(DRAFT) PROJECT REPORT

Conservation and Rehabilitation of Habitats for Key Migratory Birds in North-East Asia with special emphasis on Cranes and Black-faced Spoonbills

Edited by Korean Society of Environment and Ecology (KSEE)

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NEASPEC

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Korean Society of Environment and Ecology (KSEE)

The Korean Society of Environment and Ecology (KSEE) was founded in 1987 and is designed to make a significant contribution to a sustainable development of human being and an improved global environment by conducting research, providing and applying the research results in the areas of Ecosystem Management & Conservation, Environmental Education and Ecosystem Restoration.

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Acronyms and abbreviations

BFS	Black-faced Spoonbill
CCZ	Civilian Control Zone (ROK)
DIPA	Dauria International Protected Area
DMZ	De-militarized Zone
DTMN	Dauria Transboundary Monitoring Network
EAAFP	East-Asian Australasian Flyway Partnership
ERF	Environmental Ecosystem Research Foundation (ROK)
HC	Hooded Crane
KNPS	Korean National Park Service
KSEE	Korean Society of Environment and Ecology
NBBC	National Bird Banding Center (China)
NNR	National Nature Reserve (China)
WNC	White-naped Crane
WSCC	Wildlife Science and Conservation Center (Mongolia)
WWF	World Wide Fund for Nature

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I. Overview of the Project

1. Project Background

Between 2005 and 2007, government officials and experts from NEASPEC member countries jointly worked for developing the NEASPEC Nature Conservation Strategy (NEASPEC 2007) which was adopted by the 12th Senior Officials Meeting in 2007. The Strategy identified 6 flagship species of North-East Asia region: three species of feline animals, Snow Leopard, Amur Leopard and Amur Tiger and three species of migratory waterbirds, namely, White-naped Cranes (*Grus vipio*), Hooded Cranes (*Grus monacha*) and Black-faced Spoonbills (*Platalea minor*). Concerning the flagship species of migratory waterbirds, the Strategy recommended to 1) develop an action plan for collaborative monitoring and research in breeding or wintering sites using of habitat assessment and gap analysis, 2) research and monitoring on the breeding and wintering ecology, 3) support range countries to work together on capacity building for habitat management, population management, monitoring and research, related law enforcement, environmental education and community development.

Meanwhile, the need for follow-up actions for key migratory waterbirds has been highlighted during several occasions including: the Training Workshop for Young Researchers on Conservation of Cranes and Black-faced Spoonbills in North-East Asia in November, 2006 which was held in Izumi and Fukuoka, Japan and the Expert Group Meeting and Review Meeting of NEASPEC Project on Nature Conservation in Transboundary Areas which was held in November, 2010 in Hunchun, China and July 2012 in Vladivostok, Russia, respectively. Among them, the *International Workshop on the Conservation and Restoration of Endangered Species' Habitats in North-East Asia*, jointly organized by the Korean Society for Environment and Ecology (hereinafter KSEE) and NEASPEC as a side-event of the 5th IUCN World Conservation Congress (WCC) in September, 2012 in Jeju, Republic of Korea afforded a major opportunity to review the current status and protection measures for Cranes and Black-faced Spoonbills in North-east Asia. The Workshop discussed the need to improve the conservation status of key habitats for Cranes and Black-faced Spoonbills in North-East Asia and recommended to NESPEC member states establishing a more comprehensive conservation plan for key wetland habitats of the migratory waterbirds including Cranes and Black-faced Spoonbills. It was also proposed that improved conservation and management plan be achieved in part through habitat mapping as an effective tool for selection, conservation and restoration of key sites.

