the boat would continue on its way.

Due to bad weather, the children waited a couple days within the warmth of the cabin. They felt delighted to receive gifts of crane art sent from China. The children hung the art on their walls. Later they would make their own art, during rainy hours, to send to China and to America, too. Scientists talked with them about the strange world they had entered, with its permafrost and short summers, harsh autumns ahead for the young cranes. Many of the children did not

[1]A portion of this chapter is adapted from, "Regional flyway education programs: increasing public awareness of crane conservation along the crane flyways of Eurasia and North America," by Sara Gavney Moore and Elena Ilyashenko, in the proceedings for the Project Closing Workshop of this project.

***Figure 8.** Locations of Crane Celebration sites from 2002-2009*
Map by Dorn Moore, Green Space GIS

know that Sandhill Cranes from North America shared the same tundra nesting grounds as the Siberian Crane though occupying a different niche.

At last they followed the scientists onto the tundra, finding the nest of a Sandhill Crane left from last year and a Rough-legged Hawk nest with two downy chicks. When they came to the far end of the hill they could see four Siberian Cranes and two Tundra Swans. "We could not imagine before our land is so beautiful", said one girl, Shura.

Yakutia also has a long part of the crane flyway south through the taiga zone, open plains south of the tundra with forests of larch, pine and fir. As Chapter XII will describe, our project has established crane monitoring along this flyway, the early part of the journey south for chicks that are just three months old. A few months after the education camp at the Kytalyk Reserve, precisely at the time of the annual Crane Day celebrations in the settlement of Okhotski Perevoz in southern Yakutia, the Siberian Cranes were passing south. The scientists counted 798 Siberian Cranes during those days. Practically every child in Okhotski Perevoz could watch the cranes out the windows of their homes. Many children joined the counts and some sent their own reports to the scientists. In several communities, local Nature Protection Inspectors have taken the lead for education outreach about the cranes.

That same year, almost 2,000 kilometers to the south, one twelve-year old Chinese girl went on a hunger strike, to protest her father's scheme to convert wild lands into cropland. She felt aghast that the destruction of crane habitats near her home beside Xianghai Nature Reserve had come into her own family. Her hunger strike lasted just one meal before her father relented. Other children were taking action as well. Another girl who persuaded her family to grow corn without pesticides (the corn tastes better now, her mother said) had interviewed township officials about waste disposal (not properly done, and thus a threat to waters on which cranes and people depend), and joined with other children in painting a mural seven meters long for public display, to spread the children's vision of the beauty of Xianghai and its cranes through the four seasons.

The threats posed to cranes and wetlands in almost all cases arise from the actions of individual people, whether children robbing nests of eggs, farmers trying to farm marginal soils, local officials allowing waste and chemicals to be dumped into wetlands, or higher officials routing highways or canals through nature reserves. Especially urbanized societies become so separated from nature, and the natural connections among waters, land, forest and wildlife that they make many of the decisions in ignorance of their impacts. What one doesn't see, or glimpses only in the distance, hardly matters. People have lost a feeling for nature that makes it easy to destroy.

Thus raising awareness and providing understanding of wetland values, functions and vulnerabilities are powerful first steps toward conservation. For this need, the charisma of the Siberian Crane and the other crane species well suit them as flagships for the ecosystems that need protection. In the examples that began this chapter, education activities directly led to action: more people became involved in helping cranes and wetlands. Action is ultimately what education aims for, and action in turn strengthens understanding (one learns by doing) and strengthens commitment to a future for cranes and their wetlands.

Ideally, education is closely integrated with comprehensive programs for conservation, in particular at the sites where our project chose to work. But such is the excitement of cranes, and the eagerness with which teachers and other volunteers seized opportunity for new experience, that our education programming reached much farther across the Eurasian flyways than other components of our work.

Crane Celebrations

The most successful of these efforts have been called Crane Celebrations. The idea to organize Crane Celebrations came from a few Russian sites that have conducted annual spring or autumn crane events since the 1990s, including Crane Homeland Wildlife Refuge in the Moscow Region and Khinganski Nature Reserve in Amur Region. In 2002, the Crane Working Group of Eurasia (CWGE) decided to spread this activity widely and started Crane Celebrations at 11 sites in three countries: Kazakhstan, Russia and Ukraine. Crane Celebrations spread to new sites almost annually. Uzbekistan joined the Crane Celebrations in 2003, Turkmenistan in 2004, Azerbaijan and Kyrgyzstan in 2005, Iran in 2006, and Armenia in 2008. By 2009, this event had expanded to more than 120 sites in nine countries (see Figure 8). Seven of the 11 Siberian Crane Range States, including three SCWP countries are involved in Crane Celebrations.

It is very important that Crane Celebrations have a flexible date and the organizers plan the celebrations to coincide with the crane migrations. Most events take place in September and October to see the cranes off on their migration south. But in Iran, Uzbekistan and Turkmenistan, where Siberian or Eurasian Crane wintering areas are located, Crane Celebrations greet the cranes after their arrival in December and during January, the middle of winter.

The purpose of the Crane Celebrations is to draw attention to the conservation problems of cranes and their habitats. Every year CWGE announces different themes such as Rare Crane Species, We Live Together with Cranes, Wetlands as Crane Habitats, Crane Count, and Children's Art Exchange.

Crane Celebrations have inspired numerous theatrical performances, here at Oka State Nature Reserve in Russia and elsewhere across Eurasia. Photo by Elena Ilyashenko

Different groups are involved in the work of organizing Crane Celebrations including mainly students, teachers, but also hunters, frontier guards, and local government staff. Many diverse agencies, including zoos, nature protected areas, local schools, young biologists' organizations, and colleges and universities help run the Crane Celebrations. The events are mostly attended by children of pre-school to high school age, but in some areas local authority representatives also participate and support the event. Almost everywhere, Crane Celebrations receive wide coverage in local press and television as well as in central mass media.

Through the media of music, art, songs, plays,

dances, and games, people of all ages have learned about Siberian Crane behavior, ecology, and habitat, and have acquired a better understanding of the threats to crane survival and the need for conservation measures. Winners of competitions as well as more active and creative organizers received certificates.

Thanks to the financial support of the Convention on Migratory Species (CMS), SCWP, and Lufthansa Airlines, educational materials such as pins, stickers, brochures, calendars, posters, and bookmarks are produced and distributed among Crane Celebration sites annually. Included in these materials is the booklet "101 Questions about Cranes" with information on the seven crane species of Eurasia (Flint 2009). This book was written by the late Professor Vladimir Flint especially for these events. Professor Flint had been a central figure for crane research and conservation for decades, and developed the close, long friendship between Russian crane conservationists and ICF. We also distribute "Materials for Crane Celebration" including, short stories, legends, poems, songs, plays and games (Ilyashenko and Kiseleva 2004). Thus, the Crane Celebrations are also celebrations of culture, and of people's own relationship to nature. This connection is reflected in the book by I. Smirnov (2009), *Birds, Shamans, People: Siberian Cranes and other Migratory Birds in Eastern Siberia Folklore*, which was prepared and published through the support of SCWP. Some materials have been translated into national languages (Yakutian, Farsi, Azerbaijan, Turkmen, Uzbek, Pashto and Dari) and are accessible to rural people in those countries.

The Three White Cranes, Two Flyways, One World project has linked students in Russia, China and the United States through art and educator exchanges (left), a project website, and a shared responsibility for the future of cranes. Photo by Joan Garland

The Kazakhstan National Coordination Unit (NCU) created a remarkable array of awareness materials, with consultants developing 20 versions for different audiences and topics, more than 50 versions of calendars, and an atlas on landscape and biological diversity. Four films were produced and shown in workshops and festivals to more than 30,000 people. Kazakhstan integrated wetland and bird conservation into local school curricula, and produced sculptures, theatrical performances, and even a crane ballet! During the period 2006 through 2009, four Crane Festivals were organized in Naurzum Distric of Kostanay Region (11 villages located in the project area): more than 14,000 schoolchildren, plus representatives from seven cities and several countries, took part in the Ecological Holiday in 2008 (Inyutina et al. 2009).

The NCU organized Regional Athletics Games, under the symbol of the Siberian Crane, and more than a thousand participants received Siberian Crane athlete stickers. Two billboards each 20 meters high depicted Siberian Cranes in the stadium. There is now a crane museum in Karamendy Village near Naurzum.

The Kazakhstan NCU arranged for awareness surveys among populations near the project sites in Kostanay. In 2008, 100% of the local population was aware of the value and importance of their home areas, and that loss of these natural lands would result in reduction in biodiversity and in climate change for northern Kazakhstan. In 2005, 99% of respondents couldn't answer the questions.

This Siberian Crane education logo was designed by local art educator Aitalina Golikova in Yakutia, Russia.

Crane Celebrations seem to have a life of their own, since the caring and energy to run them come entirely from local volunteers. Our project has provided ample materials and encouragement, and also helped communicate to local groups how their events are part of a continent-wide movement. To encourage continuance and further spread of the celebrations, SCWP has prepared a handbook of suggestions and materials for organizers of these events (Ilyashenko and Kiseleva 2004). The materials supporting the Crane Celebrations are relatively inexpensive, so that

Sterkh Foundation Promotes Public Awarenss

In some sites the Crane Celebrations are organized not as one-day events, but have quite complicated programs lasting for one or even two weeks, called Crane Festivals. In Russia, for example, the Sterkh Foundation in Salekhard, just north of the breeding grounds of Siberian Cranes in western Siberia, is committed to the recovery of the central population in West Siberia through widespread and effective public education. In 2005 and 2009, the Sterkh Foundation, led by Alexander Ermakov, organized major Siberian Crane Festivals. They included a brilliant exhibition of more than 300 pieces of children's art, photos, handicrafts, poems, carvings, and sculptures. There was even a captive Siberian Crane on display from Oka Nature Reserve. An indication of the great public interest in the Siberian Crane and its habitats was the age of visitors: from seven to 70. Another indicator was the range of organizations represented: schools, local communities, a fish factory, the regional administration, the district administrations, hunting departments, and mass media. While hundreds of local people appreciated the exhibits and the crane, the crane specialists gathered in a conference room to share reports and to make plans for the restoration of the Siberian Crane. The Sterkh Foundation arranged a vast image and conservation slogan for the Siberian Crane, stretched upon a building nine stories tall, and a monument for Salekhard with the Siberian Crane over the globe. Annually the Sterkh Foundation has organized children's art competitions and the best pictures have been exhibited in the city airport. In 2006, the Sterkh Foundation published a colorful book containing children's artwork.

The Sterkh Foundation supported the development of a nine-story high billboard in Salekhard, Russia, promoting Siberian Crane conservation. Photo by Alexander Ermakov

even with reduced budgets the CWGE hopes to continue making and distributing at least single copies of materials that can be reproduced locally. Materials can also be downloaded from the CWGE and Siberian Crane Flyway Conservation websites. We expect many organizers to find local support.

Crane Celebrations are simple and flexible enough to allow local creativity and opportunity. In Yakutia, support from WWF-Germany and ICF enabled staff members of the Institute for Biological Problems of the Permafrost Zone/Cryolithozone in Yakutsk to develop a "tracking cranes" website that links to parallel websites in China and the United States (see below). Extensive education materials are available on the website on the biology of cranes, threats, what people can do to help cranes, and profiles of people and communities that have already become involved in conservation. Much material has been translated from the Chinese and English websites into Russian. While the Yakutian government is investing in internet capacity for remote schools across this vast republic, many of the participating schools could not access the project website. Website materials were therefore prepared in printed form and distributed by hand as chance allowed or sent by mail. These booklets have been highly prized by teachers and students alike.