Subsequent to the Workshop, the idea for cooperation and collaboration among of NEAPSEC member states for flagship migratory waterbirds had been discussed and developed among key participants of the workshop and the project proposal for migratory waterbirds was submitted to the 17th Senior Officials Meeting held on 20-21 December, 2012 in Chengdu, China. Recognizing the direct relevance of the Proposal with the implementation of the NEASPEC Nature Conservation Strategy, SOM-17 recommended seeking synergies with existing mechanisms such as the East-Asian-Australasian Flyway Partnership (EAAFP), ensuring communication with experts in member States and reframing the initial project title and proposed activities. In accordance with the recommendations of SOM-17, consultation with relevant international organizations and programmes including EAAFP, Ramsar Convention Secretariat, International Crane Foundation, and the North-East Asian Crane Working Group had been undertaken to reflect their views and established a firm ground for effective project coordination during the project implementation. The refined proposal was finally adopted by the Chair of SOM-17 in August 2013 and its proposed implementation plan and budget reallocation were endorsed by SOM-18 with outcomes of the 1st Expert Group Meeting (EGM) of the Project which was held on 10-11October in Incheon, Republic of Korea.

2. Project Objectives

The Project's objectives are to improve the conservation status and promote international cooperation for key wetland habitats for the flagship waterbirds; to strengthen bilateral and multilateral, and multi-level cooperation for migratory birds conservation in North-East Asia; and to contribute the achieving the goals of the NEASPEC Nature Conservation Strategy, and the Aichi Biodiversity Targets of the Convention of Biological Diversity (CBD) as well as sustainable development in the subregion. Under these objectives, scoping surveys, joint studies and capacity building and public awareness programmes were carried out on the three NEASPEC flagship migratory bird species (Black-faced Spoonbill, Hooded Crane, and White-naped Crane) by national focal points and coordinating bodies.

3. Expected Outcomes

The Project expected outcomes are to obtain international recognition and support for conservation priorities for key habitats of flagship species among major stakeholders in the North-East Asia; transfer relevant knowledge and expertise for better management of key habitats including habitat mapping, and; build capacity within NEASPEC member states and their local communities to improve species protection, habitat management and public awareness.

4. Scope and Duration of the Project

The Project was conducted in five member countries of NEASPEC, China, Russia, ROK, Japan and Mongolia. The project duration was planned to be two years from July 2013 to June 2015, and inevitably extended to December 2016 as the joint study on Dauria International Protected Area (DIPA) was postponed to summer 2016.

5. Implementing bodies of the Project

The lead implementing agency of this project is the Korean Society of Environment and Ecology (KSEE) under the supervision of the NEASPEC Secretariat. The KSEE conducted Korean DMZ joint research, Korean scoping surveys, capacity building and public awareness programs respectively. The national focal point and/or coordinating body of each country conducted scoping survey of each country, and the State Nature Biosphere Reserve "Daursky" undertook the DIPA joint study.

Table 1 Summary Table of Project Activities

Scoping Survey	Joint Study in transboundary areas
Description	
Each country's national focal point carries out **domestic** survey for the selected sites. Scoping surveys aimed to generate consistent and comprehensive information through: utilizing existing information sources, direct consultation with local stakeholders (e.g. local governments, institutions, academia, civil society and communities).	Coordinator of each Joint Study (i. DIPA, and ii. DMZ) will coordinate with other national focal points to jointly carry out the Joint Study in these selected **transboundary sites**. Joint studies would generate information through **international cooperation** in: information collection and sharing, consultation of local and international stakeholders and international joint study at the selected transboundary sites.

Scoping Survey	Joint Study in transboundary areas
Selected Sites and Tentative Timeline	
Black-faced Spoonbills Coordinating body: Chinese Academy of Forestry (China) • Xingrentuo/Yuanbaotuo at Liaoning (China) • Hakata Bay (Japan) • Incheon (ROK) **Hooded Cranes** Coordinating body: Korean Society of Environment and Ecology (KSEE) (ROK) • Lindian (China) • Izumi (Japan) • Cheonsu Bay (ROK) **White-naped Cranes** Coordinating body: Wildlife Science and Conservation Centre (Mongolia) • National protected sites in Dauria International Protected Area and adjacent territories (including Dalai Lake for China) of Dauria ecoregion (China, Mongolia and the Russian Federation) • Khurkh-Khuiten River Valley Areas of the Onon River Basin (Mongolia) • Dauria International Protected Area (Russian Federation)	**Dauria International Protected Area** Coordinating body: State Nature Biosphere Reserve "Daursky" • China, Mongolia, and the Russian Federation **Korean Demilitarized Zone (DMZ)** Coordinating body: Korean Society of Environment and Ecology (KSEE) • DPRK and ROK

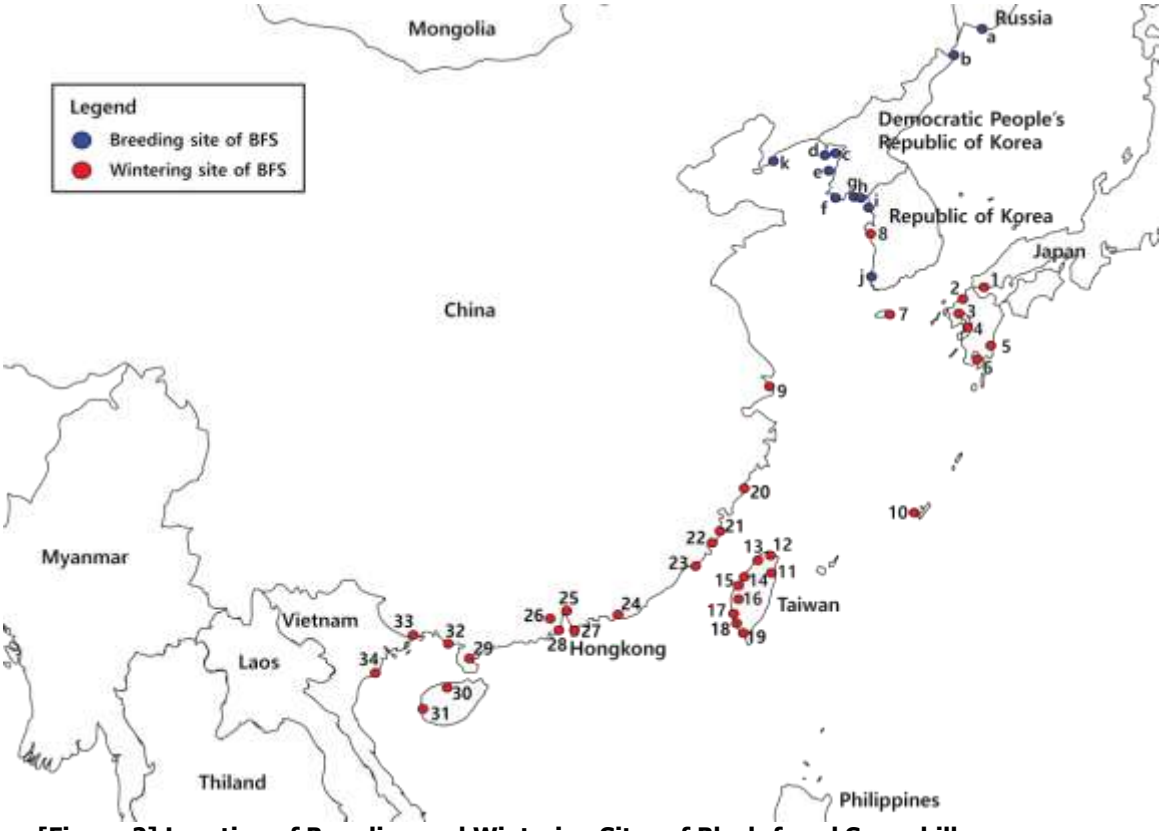
II. Scoping Survey on Key Migratory Birds' Habitat in North-East Asia