Three White Cranes, Two Flyways, One World

The Yakutian project, and its education website, are part of a related project called *Three White Cranes, Two Flyways, One World* that aims to involve children in conservation of the three rarest of the world's cranes, all white (the Siberian, Red-crowned, and Whooping Cranes) along the east Asian and eastern North American crane flyways. This project aims to show children how conservation challenges and solutions are similar in distant places, that children can make important contributions to conservation, and that we are all world citizens who can help one another to solve seemingly huge problems. The websites for each of the three languages can be accessed through www.trackingcranes.org.

For the China part of the eastern flyway, activities have been coordinated by Beijing Brooks Education Center (BBEC), a small non-profit organization. Although an education website has been developed and effectively helped to disseminate materials and news, effort in China has focused on developing materials and teacher training for communities near important wetland reserves for cranes. For each SCWP location, BBEC has developed curriculum books that address resource issues

Children in Milwaukee, Wisconsin, and Xianghai Nature Reserve, China, love to meet educators from crane flyways on the other side of the world. Photos by Joan Garland

from local perspectives, relying heavily upon local expertise especially teachers in creating the materials. Teachers thus find themselves becoming conservation leaders as they include local experience and needs, and local culture, into the curricula that have been printed and distributed. Summer camps provide teachers the opportunity to practice new skills that emphasize experiencing nature and taking action for conservation, thus fostering citizen skills. Here also they meet other teachers from along the flyway and American teachers who have journeyed to China as part of the Three White Cranes project.

Teachers near three of the reserves have developed their own curricula, to supplement the curricula developed through BBEC, and one of these has been published.

There are inspiring stories from children who are learning the power of what they can do. Three White Cranes, for example, has connected Chinese, Russian and American teachers and students who share knowledge and caring for cranes, and who learn about life for children and wildlife in the other countries. A Wisconsin boy, Farit, worried so much about the future of cranes, he used his art to make note cards. He and other children from his school sold the cards to raise money, and sent it through the International Crane Foundation to Xianghai Town, beside Xianghai Nature Reserve in northeast China. The money helped students of Xianghai learn about nature through field trips and their art. Artwork created in China was carried back ICF to make new note cards in America that have been sold to further support art activities in Xianghai.

The Xianghai students wanted to help the cranes. Their art teacher Shi Yanqiu and New York artist Val DuBasky helped them create a mural seven meters long, to express their love for cranes and wetlands, their homeland. The mural (mentioned at the beginning of this chapter) will hang in the new museum for Xianghai Nature Reserve.

The students wanted to do more to raise awareness among their neighbors and community leaders.

Students learn about cranes and wetlands at ICF and at Xianghai Nature Reserve. Photos by Zhang Juan and James Harris

Three White Cranes, Two Flyways, One World

The co-financed project **Three White Cranes, Two Flyways, One World** has linked children from China, Russia, and the United States with one another, and helped them learn about the crane flyways of East Asia and eastern North America. The similarities among the cranes of these two flyways engaged students and their teachers, as well as their communities, in a global sense of the challenges facing our environment and provided a more intimate sense of the role caring people can have in solutions. ICF developed an exhibit on the Three White Cranes project that was displayed at its Wisconsin headquarters from June to October 2009. The exhibit will then show elsewhere in Wisconsin and along the crane flyway in eastern North America.

They painted another mural on the outside wall of a building in the middle of the town. Everyone passes the mural daily. The students have learned that by working together they can do more than any of them could do alone. They have learned how to participate in conservation, and they have experienced the courage and leadership conservation requires. They have made a big difference in raising community awareness of the problems facing Xianghai's wetlands and cranes.

Our education work has had many successes, although challenges also remain. Our activities have generated considerable passion and commitment that we believe will long outlive SCWP. Many teachers, and other community members, have caught the excitement and realized what is possible to change for the better in their communities. At most of the Chinese sites, however, the nature reserve staff members have been more passive, fulfilling requirements for organizing and holding events but showing little leadership or ownership of the process. They have done little to carry the work forward. In part, the solution to this challenge is to look at the problem differently; leadership can and should come from the community to protect the wild resources on which wildlife and people depend. The extent of community leadership, and how they work with reserve staff, can be unique to each location and each opportunity.

Unfortunately, there has been a tendency for many of those involved, from SCWP staff to consultants to the reserves and teachers themselves, to view education as a separate activity from the rest of conservation. There is a great need to use education programming strategically to discover and gain support for solutions to the most intractable problems facing wetlands, often dependent on community solutions. At Keerqin Nature Reserve in Inner Mongolia (China), the reserve leadership saw these connections, and education programming has been closely integrated with efforts to involve villages in grassland management and to reduce the damage from water shortage and over-grazing. A Mongolian language curriculum has been developed, and the county education bureau has determined it should be taught in schools throughout the county.

At some sites where the project completed Public Education Plans, however, these documents seemed more oriented to a tourist audience and a happy experience with nature without raising awareness of conservation needs or opportunities for people to help. But for Fereydoon Kenar and our project's other site in Iran, Bujagh National Park, a Public Awareness Strategy did succeed in identifying urgent needs, in selecting activities to address those needs, and especially in guiding implementation of those actions. Enhanced public awareness was an integral part of the project's approach in working with the duck trappers and developing the co-management agreements between the local community and the Department of Environment.

In western Siberia, as a result of public education programming and stakeholder participation, informed scientists, officials and community members contributed to the removal of an oil exploration drilling platform that was too close to a Siberian Crane nesting site. To foster similar alliances and community involvement, ICF will be working with national and local partners in development and implementation of a Public Education Strategy for Poyang Lake Nature Reserve with new funding for 2010-11. Programming at the north end of the flyway, in Yakutia, will continue with funding from Foundation Wetlands of Germany.

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XI. *Improving Capacity*

A GIS training workshop at the Ak Tyrna (White Crane) Information and Resource Center, a local NGO, targeted nature reserve staff, employees of the national Forestry and Hunting Committee, and local NGO leaders. Both the GIS for the project sites and the training facility were developed through the SCWP. Photo by Igor Smbayev

How we worked to strengthen the readiness of institutions and individuals to implement effective conservation

The other chapters in this central part of the final report all pertain to threats and our actions in response to those threats. Each chapter has introduced an activity component of our project, with outcomes that are tangible conservation achievements. We can measure the results. This chapter considers a less tangible quality nevertheless vital to success of the project or to sustaining its results into the future. All aspects of the project have depended upon the capacity of the individuals and agencies involved to take a complex project design, ample financial resources, the guidance of workplans, and transform them into effective conservation with lasting results. This intangible called capacity is something people cannot sense unless they already have it, or have taken the steps to nurture and develop it.

The complexity of this project–four countries together with an international executing agency; regional, national and site scales of action; diverse disciplines and tools for tackling problems, which all must be integrated at each scale–made capacity more of an issue for SCWP than for most GEF projects. In addition, our project needed to find a way to make all of the individual actions, deliverables, and outcomes add up to something larger: an effective flyway program spanning the largest of continents, diverse cultures, daunting distances and landscapes, and a flagship species that is critically endangered.

Regional projects are especially difficult to develop, and ours took a very long time to pass from its earliest conceptual stages – first discussed at a meeting of the CMS MOU in Iran (in the town of Ramsar, appropriately) in 1998–through to project approval and then inception in March 2003. This period was much longer than nine months. Yet as it finally became time to begin, we felt like parents coming home from the hospital with our new babies and

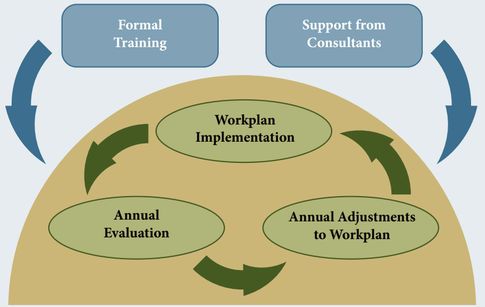

***Figure 9.** Capacity development occurs in three ways: through formal training, working with expert consultants, and an iterative process of doing, evaluating, and adjusting activities.*

the uncomfortable feeling of wondering what to do next. Chapter XIII will list many lessons from this project related to technical aspects of SCWP. But some of the most important lessons have related to capacity. See Zandri and Prentice (2009) for lessons related to project operations and capacity from GEF's earliest two flyway projects, implemented by the United Nations Environment Programme.

Given the complexity of flyway projects, the project inception period when the project design is adjusted and made operational is a crucial time. Because of the project's long development period certain specific objectives and certainly the context for the work had changed, so those plans needed adjustment. For example, we had aimed to encourage the establishment of additional nature reserves at Poyang Lake in China and to set up county wildlife protection stations to enhance wildlife status outside protected areas. Much of this work had already happened by March 2003 (the number of nature reserves had grown from 1 to 14, and all 15 counties had their protection stations, at least on paper). We adjusted our efforts toward strengthening the effectiveness of those new reserves and protection stations – in other words, developing their capacity for conservation.

In retrospect, the Regional Coordination Unit (RCU; run directly by ICF) and the newly established National Coordination Units all needed more training and mentoring than expected during project design. Almost all individuals involved were technical people who did not have experience with implementing projects of this scale. For future flyway projects, support and training in project procedures from the implementing agency should be planned as a major component of the inception phase.

One of our first steps was to employ an Operations Manager with extensive work experience with international agencies. Paul McVey, who worked for the project during its first year, developed an operations manual that has served us well. This document has grown when needs arose and we wrote new sections, and it has served as a model for other projects. Having such a project-tested operations manual as a starting point is essential. In assisting the national executing agencies for the countries in setting up their National Coordinating Units, we put attention properly on the Project Director, Project Manager, and the lead Technical Officer but the importance of the role of a national Operations Manager was under-estimated by the countries and by the RCU–due to our technical backgrounds–and we later faced difficulties due to weak or insufficient staff for these functions.

Our project implemented a very active training program during the early years of the project. Development of capacity actually proceeded along three lines (see Figure 9). First, the formal training provided background and essential information. Second, our project relied on many consultancies for management planning, research, community involvement, and so on. These experts worked closely with site and national staff on implementing or evaluating activities, and this practical work was at least as important as the formal training sessions in giving staff at junior and mid levels the skills and awareness to continue these activities on their own. Third, the annual workplans and budgets, which allowed for adjustments at each stage–meant that project implementation happened on an iterative basis. A period of implementation was followed by evaluation. Consultants and NCU technical staff–and technical staff from the RCU and ICF–provided correction and instruction for the next steps.

China had by far the most ambitious program of work, with multiple activities occurring at multiple sites. The NCU developed an effective system where NCU staff with national level consultants–without specific deliverables to prepare but

charged with ensuring high quality of all the project's outputs–toured the four northeast Chinese sites where at each location local staff and consultants reported progress and their draft documents were critiqued by the entire group. This process helped project components to develop in an integrated fashion, and strengthened the inter-disciplinary grounding of our work. These site visits happened twice a year, and were supplemented by visits of individual consultants as needed.

Within the country budgets, only very limited funding went to international consultants. Three of the four countries had considerable technical capacity within country, and we considered it more cost effective and more strategic to use consultants from within the countries in part as a way of developing domestic experience and skills. For China, because of the new directions we sought for the hydrological work needed to sustain protected wetlands, we did engage an international hydrological consultant for early years of the project. We wanted to be confident that solutions to water shortages at the northeast sites emphasized retaining or restoring natural flows and timing of water to the extent possible–with minimal use of engineering solutions, and even then designed to mimic the natural situation. This team approach between international and national consultants worked well. Past the third year, we relied upon national hydrology consultants only. We were fortunate that highly qualified consultants working at the sites interacted with a national consultant from another part of the country, a scientist highly respected, very sensitive to the dangers of over-engineered projects, and ready to speak his mind. In retrospect, however, it would have been useful to have the international hydrologist make a last visit late in the project to help assess our results and envision next steps after project completion.

An interdisciplinary team learned how to work together as they developed a monitoring program at Zhalong Nature Reserve. The box mounted on the pole records water data at one place where water enters the marsh. Monitoring is essential for evaluating and adjusting the effectiveness of water releases into Zhalong. Photo by James Harris

International consultants were also brought in to support the program in Iran, where locating local expertise on some progressive aspects of wetland management was a challenge. In particular, a series of training courses linked to the development of wetland management and monitoring plans was undertaken, which then enabled provincial level technical staff to lead the completion and implementation of these plans in association with national experts.

As mentioned in other chapters, the integration of programs on management planning, community participation and environmental awareness was essential for sustainable results. In Iran and Kazakhstan, strong teams of very experienced national experts provided input over several years to achieve these outcomes. The Iran NCU convened monthly meetings of these consultants to monitor and fine-tune their activities, resulting in greater shared vision and more effective integration of their work.

During the design phase of our project, we were asked to revise our project to have two phases. While this adjustment was necessitated in part by cash flow requirements, a phasing approach meant that we started our work during Phase 1 (the first three years) at only some of the sites while postponing work at the other sites until the second half. The lesser scope of activities at the beginning, while we were all learning how to work together, was extremely helpful. In reality, toward the end of Phase 1, we provided small budgets to the Phase 2 sites to begin their work. This gradual initiation of activity helped them with gaining capacity to manage their parts of the project. We noticed that the Phase 2 sites tended to get better work done more quickly. Perhaps this happened because they had learned from watching the Phase 1 sites and because staff members had participated in training activities from SCWP's beginning. With a smaller number of activities, these sites had less complex agendas. And finally, these sites had tended to receive less national and international attention prior to SCWP and likely were hungrier and more eager to put resources to the best possible use. Keerqin Nature Reserve in China, for example, started its education and community co-management activities after the Phase 1 sites but achieved the best outcomes and integrated the two activities more closely than at other sites.

Our project emphasized enhanced management and protection for specific wetlands along the flyways, so that much of our effort depended on involvement and leadership of the sites. Our experience varied widely with how successfully the sites engaged and performed. At Zhalong, for example, site leadership showed weak interest that did not improve during the six years, yet some of our most effective achievements occurred because the major threats to Zhalong were external. We engaged city and provincial leadership in solving these issues, as well as the water sector of government that previously had minimal contact with nature reserve authorities even though the latter were charged with maintaining wetlands dependent on water managed by the former. This lack of coordination was one major reason Zhalong Marsh was in such trouble. Through the use of consultancies, SCWP had considerable success at strengthening links between the reserves and nearby institutes and universities. Similarly, for the community work, our efforts helped to develop local leadership among villagers and teachers for managing natural resources at the community level (see Chapters IX and X). At Fereydoon Kenar in Iran, for example, the project started from a very low level of capacity but worked with the trappers/landowners in order to create a viable system for managing the damgahs; while this necessary work to strengthen participation and empowerment will take years, results thus far are promising.

In Kazakhstan, the project took the approach of developing initiative groups on various themes relevant to local concerns, assisting them to become registered as non-governmental organizations, and then building their capacity to apply for grants to fund their activities. No fewer than seven such NGOs are now active in Naurzum district (two from before the project) with more in neighboring districts, focused on community resource centers, alternative livelihoods (such as handicrafts, and biogas), environmental education, crane festivals, water management, handicapped children and bird monitoring. These NGOs have been connected through national NGO Ecoforum activities while Naurzum Bionet provides an electronic network. The main challenge remaining is effectively to link these civil society initiatives with the formal government processes related to the management of the reserves and rural development.

Another measure of improved capacity was the extent to which the project supported individuals in securing additional education. Six graduate students working on northeast water issues in China have or will soon receive Ph.D.s, and the project manager for China somehow managed to finish his Ph.D., on Siberian Cranes, while implementing our project. The research at Poyang Lake has supported eight staff members from Poyang Lake Nature Reserve to complete M.S. degrees, Bachelor's degrees, or two-year college.

Our project during Phase 1 under-estimated the importance of communications and media involvement, for disseminating our results. We thus lost opportunities to influence solutions to similar challenges elsewhere within our countries. Again, this shortcoming likely reflected the biases of the technical staff that ran our project. A strong exception was Kazakhstan, which began the project late (in January 2005) due to government reorganization. Its technical outputs were excellent, due to highly experienced consultants, but the project manager had strong management experience, understood the importance of communication, and developed a remarkable array of tools and activities for raising public awareness. The mid-term review for the project pointed out the weakness in communications. After the review, the RCU employed a communications specialist, and retained consultants within China to assist with media work, and this component improved. For example, nine reporters from national media attended our Project Closing Workshop and field trips. Professional communications experts were hired in Moscow, Yakutsk and Kazakhstan to write articles on the project's work on a long term basis to good effect during the last years of the project, and an environmental awareness NGO was tasked with this role in Iran.

In China, the project made significant investment in two Geographic Information Systems (GIS), one for the Poyang Lake Basin and the other for the four northeast sites in Songnen Plain. The Poyang Lake system includes maps with boundaries for all the protected areas in the Poyang Lake Basin, the first time that basic but essential

Russian educators (center) exchange experiences with Chinese teachers at a primary school near important wetlands in Liaoning Province. Such face-to-face contact empowers teachers and creates an exciting international context for flyway education at participating schools. Photo by James Harris

information has been easily available to the provincial office in charge, the Jiangxi Wildlife Protection and Management Bureau. This office has the staff trained and motivated to maintain and continue to use the system we have provided. In the northeast, the future of the GIS for Songnen Plain has also been secured (see Liu et al. 2009). It was developed by the Northeast Institute of Geography and Agro-ecology, which remains actively involved in research on wetlands in the region and can provide technical support to the reserves, but it will not be using the system on an on-going basis.

Instead, the system will be maintained in the National Bird Banding Center (NBBC) of China, that has housed the China NCU, due to continuing research and conservation interests in these wetlands. Each of the northeast reserves has copies of the system, and staff members have been trained in its use. Our Phase 2 sites used GIS to prepare the maps presented in their publications for this project, through the work of their own staff. This achievement, and the availability of technical support from both the Northeast Institute of Agro-ecology and the National Bird Banding Center, bode well for continued utility of the system.

Unlike many GEF projects, SCWP began through the efforts of conservationists who had already long been involved in the places and issues addressed by the project, and who had known each other for years through the CMS MOU for Siberian Cranes. One has to ask if passion and experience with the work resulted in superior performance during this project. Curiously, our experience was decidedly mixed. The Russian NCU was led by scientists who had devoted their careers to Siberian Cranes and who did accomplish important work during the early years of the project. Yet they could not enlarge that passion to include fulfilling the considerable management and reporting requirements necessary in a GEF project. On the other hand, despite early struggles, the younger and less experienced crane specialists from China performed very well and demonstrated adaptive management under challenging circumstances. Kazakhstan relied upon a project manager who was hard working and soon passionate about our cause although entirely new to this waterbird/wetland conservation endeavor. Kazakhstan started late but was the only country to have finished all its original objectives by the end of the six-year timeframe designed for the project.

The mid-term evaluator and several other outside observers commented on the warmth and caring evident during our meetings. Participants cared for the project and for the other individuals on our team. This atmosphere seemed natural to those involved but apparently is unusual for such a project. Such feeling, and personal commitment, may not have direct bearing on project outputs but does bode well for sustainability of the project's outcomes in future years.

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Through pilot Integrated Pest Management projects, farmers in northern Iran learned how to grow rice without pesticides, while ducks controled weeds and provided additional income. Photos by Hossein Heidari

Integrated Pest Management in Fereydoon Kenar

Rice is the major crop in the Fereydoon Kenar Non-Shooting Area, providing habitat for many migratory waterbirds, including the Siberian Crane. Once harvested, the rice fields in the damgahs are flooded.

The farming methods practiced in these fields, however, pose serious threats to the health and survival of waterbirds. The farmers apply pesticides, herbicides and fungicides more than 10 times a year on some of these fields. Some of the pesticides used are banned but obtained from the black market. Upon entering the irrigation water, the pesticides are highly toxic, threatening aquatic life.

In response, pilot projects conducted since 2002 with support from SCWP and the UNDP/GEF Small Grant Program (SGP) near these fields has demonstrated how the Non-Shooting Area could be cleaned of these pesticides through integrated pest management (IPM). During several cropping seasons, participating farmers eliminated the use of pesticides from their farming, while largely maintaining yields (see Heidari 2005).

This project emphasized the farmers' empowerment through the Farmer Field School (FFS) approach, in which the participating farmers were trained through informal adult education techniques by IGRA, an Iranian NGO. During one farming season the farmers improved their knowledge through exploring the facts about pests and their life cycles through experimental plots, with assistance from a facilitator. As an output, they learned how to replace herbicides with mixed rice cropping and ducks to control weeds, particularly *Azolla* (an invasive aquatic plant). Other cropping combinations, like fish-rice, fish-rice-duck and fish-rice-duck-*Azolla* have also been carried out. The overall FFS approach proved extremely efficient in eliminating the hazardous chemicals, while increasing the farmers' income.

When mixed cropping is used, the application of pesticides for other pests should be stopped or limited. Based on this principle, for controlling the leaf-feeder worm that farmers usually spray chemicals two times against each season, they used a microbial agent, *Bacillus thuringiensis*, which is harmless for other living animals. The result was wonderful. The farmers said that they have managed to control this worm without the need to use chemicals. They have felt encouraged to try other similar environmentally-friendly practices, such as using *Azolla* compost as an alternative to fertilizers.

These methods can be extended through farmer-to-farmer techniques. The fact that staff members of the relevant government agencies supported this project was another important achievement. Now, the local extension office is ready to collaborate with the Department of Environment and other organizations to support the expansion of the project's outcomes throughout the Non-Shooting Area and to other parts of the country. The group of farmers at one of the pilot sites has been linked with local groups and NGOs in Kiashar to transfer their experience in setting up a new IPM project along the Sefid Rud River near Bujagh National Park, the second SCWP site in Iran.

XII. *Traveling the Flyways*

Monitoring and exchange along flyways of the Siberian Crane

A decade ago, when this project was first discussed in the context of GEF funding, GEF had a strong record of supporting comprehensive conservation efforts for ecosystems and landscapes but had not undertaken flyway or species-oriented projects. As mentioned earlier, 80% of the SCWP budget was therefore allocated to site level activities. Yet the site work always was undertaken in the context of the flyway–how that wetland link in the long journeys of the cranes had significance for waterbird populations spanning large parts of Asia.

A key aspect of protecting essential links in the flyway depends on knowing where those links are, how significant they are and when they are significant. Our project made special effort to answer these questions for little known or unknown sites that had not been selected for more intensive effort. And thus, during the past six years, not only have the cranes made annual journeys up and down the flyways, but so have researchers from the four countries.

Despite the long track record of international cooperation for the Siberian Crane, this flyway research has most easily been accomplished by national teams working within their own countries and sharing results with the larger, international team. As three of the four countries–Russia, China, and Kazakhstan–have long expanses of flyway within their own boundaries, these national level activities covered major parts of the two flyways. China has the special

With support from the SCWP, researchers from the Institute for Biological Problems of the Cryolithozone intensified detailed monitoring on the Siberian Crane breeding grounds in the Kytalyk Republic Resource Reserve, Sakha Republic, Russia. The surveys were conducted in June when portions of the tundra are still frozen, sometimes requiring long and dangerous walks across the ice between survey locations (left). Ross' Gulls also nest on wetlands of Kytalyk(right). Photos by Inga Bysykatova

situation in that major populations of waterbirds not only migrate across eastern China but also breed and winter within the country.