1. Black-faced Spoonbills (*Platalea minor*)

1.1 Current status of the bird

Error! Reference source not found. Black-faced Spoonbill (BFS) *Platalea minor* is listed as a globally endangered species due to its small known population in range countries. The overall population is expected to decline in the near future for the loss of habitat to industrial development, land reclamation and pollution (BirdLife International 2016). According to the International Black-faced Spoonbill Census 2015, 3,272 Black-faced Spoonbills were found at 62 sites in East Asia. Since annual census was inaugurated in 1993, the wintering population has increased: recording exceeded 1,000 individuals since 2003, over 2,000 since 2009, with an exception in 2011, and over 3,000 in 2015 (Yu, Y.T, Fong, H.H.N. and Tse, I.W.L. 2015). The lack of baseline data makes identifying the population trend problematic, but if the apparent recent increases are confirmed as genuine, the species may warrant downlisting in the future (BirdLife International 2016). The known breeding grounds of the bird so far are on rocky islands around the eastern and northern coasts of the Yellow Sea, along the western coast of the Korean Peninsula (in both Democratic People's Republic of Korea (DPRK) and Republic of Korea (ROK)) and in North-East China and there may be breeding sites in the Ussuri basin in southern Primorye, Russian Far-East (BirdLife International 2001). It winters in East Asia, almost exclusively in coastal areas. The major wintering grounds where over 100 birds are wintering include the Tsengwen Estuary, Tainan City, Taiwan (1,490 individuals), Deep Bay, Hong Kong including Mai Po and Futian Shenzhen (411 individuals), Chiayi County, Taiwan (296 individuals), Kaoshung City, Taiwan (208 individuals) and Haifeng, Guangdong (116 individuals) (Yu, Y.T, Fong, H.H.N. and Tse, I.W.L. 2015). Coastal area of Kyushu, Japan, eastern and southern coasts of China and northern part of Vietnam are also important wintering grounds for the bird.

[Figure 1] BFS Family in border area between DPRK and ROK © KIM Yeonsoo



[Figure 2] Location of Breeding and Wintering Sites of Black-faced Spoonbill

a) Murav'inya bay; b) Sivuch'ya baya; c) Ae-do, Hyengze-do, Zung-do; d) Dongsolbatsem, Namsolbatsem, Oksem, Sesolbagtsem, Sogam-do; e) Tok-do; f) Gurang-ri, Ongjin county; g) Yongsan-island, Gakhouido; h) Ryongmaedo, Yemzen-gu; i) Yongjong island, Won-do; j) Chilsan-do; k) Xingren Tuo

1) Yamaguchi, Japan; 2) Fukuoka, Japan; 3) Saga, Japan; 4) Kumamoto, Japan; 5) Miyazaki, Japan; 6) Kagoshima, Japan; 7) Jeju, Republic of Korea; 8) Seosan City, Republic of Korea; 9) Shanghai, China; 10) Okinawa, Japan; 11) Ilan County, Taiwan; 12) Taipei City, Taiwan; 13) Hsinchu County, Taiwan; 14) Changhua County, Taiwan; 15) Yunlin County, Taiwan; 16) Chiayi County, Taiwan; 17) Tsengwen River estuary, Tainan City, Taiwan; 18) Kaohsiung City, Taiwan; 19) Pingtung County, Taiwan; 20) Wenzhou, Zhejiang; 21) Mingjiang estuary, Fujian; 22) Xinhua (Fuqing Bay and Xinhua Bay, Putian), Fujian; 23) Kinmen County, Taiwan; 24) Haifeng, Guangdong; 25) Jiangmen, Guangdong; 26) Guangzhou, Guangdong; 27) Deep Bay, Hong Kong and Shenzhen; 28) Taipa, Macao; 29) Leizhou, Guangdong; 30) Lingao, Hainan; 31) Sigang, Hainan; 32) Beihai, Guangxi; 33) Beilun estuary, Guangxi; 34) Xuan Thuy, Vietnam

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Re-organized from: Chan, S. Fang, W.H, Lee, K.S., Yamada, Y. and Yu, Y.T. 2010; Yu, Y.T, Fong, H.H.N. and Tse, I.W.L. 2015

1.2 Scoping Survey in China: Xingrentuo and Yuanbaotuo

Site name(Country)	**Xingrentuo and Yuanbaotuo (China)**	**Submitted Date**	DEC, 2016
Complier name	National Bird Banding Centre, China	**Contact Information**	

The Black-faced Spoonbill is listed as a globally endangered species in the IUCN Red Data. According to the International Black-faced Spoonbill Census in January 2016, there were only 3,000 wintering individuals worldwide. The breeding area is mainly distributed in the Korean Demilitarized Zone (DMZ). Zhuanghe, located in Dalian City, China, is the world's second-largest Black-faced Spoonbill's breeding site; despite the small breeding population, the site is of great importance for the protection of Black-faced Spoonbills in China.