China then had the most elaborate and dramatic effort at flyway monitoring–on a scale never before attempted for the country (Qian et al. 2009). Beginning in 2004, the China NCU signed waterbird monitoring agreements with 18 partners in 10 provinces of China (see Figure 10). The objectives of the site network were to monitor the distribution and migration of Siberian Cranes and other globally significant migratory waterbirds, in order to improve the management capacity for conservation of migratory waterbirds on this flyway. Given that millions of waterbirds, including over 99% of the world's Siberian Crane population, must cross one of the most densely populated and rapidly developing regions on earth, this monitoring

effort would be an essential foundation for successful flyway management.

A total of 158 locations were included within the monitoring plan, and the flyway was divided into four sections with a coordinator assigned for each section. The first section included the wintering grounds and staging areas in the middle and lower reaches of the Yangtze River, with the provinces of Anhui, Jiangsu, Hubei and Hunan. The second section covered staging areas in northern China. The third section covered staging areas in Jilin and Liaoning (some of these also serve as breeding areas for Red-crowned and White-naped Cranes and other waterbirds). Fourth, in the far northeast, were staging and breeding areas in Inner Mongolia and Heilongjiang.

This effort has involved considerable coordination and planning. Each year, the participants have met to put their results together, assess the data, discuss ways to improve methods, and other adjustments. The coordinators of each section compile the year's work into reports that a national level consultant reviews and submits to the NCU. While cranes are the main focus, numbers of other large waterbirds are recorded including, for example, the endangered Oriental Stork that flies the same path as the cranes. In addition, based on these discussions, a monitoring plan is developed for the next year. Year by year, adjustments have occurred including more advanced methods for field monitoring and for statistics, adjusted lay-outs for monitoring sites, adjustments in monitoring dates, increased flexibility in monitoring of sites based

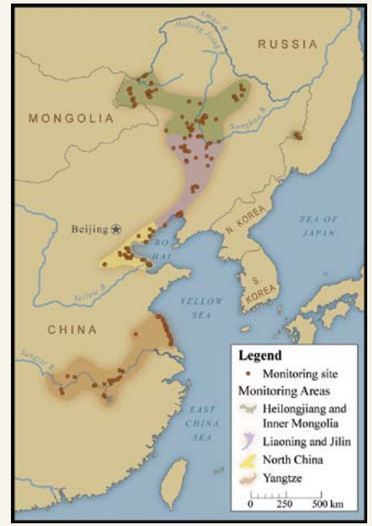


Figure 10. China waterbird monitoring sites

Map data provided by the National Bird Banding Center of China; Map by Dorn Moore, Green Space GIS

on conditions, and addition of the spring/autumn monitoring site at Beidaihe. Special effort has been devoted to this latter site, as a major part of the cranes along this flyway pass within sight of Liangfengshan where the mountains come down close to the sea and the birds are funneled through the narrow coastal strip of lowland.

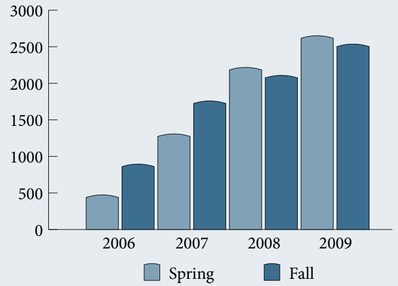
SCWP researchers banded two Siberian Crane chicks in Yakutia, Russia, in August 2008. One of the banded cranes (above) was sighted at Huanzidong Reservoir in Liaoning Province, China, during the 2009 spring migration. Photos by Zhu Ying

This monitoring effort has continued through spring 2009, providing five years of spring and fall data. While results are quite variable from year to year, as one might expect given differences in water supply for the wetlands, significant findings related to all parts of the flyway, including new information on the distribution of Siberian Cranes during migration. In the 1980s, Siberian Cranes primarily used Zhalong Nature Reserve, and to a lesser extent Momoge Nature Reserve, for long stopovers especially during spring migration. Distribution of cranes has changed dramatically since then, with Zhalong attracting far fewer birds. Momoge has grown in importance (see Figure 11) while two sites in Liaoning Province, Huanzidong and Wolong Reservoirs, now host large number of cranes and other waterbirds in both spring and fall.

At the project closing workshop in Harbin in October 2009, Professor Wang Qishan of Anhui University well summarized the situation to the south of Liaoning. All the cranes must pass down the western side of Bohai Bay, where development pressures continue to change the coastline and reduce wetlands available to the cranes. Bohai needs great attention as a weak and threatened link in the flyway. During SCWP, with co-financing secured by ICF, several wetlands were surveyed during spring and fall in Tianjin–one of the largest cities in China and located on the coast of Bohai–and both professional training and public education activities were organized. Our partners at Beijing Normal University will be continuing these efforts.

To the south, from Bohai, the monitoring effort has uncovered stopover locations used briefly by passing cranes but none with the size and good protection that offers the birds security for longer rests. As Professor Wang summarized, "The cranes cannot fly from Bohai to the Yangtze in one flight, they need stopovers to survive."

***Figure 11.** Changing numbers of Siberian Cranes at Momoge Nature Reserve from 2006-2009.*
Data provided by the National Bird Banding Center of China



The flyway monitoring has provided a new, more dynamic perspective on waterbird conservation for all scientists and agencies involved, where protection involves an ever-changing matrix of sites rather than focused on a few, best sites that in themselves cannot sustain the flyway. Success of the monitoring will lead to an extended effort after our project, supported by the State Forestry Administration of China, to organize monitoring of a larger variety of waterbirds.

The monitoring has drawn attention to problems along the flyway, and already led to conservation actions. For example, the planting of poplar trees was eliminating important habitat for White-naped and Hooded Cranes as well as geese in the middle and lower reaches of the Yangtze River, so the State Forestry Administration is now adjusting this practice. In North China, nature reserve management and soil and water conservation have received increased priority from local governments.

The two Liaoning sites have now been designated nature reserves but, as so often in China, management authority, resource rights and tenure are complex. Waterbird protection must be integrated with management of these reservoirs that supply water to the cities in a region that is stressed for water–which is a major reason these sites have not been filled to capacity and thus have crane habitat around extensive shallows and drying edges.

A parallel effort at migration monitoring has occurred along the northern part of the eastern flyway in Yakutia (Germogenov 2009). During Phase 1 of this project, the Yakutian Coordination Unit secured co-financing from the Yakutsk Power Company to monitor migration at these sites. Results indicate the high importance of these floodplain wetlands for cranes and other waterbirds, new information of considerable importance for our flyway program. As in China, the Siberian Cranes migrate along a narrow corridor, following the middle Aldan River through the taiga zone of southern Yakutia. The birds use shallow lakes with rich plant and invertebrate foods in Kuoluma-Chappanda, Kyupski, and Chabda Resource Reserves, established by the Sakha Republic Government to protect these critical habitats. As much as 30% of the world Siberian Crane population can be seen in transit from these sites. The mass migration of Siberian Cranes in autumn often occurs during conditions of poor visibility, when birds are only dimly glimpsed through mist and low cloud. The voices of others pass overhead.

Although the Mid Term Review for our project recommended consolidating and reducing the number of activities in Russia for Phase 2, we did add limited but significant agendas for these migratory stopovers along the Middle Aldan. Aside from continued monitoring, our project has developed management plans for these three Middle Aldan reserves and equipment to assist reserve management. The project prepared a review of ecotourism possibilities for this area, and we undertook training and public education. Together these steps have provided such emphasis and such a foundation that continued support from the Yakutian and local governments are expected here.

A crucial element of the monitoring has been to develop mechanisms for pulling all the data from so many sources and locations into one system accessible to all. The RCU has taken the lead on a regional database that will be maintained after our project by ICF, as a service to the CMS MoU. This database has had glitches due to its complexity, and involvement of multiple languages. Another obstacle has been the timely submission of data from all of the project countries. The Chinese in particular have held their data back, explaining that it is highly fragmented, in need of organizing, and much of the information requires translation. Part of their delay has been a higher priority effort (for them) to develop a Chinese database for their own use in analyzing the data they have collected and to support on-going monitoring and research within the country. They wish to build on their flyway scale monitoring program. At project's end, their database is functional and the data now have also come to the RCU. The regional data have been used to compile an atlas of Siberian Crane sites in West/Central Asia as one of the final project outputs.

SCWP also wished to answer two sets of questions related to the eastern flyway, through the use of satellite transmitters (PTTs). First, where do young birds go after the end of their first winter? While some yearlings appear on the breeding grounds, their small numbers suggest that many others summer at places unknown, where their conservation needs also are unknown. For this reason, we wished to capture chicks on the nesting grounds, fit them with PTTs and follow them through both migrations to learn where the northward journeys ended. Second, in order to help in extending our studies at Poyang Lake from Poyang Lake Nature Reserve to the much larger lake basin, we wished to mark chicks or adults and gather data on their movements and habitat use during winter.

Despite great effort over multiple years, we had limited success. While satellite tracking had been successfully accomplished in the 1990s in Yakutia, conditions now were not so supportive. Permit processes had become more complicated, especially regarding foreign-made equipment and researchers. The costs for helicopter rental had escalated and few helicopters were available for this work of chasing down the chicks before they could fly or adults during deep molt. In August 2005 we successfully caught and color banded eight chicks but were unable to attach PTTs due to an unexpected change in permit requirements. We failed for several years, and turned instead to the wintering grounds. Cranes had never been caught (alive) here. Poyang Lake is too vast, too wet, too muddy and the birds are wary and restless and unexpectedly move from wetland to wetland. We used foot-snares that had been successful in North America for Sandhill Cranes and in southwest China for Black-necked Cranes–and completely failed during two different winters.

The Russians finally did succeed in capturing and placing PTTs on two chicks in August 2008 (the

In Liaoning Province of northeast China, flyway monitoring documented the importance of Huanzidong and Wolong Reservoirs as migration stopover sites, with sizable numbers of cranes and other birds using these wetlands for weeks in both spring and autumn. Photo by Zhou Haixiang

number was low due to poor breeding success that summer). We successfully tracked both chicks (these families traveled separately) south down the Middle Aldan, across the Amur Region and then northeast China. With the use of satellite images available almost daily over the internet, we were able to determine habitat and water conditions at stopover sites that in many cases had not been known before for Siberian Cranes. Wolong Lake in Liaoning was one of these sites; as mentioned above, a protected area is being established here.

We encountered a problem of interference with signals once the birds passed from Russia south across China. We know that both birds wintered at Poyang Lake (although one of the signals stopped in December), and we have locations from around the lake showing their movement. But the signal quality is too poor to provide precise locations, which was the need for our winter study. We did follow the remaining chick all the way north to its natal area, where it left the territory of its parents but spent most of the summer 200 km to the west.

Poor signal quality is a major and new obstacle to satellite tracking in eastern China, and likely will necessitate use of an alternative technology. ICF is currently working with colleagues to test a new cell phone transmitter on Sandhill Cranes in Wisconsin, as a first step toward using the devices at Poyang.

A big part of creating a sense (and reality) of a flyway scale program has been engaging the relevant officials and scientists and educators with one another, and this process of relationship building has happened at annual meetings of the SCWP Steering Committee, and at the CMS MoU meetings that occur roughly every three years, as well as at training workshops organized at the regional level on monitoring and data management (held in Kostanay, Kazakhstan) and nature reserve management (held at Poyang Lake).

With support from SCWP, researchers from the project have also been able to visit distant wetlands along their flyways. The Chinese have been on the breeding grounds of the Siberian Crane, where their vehicle, specially designed to travel over tundra, got stuck and they spent a long, cold night. The Yakutians, and others from the East Asia flyway in Russia, have been to crane sites in China. They had sufficient time at Momoge in fall 2007 to collect extensive behavior and feeding data.

In Kazakhstan, following years of collaborative surveys involving Scandinavian ornithologists in search of Lesser White-fronted Geese, Russian experts joined field surveys in Kostanay that fulfilled several objectives (Yerokhov et al. 2009). Training was provided for local reserve staff, equipping them with the

Table 4. Monitoring data from waterbird surveys in Kostanay, northwest Kazakhstan

Year	Season	Number of sites surveyed	Total number of waterbirds	Total number of species observed
2005	Fall	20	186,307	80
2006	Spring	17	101,649	80
	Fall	39	329,420	91
2007	Spring	15	30,858	74
	Fall	39	383,718	89
2008	Spring	23	424,056	61
	Fall	34	181,301	62

Data compiled from Yerokhov et al. 2009

skills to continue monitoring in the future. Also the methodology for the monitoring was improved, tested and prepared for long-term use in the form of a manual. The results of the surveys confirmed the outstanding importance of the wetlands in this region for endangered goose species in particular. These water bodies are visited by not less than 70% of the western population of Lesser White-fronted Goose and not less than 80% of the Red-breasted Goose. Observers visited on average 41 wetlands and lakes each spring and autumn. In total during the seven field seasons from 2005-08, the teams recorded 1,640,309 birds of 126 waterbird species (see Table 4). Six bird species new to Kostanay were recorded. While these intensive surveys have worked well for most waterbird species, they are not sustainable. Networks of observers will be needed on the ground to cover these vast remote areas for the Siberian Crane and other rare birds. The data collected so far are being used in national and regional databases in support of the CMS MoU, and to support the conservation management of these areas.

For the Siberian Crane and other waterbirds, Kostanay is an intersection between two flyways coming south from Siberia. Some birds continue southeast toward India (for example, at least formerly, the central flock of Siberian Cranes) while others go west and south toward the Caspian (as does the single Siberian Crane still journeying to Fereydoon Kenar in northern Iran).

Kostany wetlands have highly important breeding bird populations, including the Dalmatian Pelican *Pelecanus crispus*, the White-headed Duck *Oxyura leucocephala*, the Ferruginous Duck *Aythya nyroca*, and the Sociable Lapwing *Vanellus gregarious* (about 50 pairs of Sociable Lapwings breed here, the second largest known population for this critically endangered species).

In Kostanay, biologists and field staff regularly see more than a single white crane. At Astrakhan on the mouth of the Volga River and at other locations including Azerbaijan, small flocks have been reported, and even on the breeding grounds. These reports are frequent enough, and from credible observers, so that we now believe there are additional wintering sites for the western flock and potentially for the central flock, with perhaps 10-20 birds now occurring in western and central Asia (Sorokin et al. 2009).

Russia and Iran have also been active with exchanges, including Russian participation in searching for alternate wintering sites in Iran and Azerbaijan. This collaboration has mostly centered on experimental releases of captive-produced Siberian Cranes with the birds (now one bird) wintering at Fereydoon Kenar. Their urgency is understandable, as the knowledge of the flyway is passed down the crane generations, with parents teaching their chicks rather than by instinct. Once the last cranes are gone, it will be more difficult to re-establish the flight paths. Current work in North America, starting a new Whooping Crane flock along a preselected flyway in eastern United States, shows promise but is still years away from success.

The releases in Iran have been intended to bolster the remnant flock and to raise public awareness and support for crane conservation (Sadeghi-Zadegan et al. 2009). This work has also led to strong friendships. Mr. Azadi, a damgah owner from Fereydoon Kenar, and his family became very involved in the project over the years, helping take care of captive Siberian Cranes sent from Russia for release to the wild. The birds were released in his damgah. Although he traps wild birds for the market, Mr. Azadi developed a strong interest and affection for the Siberian Crane and was very hospitable to Yuri Markin (Director of Oka Nature Reserve) when he visited from Russia, sometimes for as long as a month. Yuri invited Mr. Azadi to visit him in Russia. After a time, Mr. Azadi persuaded his friend Mr. Zakariayi (a trapper and fisherman who spoke some English) to travel together to see the Siberian Cranes. They had a delightful five days at Oka Nature Reserve (the captive breeding center for Siberian Cranes, not far from Moscow) then continued to Tyumen looking for Yuri, who was out in the field. After two days of patience and waiting, Yuri returned. Together they went to the crane release site at Armizon for fifteen days that the Iranians will never forget. Nor will the Russian hosts.

Mr. Azadi, a trapper from Fereydoon Kenar, worked with Russian colleagues to care for Siberian Cranes before release on the crane's wintering grounds in northern Iran. While caring for the cranes, he and his son Yaser (shown above), who is also a conservation guard at the site, developed strong ties to the cranes and the visiting scientists from Russia. Photo by Azin Fazeli

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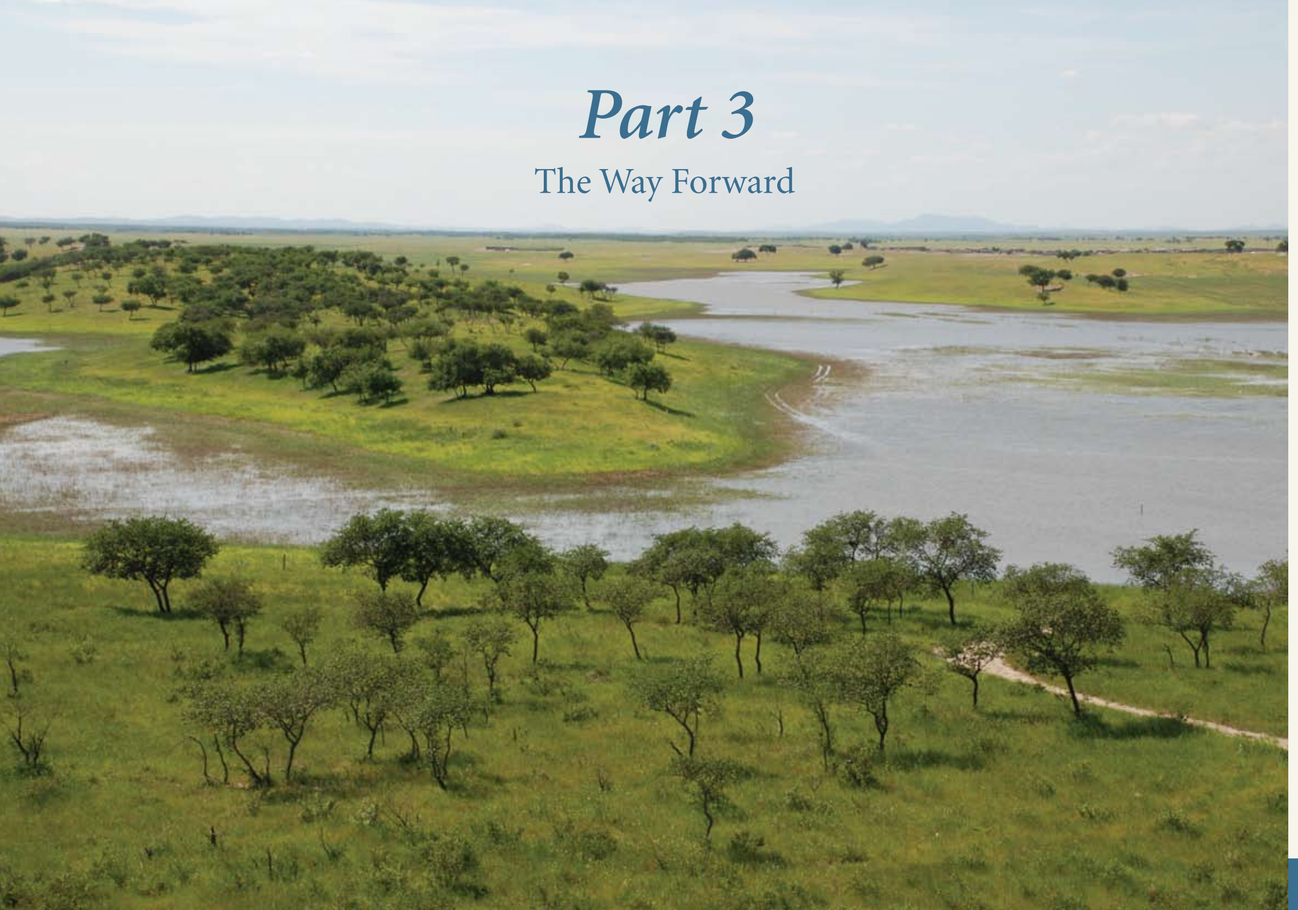

Part 3

The Way Forward

XIII. Lessons Learned

Recommendations for future efforts for flyway, wetland, and waterbird conservation

The SCWP was the first flyway project to receive funding under the GEF Full-sized Project portfolio, with a second project, the African-Eurasian Flyways Project ("Wings Over Wetlands" or WOW), starting shortly after. Both projects cover multiple flyways that extend thousands of kilometers north to south, but the Siberian Crane's two flyways include only four countries that participated in the project. WOW in contrast covers 118 countries. Accordingly, the two projects took somewhat different approaches to flyway conservation, with most activities and funding for WOW directed at regional activities (at a multi-country scale), with a relatively small part of funding devoted to site activities–12 sites in as many countries. SCWP put most funding into site level activities–80% of funding was allocated to support work at 16 sites in four countries–with much smaller but still significant national and regional components.

Lessons from the two projects have been summarized in the UNEP GEF Issue Paper, "The Experience of UNEP GEF and Partners in Flyway Conservation," (Zandri and Prentice 2009). Given the major differences between the two projects, they offer somewhat different, and complementary, lessons on how to develop effective flyway conservation initiatives.

Many but not all of the lessons listed below have been identified through the process of preparing this flyway overview paper. Additional lessons, more concerned with development and implementation of GEF projects, are omitted from this report but can be found in that paper.

Summer rains filled these wetlands at Keerqin Nature Reserve in Inner Mongolia. Rainfall has been erratic in recent years, with drought drying up many marshes during breeding season. Photo by James Harris

This chapter groups the lessons learned into two categories, but actually there is considerable overlap.

- related primarily to flyway-scale conservation initiatives
- related more generally to effective wetland and waterbird conservation

Lessons related primarily to flyway-scale initiatives

For flyway conservation, long-term projects and long-term commitment are needed. The length of our project (six years plus a nine-month extension) was highly important to achieving successful outcomes. Particularly for developing shared understanding and common objectives, within and among countries, activities need to be spaced over time so that there is ample opportunity for learning, action, evaluation, and adjustment for the next round of activity. It was also significant that the International Crane Foundation (ICF) had been working in the region, and at many of the sites, for a long period before the project was developed, and hence already had familiarity with needs and challenges, and knew many of the players involved. Another favorable factor was that ICF had staff members already part of the organization from the two countries with the largest share of project activities, and was able to utilize their knowledge and language skills during project implementation.

Due to their complexity, flyway projects require a long start-up time. SCWP, like WOW, required years for design and preparation before the Full Project funding could be secured and project implementation could begin

White-naped Cranes and other breeding waterbirds are vulnerable to sudden changes in water levels during spring. An ill-timed release of water into this wetland could easily flood this nest. Photo by Crane Wu

Little Tern. Photo by Zhao Jun

(considerably longer than for other GEF projects of comparable size). As one consequence of this long process, there is a special need to re-evaluate budgets, logframe indicators, and activities at the onset to project implementation. Ample time is needed for an inception phase, as an opportunity to make significant adjustments.