1.2.1 Study area

Zhuanghe is a county-level city in Dalian City, Liaoning Province. It is located on the southeast Liaodong Peninsula, in northeast Dalian. It is one of the three northern cities under Dalian. The geographic coordinates are 122°29′–123°31′ N, 39°25′–40°12′ E. It adjoins Donggang City, Dandong in the east, neighbors Pulandian City in the north, connects Yingkou City, Gaizhou, Xiuyan County, Anshan City in the north, and approaches the Yellow Sea. The total area of Zhuanghe is 6,968 km^2, including 4,073 km^2 of land and 285 km^2 of the seashore.

Zhuanghe City is located in the North Temperate Zone and has a warm, temperate, humid continental monsoon climate. It has a mild climate with four distinct seasons. The average temperature is 9.1°C, with the minimum and maximum being −29.3°C and 36.6°C, respectively. Affected by the mountains and seas, the temperature difference between the north and south is 1–2°C.

There are 13 rivers with a catchment area of > 100 km^2, 22 rivers with a catchment area of >50 km^2, and 53 rivers with a catchment area of > 20 km^2; these include the Yingna, Zhuanghe, Huli, Xiaosi, Xiaosha, Guafu Rivers, among others. The total length of these rivers is 882 km. The Biliu River forms the boundary between Zhuanghe and Pulandian Cities in the west, and the Huli and Diyin Rivers run through Zhuanghe longitudinally in the east. All rivers originate from the northern mountains and pass through the central hilly areas and the southern coastal plain, and most of the rivers basically flow into the Yellow Sea from north to south.

1.2.2 Methods

In the 2012–2014 Black-faced Spoonbill's breeding seasons, the investigators went to the breeding sites at Xingrentuo, Shicheng Island, and Yuanbaotuo, Wangjia Island by boat, and investigated Black-faced Spoonbill's breeding ecology around the islands by telescopes and cameras, and counted the number of nests. Meanwhile, the surveyors went to the Black-faced Spoonbill's feeding site, Zhuanghe Estuary, to observe food availability and the bird's feeding habitats on the coastal tidal flat.

1.2.3 Results

In 2014, a total of 21 nests were found: eleven nests were recorded at the Black-faced Spoonbill breeding site in Xingrentuo, Shicheng Island and ten nests were found in Yuanbaotuo. The Black-faced Spoonbill chicks had hatched and were in the brood stage. The Zhuanghe Estuary feeding ground did not change compared with the previous years. There was a significant increase in the Black-faced Spoonbill breeding population compared with the previous two years.

Table 2 Number of Black-faced Spoonbill nests in Xingrentuo and Yuanbaotuo, 2012–2014

Survey year / Site name	2012	2013	2014
Xingrentuo	0	3	11
Yuanbaotuo	7	14	10
Total	7	17	21

In 2014, the nest numbers increased significantly in Xingrentuo. According to data from the Zhuanghe Wild Animal Protection Station, in autumn 2013 a total of 77 Black-faced Spoonbills were found in the Zhuanghe Estuary intertidal zone. In mid-May 2014, one Black-faced Spoonbill sub-adult was found in Zhuanghe coastal beach with S47 red leg rings on its left leg and a combination of orange, green, and blue rings on the right; It is known that this individual was banded by Dr. Lee Kisup at Gaskiam, Republic of Korea (ROK), on July 10, 2013.

The discovery of a Korean banded Black-faced Spoonbill sub-adult indicates that Zhuanghe Estuary intertidal zone is an important feeding site during the breeding season, which also reflects the close relationship between the Zhuanghe and Korean breeding populations, and highlights the importance of the of Zhuanghe Estuary feeding ground. The 77 Black-faced Spoonbills found in 2013 represented an increase in the Black-faced Spoonbill breeding population and a higher breeding success rate. The 21 Black-faced Spoonbill nests found in 2014 indicated that population would increase in size in autumn.