Due to their geographic scope and complexity, flyway projects need to put considerable emphasis into strategies for sustaining conservation impacts after project completion. Threats to migratory waterbirds at the flyway scale require prolonged efforts in terms of monitoring, management and education of diverse audiences. Planning for sustainability of activities should begin in early stages of the project. These activities will need to be incorporated into national workplans and budgets. In addition, conservation strategies and actions should be included in resolutions and workplans of multilateral environmental agreements such as CMS, Ramsar, and the East Asian - Australasian Flyway Partnership. Because such activities transcend international boundaries, on-going institutional and financial support may be more difficult to obtain but is essential.

Long-eared Owls. Photo by Zhao Jun

Successful flyway conservation requires diverse components that complement one another. The design for SCWP included site, national, and regional scales of activity. Even within these three levels, diverse types of activities were needed given the array of threats present. Interventions at single sites, for example, often included research, management planning, community involvement, and public education plus action targeted at one or more specific threats. For some locations, SCWP lacked effective involvement at the provincial level, making sustainability of outcomes more difficult. Careful balancing is needed between targeting resources and effort, and yet involving all players who are important to the outcomes.

This complexity of flyway conservation makes project management and technical oversight correspondingly complex. Ample resources are needed for these management tasks, both within the international executing agency and within the national executing agencies; again, the longer time frame favors successful implementation. Selection of staff with appropriate skills is a crucial step in order for the NCUs effectively to provide the oversight, organization, and detailed reporting needed for GEF projects.

Phasing of flyway projects provides opportunity to pace the work, to adjust plans between phases, and to respond to early successes or new findings. Due to the scale and diversity of activities envisioned for SCWP, we designed two phases for the project and held involvement of some sites back until Phase 2. Project staff at all levels thus could focus on fewer activities during early years of SCWP, while we strengthened capacity and completed baseline studies. We could then apply that learning successfully to Phase 2 activities. Interventions in Phase 2 tended to be more efficient and, at some sites, more quickly effective.

While many site level activities may be appropriately undertaken through single-country projects, certain sites or clusters of sites may be critical to the viability of the flyway itself and therefore deserve significant attention in flyway scale projects. Poyang Lake, for example, is the only or the primary wintering destination for several threatened species including the Siberian Crane, Oriental Stork and Swan Goose, and threats to its integrity would have substantial impact on the entire East Asia flyway. Similarly, the wetlands of Songnen Plain in northeast China or the steppe lakes region in northwest Kazakhstan have vital functions as major staging areas at mid points along their migration routes. Where single threats (or the same suite of threats) affect all wetlands in a key portion of the flyway, flyway conservation efforts do need to address these challenges.

Where site level activity is planned in flyway projects, priority should be given to strategies or demonstrations that can be replicated elsewhere, and to supporting similar interventions within multiple countries while ensuring that exchange of staff members and information fosters learning across sites and countries. Although threats are often similar among different countries of the flyway, different contexts (ecological, institutional and cultural) can lead to different challenges or solutions, while exchange leads to new learning opportunities and to flyway level thinking that transcends single country perspectives.

While flyway projects emphasize transboundary and multi-country aspects, flyway-scale activity within countries can be highly important to strengthening flyway protection. Three of our four countries have long segments of the flyways within their national boundaries, and were able to coordinate monitoring effort at multiple sites to a degree not accomplished previously. As described in Chapter XII, China's flyway monitoring involved 18 partner organizations and 158 sites, and found numerous new locations of significance to cranes and other waterbirds. This internal aspect to flyway conservation should not be neglected, especially in countries like China that have many waterbird populations nesting, migrating and wintering all within the nation's boundaries.

Do not underestimate the importance of fostering support at the national level by taking into account the common issues and interests of stakeholder groups. At the national level, the enabling environment for project implementation is an important factor for success. For example, within the framework of the SCWP in China, the central government has increasingly recognized the importance of environmental protection and biodiversity conservation, manifested in terms of policies and related budget allocations for wetland restoration, watershed rehabilitation and ecological water demand considerations in water resource management. This change was largely achieved when waterbird and flyway conservation issues were effectively combined with a dialogue on common issues such as on water use or socio-economic concerns affecting the sustainable use of the wetland sites. These common issues provided the basis for integrated wetland management. These policies and political support have provided the conditions for effective project implementation (e.g., the water management plans for sites in northeast China) and the delivery of substantial co-financing and associated financing. In contrast, the Russian Ministry of Agriculture's decision to abandon management of all federal zakazniks (wildlife refuges) under its control was a severe setback for project implementation at sites in West Siberia. Stronger support from the federal Ministry of Natural Resources could have significantly enhanced impacts of this project, for example through official approval for the extension of flyway site networks, support for Ramsar site designations, and proactive support for site conservation.

Lessons related more generally to effective wetland and waterbird conservation

As the UNEP/GEF project had a rather large scale investment at the site level, we were able to develop demonstration activities at multiple sites and then continue to support those that proved to be most successful. For example, we found both community work and the education program were most effective at Keerqin due to leadership from the nature reserve, even though our project design did not emphasize such work at Keerqin. In the project extension, we shifted resources to Keerqin. ICF plans to find new sources of support for Keerqin to maintain a strong demonstration of community-based conservation in the vulnerable mid-point of the flyway.

Leadership in community conservation and environmental education can

Timeline of project milestones and achievements

1998

- First discussion on developing a GEF project at meeting of the CMS MoU on the Siberian Crane in Ramsar, Iran

2000

- UNEP/GEF Project Preparation (PDF B) Phase started – *March*

2001

- Extension of Kytalyk Republic Resource Reserve in Yakutia, Russia – *May*

2002

- First Crane Celebrations held in Russia, Ukraine and Kazakhstan
- Last Siberian Crane pair leaves its winter home at Keoladeo National Park in India; Siberian Cranes have not been seen again in India. – *spring*

2003

- Fereydoon Kenar Non-Shooting Area established in Iran in cooperation with local hunters and land owners, building foundation for local support of protected area
- SCWP formally launched as a Full-Sized UNEP/GEF Project – *March*
- Fereydoon Kenar, Ezbaran, Sorkhrood Ab-Bandans designated as Ramsar site, Iran – *March*

2004

- SCWP China program begins five year migration monitoring program involving 158 sites – *fall*

2005

- Illegal oil drilling rig removed from Konda-Alymka Rivers Basin, western Russia
- Fires burn much of Zhalong Marsh in northeast China – *spring*
- H5N1 Highly Pathogenic Avian Influenza outbreak at Qinghai Lake in China causes major mortality of wild waterbirds, leading to concerted international action and response from SCWP – *May*
- Expansion of Naurzum Nature Reserve, Kazakhstan – *October*
- Public awareness campaign organized by Sterkh Foundation at Salekhard Airport achieves major outreach for the project in West Siberia – *November*

2006

- Launch of the East Asian-Australasian Flyway Partnership – *November*

2007

- SCWP Mid Term Review adds activities at Middle Aldan sites in Yakutia, Russia – *January*
- Kazakhstan joins CMS – *May*
- Western/Central Asian Site Network for Siberian Cranes and Other Waterbirds launched – *May*
- Third North Pacific Migratory Birds Conference convened in Yakutsk provides strong support for project implementation – *August*

2008

- Synsko-Voikarsky/Kunovat protected area system established, providing a buffer around Siberian Crane breeding areas in Kunovat Nature Reserve
- Nanjishan designated a national-level nature reserve, Poyang Lake, China
- Iran joined CMS – *February*
- Zharsor-Urkash designated a national-level nature reserve in Kazakhstan, providing increased protection for the site – *June*
- Naurzum Nature Reserve together with Korgalzhyn listed as *Saryaka Steppe and Lakes of Northern Kazakhstan* UNESCO World Heritage Site – *July*
- Satellite transmitters placed on two wild Siberian Crane chicks in Yakutia, Russia, leading to an increased understanding of the eastern flyway – *August*
- H5N1 Highly Pathogenic Avian Influenza risk reduction guidelines approved in Ramsar Resolution X.21 at Ramsar COP10 – *October*
- Only one wild Siberian Crane returns to wintering area in Fereydoon Kenar, Iran – *fall*

2009

- Crane Celebrations grow to over 120 sites in nine countries
- All four SCWP sites in Kazakhstan designated Wetlands of International Importance under the Ramsar Convention, increasing international recognition of sites
- Water supply funds committed by Heilongjiang government for Zhalong Nature Reserve, China – *September*
- SCWP Completion Workshop participants view over 2,000 Siberian Cranes at Momoge Nature Reserve, China – *October*
- Caspian shore Ramsar sites expanded to include Bujagh National Park, Iran – *December*
- SCWP formally ends – *December*

2010

- CMS MoU meeting scheduled for Tehran, Iran to plan future Siberian Crane conservation activities – *March*
- UNEP Terminal Project Evaluation

Photo by Zhou Haixiang

come for places other than the nature reserves. Much of our most successful work on these components came from community members and consultants from technical institutions in China, while in Iran and Kazakhstan, the empowerment and strengthening of local community-based organizations was a highly effective approach. Provincial and local government is another potential source for leadership and support, as demonstrated in various locations, but especially in Russia. Training workshops were important for empowering nature reserve staff members for roles in these activities, yet the experience of working with communities and of exchanging ideas with others engaged in this work proved to be more significant. Without strong involvement and support of protected areas staff, however, these interventions will be more difficult to sustain after project completion. Therefore, the establishment and official recognition of permanent mechanisms for consultation and involvement of stakeholders, such as site management committees, is highly important.

Conservation solutions need to involve diverse stakeholders who have very different priorities and needs. In building such involvement and enlarging alliances, care is needed in communicating about conservation threats and conflicts in order to engage multiple players in the solutions. Zhalong is a good example, where we have important accomplishments from SCWP. Nevertheless, considerably more work is needed to restore the marsh successfully. We have found it best to emphasize positive achievements and clearly express the needed improvements as positive opportunities – in other words, honest assessment of continuing challenges can be communicated in large part by promoting the positive, achievable remedies.

Iris at Muraviovka Park, far eastern Russia. Photo by James Harris

Close partnership between international and domestic specialists led to better results than either side working alone. The countries in our project have many technically strong institutions and scientists. Through involvement of ICF staff and international consultants, SCWP strengthened collaborations and brought certain international perspectives and strategies–for example, related to wetland management–that helped inform strong efforts for planning, monitoring, and implementation by specialists from within the countries. Yet too great a reliance on international expertise, without strong domestic involvement, is not sustainable and runs significant risk of attempting unrealistic solutions to conservation challenges within the national contexts. For water management and community participation tasks especially, it is advantageous to retain the same consultants over the life of the project for the sake of continuity, as these activities require time to mature.

Given the length of this project, we had important opportunities to develop co-financing as the work progressed that complemented the GEF-funded activities. In this way, we were able to respond to gaps we found between the education work and community involvement activities in the eastern flyway by securing new resources, and to fund research in response to a significant threat of wetland fragmentation at Zhalong, a problem we had not recognized at the project initiation. While the operational procedures for UNEP/GEF did allow for rephasing budgets, co-financing enabled us to add important work without taking away from other planned activities.

For longer projects, it is important to be able to adjust workplans and budgets in response to emerging threats or opportunities. Results of co-financed monitoring at Middle Aldan sites in Yakutia, for example, revealed the significance of these wetlands to migrating Siberian Cranes, and a relatively small amount of funding allowed us to increase capacity of protected areas here. On the other hand, a change in national policy within Russia made it impossible to implement some planned activities at regional level game refuges in Western Siberia. Funds and staff time could be put to good use elsewhere.

Given the diverse audiences who must be involved in solutions to waterbird and wetland conservation, communications must be a vital component. We underestimated the resources (staff and funding) needed for effective communications in Phase 1 of SCWP, and adjusted in Phase 2. For multi-country projects where language differences exist, communication must be an even higher priority. Professional communications staff or partners should be engaged, but technical staff need to allocate time for writing and editing. A Communications Strategy, at regional and national levels, should be created at the beginning of the project to guide activity, and the strategy should be re-assessed and revised at intervals. Communications need to rely on diverse media to be effective, given the diversity of audiences to be reached. Our tools need to be adapted to suit message, audience, and local circumstances.

Use of the Internet and project websites was less effective than we had anticipated in some cases, but valuable in others. Language differences and our priority of reaching rural audiences, with poor Internet access, contributed to this challenge. Conversely, in the remote and sparsely populated settlements at the project sites in Kazakhstan, the project enabled the creation of a resource center that provided an internet connection for local communities and businesses. The "Naurzum Bionet" was also created to strengthen the network for conservation among civil society groups in this region. In Russia, the internet was used to communicate with students across enormous distances for environmental education activities. Yet in Yakutia in far northeast Russia, our partners created hard copies of educational website materials and mailed or hand delivered them to remote schools.

Opportunity for project participants to travel to other sites within their flyways was highly effective for learning about project successes and challenges and gaining a flyway perspective. Thus, face-to-face contact succeeded in ways not attained via our web-based efforts. These exchanges happened more easily within countries than between countries, due to logistical and communications issues. Failure to allow sufficient time for visa processing, in countries sending delegations as well as countries receiving delegations, caused cancellation of several significant exchanges. Also, some NCUs demonstrated the benefits to be realized by collaborating with other similar GEF projects, such as in Iran, where regular coordination meetings convened by the UNDP/GEF office helped to share problems and build synergies among projects. Several UNDP/GEF Small Grant Programme projects directly contributed towards SCWP objectives in Iran as a result of effective collaboration.

An active and balanced Steering Committee should be established early on. Involvement of a wide range of stakeholders, with sometimes differing agendas and priorities, adds significantly to the complexity of project implementation. A well-balanced and closely engaged Steering Committee is essential for such multi-stakeholder and multi-donor initiatives. The project aimed to coordinate with a wide range of other national governmental and non-governmental organizations through National Project Advisory Groups. It was difficult to sustain these linkages in reality, however, underlining the real challenges of achieving effective intersectoral cooperation at the national level.

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XIV. Does the Flyway Approach Succeed?

White-naped Cranes share many of the same wetlands used by Siberian Cranes across eastern China. They often feed on uplands, including farmlands where they find waste grain. Thus they are less specialized than the Siberian Cranes, which feed and roost only in wetlands. Photo by Zhou Haixiang

What we have accomplished, and how these achievements will live into the future

For those of us involved at the beginning of this project, the six years of work–close to a decade when you count the preparation and the project extension at the end–and twenty-two million dollars of GEF and co-financed support felt like a long opportunity to make these flyways safe for the cranes. Yet a decade is short in the memory of a flyway, short for the long future that we hope these spring and autumn traditions will have.

In these past pages, we have looked at many successes and achievements, some small but others highly significant for large countries and a region rich with an immense diversity of waterbirds and wetlands. The timeline in Chapter XIII lists a small number of the project's achievements–highlights from the SCWP, as our work has been immensely wide in scope, with large numbers of activities.

We have also seen challenges and obstacles, some of them overcome and others the sort of troubles that we may have to live with, or that future projects will tackle. Overall, however, the steps forward have taken us a long way from where we began.

For our flagship species, these years have not been kind for the Central and West Asian populations. The last known pair migrated through Afghanistan in fall 2001, through the upheaval that sent the Taliban out of power. They wintered in Bharatpur and went north again in spring 2002; a single bird was seen during an aerial survey of Kunovat in August 2002. We have no record of Siberian Cranes from India since then. To the west, the small flock of Siberian Cranes at Fereydoon Kenar has dwindled to a single bird for these recent winters. We awaited its return this autumn, and the bird did return. Although other reports suggest small numbers of birds are wintering elsewhere, these populations are very close to extinct, with recent

Siberian Cranes feed in shallow mud at Huanzidong Reservoir, where they leave footprints that help researchers identify exact feeding locations. The cranes probe in the mud for tubers. Photos by Zhou Haixiang

losses probably due to hunting uncontrolled along major parts of both the Western and Central Asian flyways (Sorokin et al. 2009).

The eastern population, which from the beginning of this project represented the major hope for the species, has held stable numbers and has possibly increased. A count from the relatively small wetlands at Momoge Nature Reserve in April 2009 indicated that 2,616 birds came together on this one staging area for a brief time. This number, and the network of protected areas that has expanded under this project and looks likely further to expand, as well as the active networks of conservationists within and outside government working on behalf of cranes and other waterbirds of this flyway, all bode well for the security of this flyway.

Flyway scale conservation of course is never a finished task. The distances birds travel across the human-dominated landscapes and the growing intensity of development, growing numbers of people

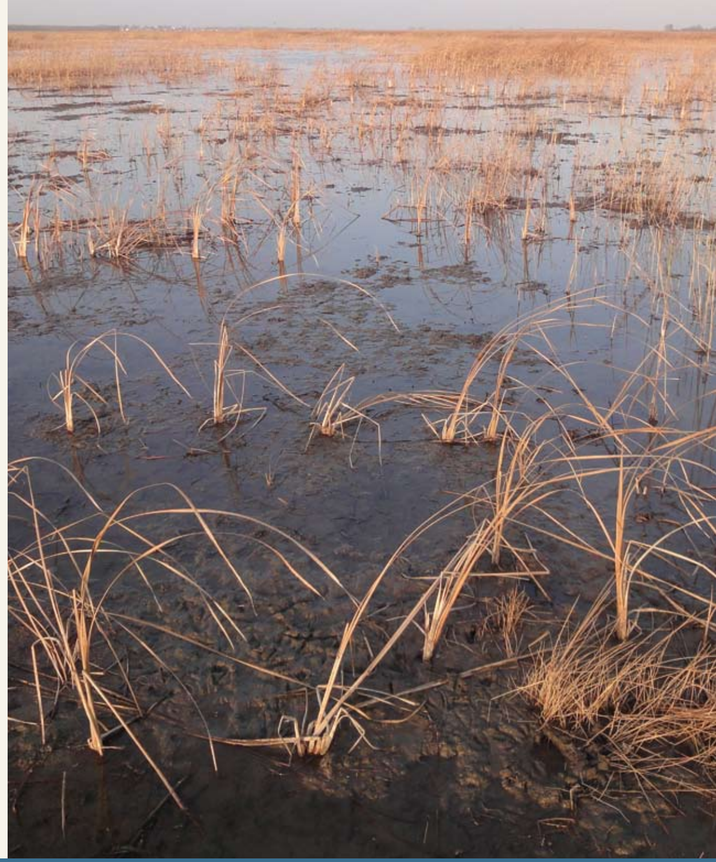

Figure 12. Western flyway site network

The SCWP sites in western Asia are part of a broader network of protected wetlands under the Western/ Central Asian Site Network for Siberian Cranes and Other Waterbirds (WCASN) and the Ramsar List of Wetlands of International Importance. Map by Dorn Moore, Green Space GIS

and growing need for water, all mean that threats and crises will continue. Flyway conservation is a process that depends upon highly diverse but interlocking activities at site, national and international levels. SCWP has created a vibrant process on all these fronts, and multiple ways to respond to future needs.

For West Asia, a future for the Siberian Crane will depend on addressing the hunting issues and likely on application of sophisticated and expensive reintroduction methods, now being developed in North America with the Whooping Crane, to return the charismatic Siberian Crane to its West Asia flyway. Already, breeding facilities produce ample young birds for such an effort that would become possible if the hunting threat can be mitigated. Success of such an effort is uncertain, however, given that over a hundred birds have been released to date in West and Central Asia without adding birds to the known flocks (Sorokin et al. 2009). For the flyway itself in West Asia–and this project concerned itself with the wide array of waterbirds and wetland sites that together embodied this flyway–SCWP has made the journey safer through securing major waterbird habitats.

An important sign for the future is the multiple, well established mechanisms to carry on the integrated, broad-scale perspective necessary for flyway conservation. The last activity under SCWP will be the 7th Meeting of the Range States of the *CMS Memorandum of Understanding concerning Conservation Measures for the Siberian Crane*. This coordinated effort involving all 11 range states, ICF, and several other non-governmental organizations will resume a larger role in facilitating joint activity and coordinated strategy. One legacy of SCWP is a West/Central Asian Site Network, that initially has focused on places important for Siberian and other crane species but that can be expanded to cover wetlands important to waterbirds more generally in collaboration with the developing Central Asian Flyway Initiative (see Figure 12).

The CMS MoU offered a unique opportunity to initiate this network, because it formally involves all countries along the West and Central Asian Flyways and thus could immediately function as the umbrella for this undertaking. Now and in the near future, it would be extremely difficult to develop a new agreement that could secure each of the country's signatures. Following the launch of the West/Central Asia Site Network in May 2007, five countries have nominated ten sites with an additional twelve sites preparing nominations. Further development of this network, and steps to address the hunting issue, will be significant topics for the Seventh Meeting of the CMS MoU.

Though circumstances have changed over the years, the rationale behind the CMS Siberian Crane MoU remains the same: to encourage participating governments and partner organizations to make and fulfill individual and collective commitments that contribute to the conservation of Siberian Cranes, to facilitate exchange of information and expertise across the Western, Central and Eastern flyways, and to create a platform for countries and experts to learn from one another–from Azerbaijan, Iran and Russia in the west, through Uzbekistan, India and the other range states to China in the east.

A recently created East Asian - Australasian Flyway Partnership offers additional opportunities for communication and coordination among the countries of the East Asia Flyway. In 2009, the Partnership accepted the offer from the Republic of Korea to host the secretariat, an offer that came with substantial support for the staff and operations of the secretariat and even seed money for flyway work of the Partnership. Our project's work had from its beginning been closely integrated with the North East Asia Crane Site Network and the Crane Working Group. The Crane Working Group continues to be active under the Partnership, met in Harbin immediately before SCWP's Project Completion Workshop in October 2009, and participated in our events.

Bi-lateral migratory bird agreements are also important, and China and Russia have just begun activities under their new agreement.

Table 5. Changes in national protection status of protected areas at SCWP sites during project implementation

Site Name	New or Upgraded Protected Areas
Poyang Lake Basin, China	Nanjishan Provincial Nature Reserve upgraded to national-level reserve (33,300 ha) Duchang County Nature Reserve upgraded to provincial-level reserve (41,100 ha) HeXi County Nature Reserve established (4,000 ha)
Fereydoon Kenar, Ezbaran & Sorkhe Rud Damgahs, Iran	Fereydoon Kenar Non- Shooting Area established (5,427 ha)
Bujagh / Sefid Rud Delta, Iran	Bujagh Non-shooting Area upgraded to Bujagh National Park (3,276 ha)
Zharsor and Urkash Lakes, Kazakhstan	Zharsor-Urkash Nature Reserve designated (53,350 ha)
Kunovat River Basin Wetlands, Russia	Zuravliny Division of Synsko-Voykarsky Natural Park(317,100 ha) established as a buffer around existing Kunovat Zakaznik (147,000 ha) Sobty-Yugansky (217,030 ha), Poluisky (48,260 ha) and Verkne-Poluisky (92,040 ha) regional-level Zakazniks established in adjacent areas

Another important measure of the long-term outcomes of SCWP is the sustainability of specific activities. Our achievements in developing new, expanded, or upgraded status for protected areas (see Tables 5 and 6) is one measure of governmental commitment. Many of our achievements appear to have influenced priorities or approach by the managing agencies within the countries. For

Left: These Siberian Cranes are beginning the next stage of their migration, departing from Huanzidong Reservoir in Liaoning Province, China. As the cranes start a day's flight, the flocks spiral upward to gain altitude and then will glide south. At intervals, they will ride thermals upward to regain altitude and often rise out of sight. Photo by Su Liying

***Table 6.** Increases in size of protected areas at SCWP sites during project implementation*

Site Name	Area ha (2002)	Area ha (2009)
Naurzum Nature Reserve, Kazakhstan	60,694	191,381 ha, plus new buffer zone of 116,726
Kytalyk Resource Reserve, Russia	1,607,000 (plus 1,037,960 ha of contiguous local level reserves)	2,598,590 (plus 1,472,004 ha of contiguous local level reserves)
Bujagh Non-hunting Area / National Park, Iran	2,000	3,276

example, the participatory planning process will be used at other protected areas in Iran and Kazakhstan. Monitoring also seems to be embedded within institutional arrangements within the countries–for example, that Naurzum will oversee monitoring (and management) at Zharsor-Urkash Zakaznik. China has established a network of wetland monitoring sites across the country, including several SCWP sites. China will also maintain the national database developed under SCWP at the National Bird Banding Center, with the aim of developing a similar flyway monitoring approach with other species.