Improved natural habitats and effective protection measures are important in increasing breeding populations. Based on the investigation results, Zhuanghe Estuary, the main Black-faced Spoonbill feeding site, exhibited almost no changes. The large open coastal mud flat provides better feeding sites for Black-faced Spoonbill. The retention of a large area of the feeding site supports the current breeding population. To preserve the feeding site, the Zhuanghe City government has abandoned many economic and tourism development projects and has also increased protection efforts and taken serious protective measures. They have signed an agreement with both of the towns adjacent to the breeding sites, hired people specifically to keep watch during the breeding season, set up protection signs, disabled a cement road, and provided nest building materials in the earlier stage of breeding. These protective measures will contribute to increasing the Black-faced Spoonbill breeding population.

1.2.4 Conservation suggestions

First, the greatest threat to the Black-faced Spoonbills breeding population comes from the destruction of the Zhuanghe Estuary coastal beach. In light of the economic and wetland development pressures, providing better feeding habitats is a key issue for the protection of this internationally endangered species. Preventing the pollution and destruction of the wetland that supports the currently abundant food for Black-faced Spoonbills is a long-term task, which requires cooperation and scientific management of the relevant local authority departments. To

achieve this goal, it is recommended that a national nature reserve be established for the long-term protection on the Black-faced Spoonbill breeding sites.

Second, human disturbance is also an important factor threatening the Black-faced Spoonbill breeding population. The direct protection of the breeding island is also absolutely necessary. There is need to continue the increase of effective conservation efforts for Xingrentuo and Niuxintuo, both important breeding sites, to strengthen relationships between the protection department and local villagers and clearly define the responsibilities of each, to increase investment in local economy development, to reduce human disturbance, and to restore and create the ecological conditions necessary for Black-faced Spoonbill breeding.

1.2.5 The Sites

[Figure 3] The Breeding ground and the breeding population of Black-faced Spoonbills in Zhanghe Estuary, China

[Figure 4] Breeding ground and its breeding population of Black-faced Spoonbills in Zhanghe Estuary, China (Continue)

[Figure 5] Landscape of Zhanghe Estuary

[Figure 6] S47 taken at Zhuanghe Estuary

1.3 Scoping Survey in Korea: Incheon

Site name (Country)	Han Estuary and Incheon-City (Korea)	**Submitted Date**	February, 2016
Complier name	Korean Society of Environment and Ecology (KSEE) & Environmental Ecology Research Foundation (ERF Korea)	**Contact Information**	