Just as flyway conservation consists of many small steps, so sustainability relies on upon many small achievements such as relationships developed within SCWP–for example, between nature reserve staff and experts from nearby institutions. Our partners have more capacity now. The Institute for Biological Problems of the Permafrost Zone/Cryolithozone in Yakutsk, for example, has now integrated environmental education with its more traditional research expeditions, and works closely with a network of educators across the country. In China, Beijing Brooks Education Center introduced a small activity near the end of SCWP, offering small grants of 1,500 rmb (about $225) to school teachers near wetland nature reserves to implement environmental education activities. The intent was to give teachers experience with developing and managing their own projects, so that they become capable of creating new opportunities in the future. Response was enthusiastic; all 13 grants were completed, most with excellence.

A dramatic example of sustainability came on the field trip to Momoge following the Project Completion Workshop in October 2009. Momoge had been a Phase 2 site and added a water management plan to its activities late in the project, following the success with creating water management plans for the other three sites in Songnen Plain. This plan was completed early this year. Unknown to field trip participants, the reserve had already started to implement one part of the plan, spending 300,000 rmb for water to flood two of three wetlands traditionally used by Siberian Cranes for weeks during both spring and fall migrations. This year, without the water releases these wetlands would have been dry. We visited both. The first had many hundreds of geese and a few Siberian Cranes. The second had thousands . . . no time to count, maybe as many that day as the recent count by Momoge Nature Reserve of 2,600 Siberian Cranes. We also found one Hooded Crane, swans, and geese of four species. We had the chance to walk down a hillside with poplars and look over them–more Siberian Cranes than most of us had ever dreamed of seeing.

The head of wildlife for Jilin Province accompanied us and said the province has committed 10 million rmb ($1.5 million) to provide water to Momoge over the next three years. Our minds already were busy with next steps: to have this money written into the regular provincial budget for the province to secure

a long-term funding mechanism for Momoge (as it is now for Zhalong). We also have in mind ecological studies, about water management and food plants/invertebrates that provide food for cranes and other birds. These experiences would have wide applicability elsewhere in China where water management will need to become more active at protected areas and yet require a strong scientific basis to be successful.

Vibrant flyway programs depend on coordinated effort, but also on diverse, surprising successes that come from multiple organizations and leadership at many levels, who have learned through their own activity, or through activities of sites elsewhere along the flyway–a creative process now underway, as our view from the hillside at Momoge attested for all of us.

The steps taken for water management at Momoge, Zhalong, Naurzum and other flyway sites, and the experience with developing water supply mechanisms and with monitoring programs to evaluate these efforts and guide adjustments–even the experience gained with participatory management and with linking environmental education to priority conservation needs – have further significance. They are all important preparations for the adaptations necessary to respond to climate change impacts on the flyways, their wetlands and the waterbirds. These impacts will primarily affect the waterbirds through the changing availability of water, including more frequent periods of water scarcity, as many of the sites already are experiencing. In addition, climate change will impact the human communities living with the birds and wetlands, and the human efforts to adjust will determine the health of wetlands and their catchment areas. As always, the fates of waterbirds and human communities are intertwined. While our project has not directly addressed the threat of climate change, it has laid foundations for effective action. ICF is now working with partners in China and Russia to extend the successes of SCWP to programs that would reduce vulnerability of wetlands along the flyway to climate change.

Thirteen days after the bus load of participants from our Project Completion Workshop watched the cranes at Momoge, ICF's Su Liying traveled to the two reservoirs to the south in Liaoning that our project monitoring has confirmed as major stopovers for the Siberian Cranes. Her guide was Zhou Haixiang, a bird enthusiast and volunteer conservationist who discovered the importance of Huanzidong for cranes and has made major contributions to protecting the birds at both sites. She was accompanied by a graduate student Sha Jianbin, one of many young Chinese biologists growing up with a love for wetlands and field research. They were digging for tubers that are food for the cranes and many other migrants, as the beginning of a food study at these sites. Close to mid day, while they worked, flocks of Siberian Cranes were soaring overhead on the thermals, to gain altitude and then begin their long glide south. It is a rare moment, to witness these departures on migration.

Less than 30 minutes later, when Liying and Sha again bent toward the mud, they heard more bugling of the cranes. They looked all across the sky but could not see birds. Back to work. Then the voices were closer. Small specks against the blue were cranes, they had been too high to see before. The cranes descended with rapid, surprising speed, finally with legs extended to drop into the water shallows. Likely they had just completed the stage in migration from Momoge.

Liying has often watched the grace of dancing Red-crowned Cranes on the ground. In the air, the Siberian Cranes are lighter, the black feathers of the wingtips spread like fingers and the outer wings delicate and swift, as if these timeless birds were dancing in the sky.

Left: Red-crowned Cranes feed by picking food from shallow water or the surfaces of plants. They walk while feeding. In contrast, Siberian and White-naped Cranes dig for food, moving less distance as they feed. Photo by Wang Keju

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XV. Challenges and the Commitment Ahead

Time is relative. Not long ago, the cranes and geese, the storks and spoonbills and other waterbirds of Asia were flying over and around great sheets of ice. Cranes are ancient birds, we hear those lost wilds in their voices, in the swoosh of their long wings as they pass overhead. In the history of Siberian Cranes, the Ice Ages happened just moments ago, and somehow these birds survived the ice flickering across their flyways time and time again. Not all species survived, we know only those that did.

While humanity has changed Asian landscapes for millennia, the crisis of change rose less than a century ago. Transformation of the flyways–in particular of wetlands morphed into farmlands, cities, even desert–challenges the survival of almost all waterbirds. From these perspectives, SCWP seems extraordinarily short.

Our project is not just about the flagship species, but has aimed to benefit a wide variety of waterbird species. Each one has its story. Not quite so ancient as the Siberian Cranes, but still old indeed are the Red-crowned Cranes, a second white and rare crane that shares the East Asian flyway with the Siberian. For China, this project has been as much about the Red-crowned Crane, a bird of extraordinary cultural significance. In nearby Korea and Japan, they are literally "national monuments".

The Red-crowned Crane now has two entirely separate populations (Meine and Archibald 1996). The mainland population shares Zhalong, Momoge, Xianghai and Keerqin with the Siberian, and formerly came to Poyang but now winters in China only on the coast of the Yellow Sea. This species has benefitted from most of the activities undertaken by the China portion of our project. The island population survives only in southeastern Hokkaido, the northernmost island in Japan. Believed to be extinct a hundred years ago, a handful of birds were rediscovered in the 1930s; they had hidden in remote marshes and had survived because they did not migrate but lived year round in landscapes too cold for croplands. Yet winters were fiercely cold, and the cranes resorted to swift moving streams that did not freeze.

Siberian Cranes have been protected from disturbance at Huanzidong Reservoir, and become more tolerant of livestock, people, or cars than at many other locations. Photo by Zhou Haixiang

In 1952, the streams did freeze, and the cranes survived only because farmers fed them grain. So responsive and so beautiful were the cranes that the people continued to feed them in later years. It turned out that winter food had limited growth of this population. With winter feeding, the island population steadily grew over the decades. As numbers climbed, crane scientists were astounded that the small expanses of wetland in southeastern Hokkaido could support so many birds, far more than anyone had expected. By the close of our project, the island population has exceeded 1300 birds, all from 33 birds alive in 1952.

For ecologists studying behavior of the Red-crowned Crane, the two populations behave like distinctly different species. On the mainland, where people have until recently killed birds and taken eggs–and still disturb the wetlands at all times of year–the cranes will only nest in large expanses of wetland with minimal human presence. We used to believe they needed these huge territories to breed. But in Hokkaido, as the population grew, pairs crowded into smaller and smaller territories and started breeding on the smallest of wetlands slipping among forest and pasture. Strictly protected by everyone, the cranes were not afraid of the human places, coming close to farm yards, even into farmyards and onto roads. This familiarity has its problems, but also offers hope for the mainland population – as well as other cranes and waterbird species.

Red-crowned Cranes linger in the vast marshes of Zhalong in autumn. In Hokkaido, Japan, Red-crowned Cranes have learned to use small wetlands for nesting, and to tolerate human activity nearby, due to strict protection for decades. Changing awareness for wildlife on the mainland may allow the cranes to use many wetlands that are now too disturbed by human activity. Photo by Wang Keju

If our combined efforts can save the fragments of wetland we now have, and if the people learn that safeguarding the cranes will at the same time safeguard resources that humanity needs to survive (such a change in attitude has begun in many countries) the birds will respond by using the wetlands more intensively. Even the cranes have flexibility, they will respond if we humans change.

Perhaps the Asian flyways are like human patients in the crisis of disease. If science and care and coordinated effort can enable these patients to pass through perilous times, the future opens out again. Full and long life is possible. The Hokkaido cranes give us the living example of what is possible. This project has not solved the entire cascade of threats for

Red-crowned Cranes are hardy birds. They migrate later than other cranes and winter farther north than Siberian Cranes. Photo by Wang Keju

waterbirds and wetlands across Asia, but the positive changes we have described will grow and magnify if they are sustained and expanded as we hope and expect.

As the project nears completion, ICF and its partners have started attending to other threats, less imminent but nevertheless significant. And growing. We are studying the impacts of powerlines and wind farms, and the measures needed to avoid mortality to migrating birds. Water quality has been a very small part of activity under SCWP but the contamination of waterways has grown so perilous it threatens human health as well as wildlife in large parts of Asia. While the Siberian and most other cranes are primarily vegetarian, the Red-crowned eats much animal food. Research in Hokkaido has found significant levels of mercury in these birds (Teraoka et al. 2007).

Climate change presents a special challenge in Asian countries with high human populations and extensive arid landscapes. Unlike many threats that act locally, one site at a time, climate change affects all portions of the flyways–although in different ways difficult to predict. The lessons and achievements of SCWP have helped prepare decision-makers, managers, and scientists along the flyways to understand the challenges posed by climates. We have a sound basis for developing effective strategies for responding to the changes ahead.

Hope for the future–for the flyways, the wetlands along the way and the waterbirds that journey each spring and fall–depends on long-term commitment by multiple players with a flyway perspective and the passion to communicate and recruit others to the effort. By this measure, this project in its closing stages offers strong reason to hope.

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List of Annexes

Annex 1. Final Logframe Tracking Form (LTF)

Annex 2. Complete list of donors and co-financing sources

Annex 3. SCWP staff contact list

Annex 4. List of SCWP outputs

The SCWP outputs listing includes technical reports and public awareness materials developed by SCWP staff. The outputs are available in their national languages (Chinese, Farsi, Russian or English), with select non-English outputs fully or partially translated into English. Key outputs will be available to download from the SCWP website at www.scwp.info, or you may request digital copies by contacting the International Crane Foundation at scwp@savingcranes.org or +1-608-356-9462.

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