1.3.1 Biophysical Information

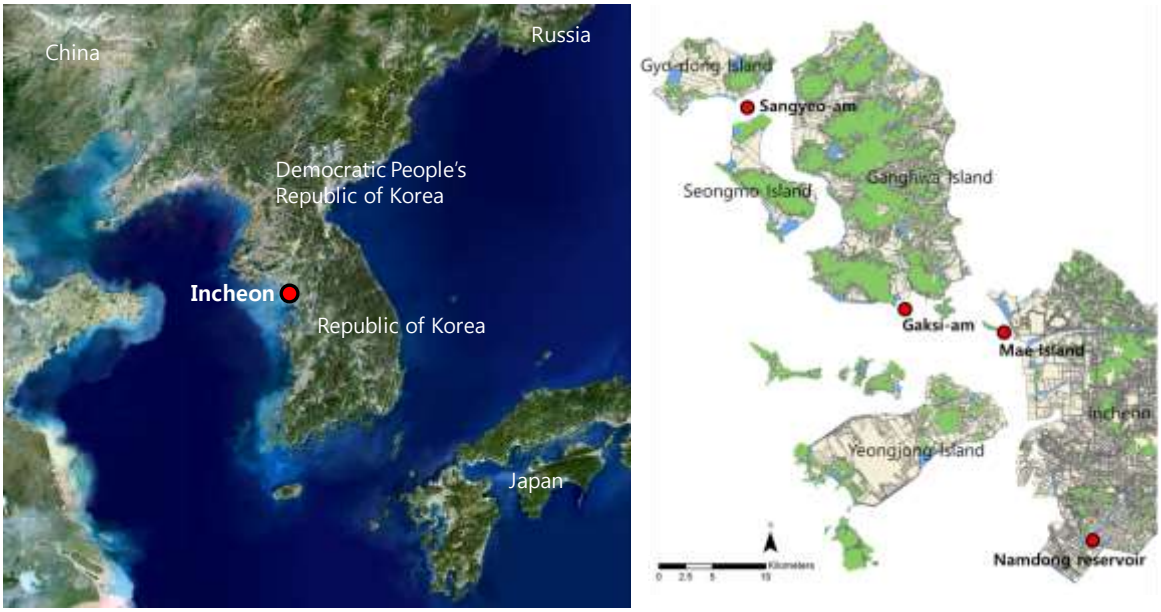
1) Location & site boundary

The Han River flows down from Baek-du-dae-gan Mountain, east of Gangwon Province and goes through the Korean Peninsula in the west with a river area of 34,674 km^2, a length of 459 km and a width of 75.5m as the largest river in Republic of Korea (Ministry of Construction and Transportation, 2001) and is the only natural estuary in the west coast of ROK. The region of Han estuary where Imjin River and the West Sea meets is connected with a waterway created between Gimpo City and Ganghwa Island and the Gyeonggi Bay in the south and with Yeseong River in the north. Thus, it is not suitable to consider Han estuary as a separately divided area but as the biosphere in a broad scale. Moreover, it is off limits to the public for the military purpose since it borders Gaepung-gun, DPR Korea.

Located west of Gimpo, Ganghwa Island (Ganghwa-gun) takes up 40% of the entire land area of Incheon with 411.3 km^2. Originally, it belonged in Gyeonggi Province but was incorporated into Incheon in 1995. Incheon is a flagship port city in ROK whose port was opened in 1883, but the natural shoreline has already disappeared due to the construction of the Incheon International Airport from 1992 and continuous reclamation projects. Even now, its tidal-flats are being reclaimed for urban development. Though, a lot of tidal-flats have remained on Ganghwa Island where there has been no reclamation project in a large scale. A tidal-flat on the southern Ganghwa Island which serves as a habitat for Black-faced Spoonbill was designated on July 6th, 2000 as the 419^{th} Korean Natural Monument for preservation. Currently, tidal flats on Ganghwa are known as a critical food source for lots of shorebirds and Black-faced Spoonbills.

Around the globe, there are about 3,000 Black-faced Spoonbills designated as an endangered species. Uninhabited islands in the West Sea of ROK including some borderline areas on Han estuary are major breeding sites for the most of its global population. Currently, breeding sites adjacent to Han estuary includes Yu Island in the lower reaches of Han River; Mae Island next to Sudokwon Landfill site; Namdong reservoir in the Namdong Industrial Complex of Incheon; Gaksi Rock at the southern tip of Ganghwa Island, and Sangyeo Rock between Seokmo Island and Gyodong Island in Ganghwa-gun. Yu Island was a core breeding site on Han estuary, but since 2009 breeding of Black-faced Spoonbills has not been identified. Instead, an artificial island in Namdong reservoir situated inside the Namdong Industrial Complex of Incheon has emerged as a new breeding site for Black-faced Spoonbills since 2009. This research focuses on their breeding sites near Han estuary, and inland rice paddies and wetlands located within a feeding distance of birds.

2) Maps



[Figure 7] Location of breeding sites of Black-faced Spoonbill in Incheon, Korea

a. Ecological character

Han estuary has a vast tidal flat which has been formed from earth and sand deposits flowing in along the Han River, Imjin River and Yeseong River through tens of thousands of years. With big tides, it has strong tidal currents. Unlike other tidal-flats with even grounds on the southwest sea, it has well-developed tidal channels, causing severe topographical changes.

Most of waters belong to borderline areas and have been relatively well-preserved since they are restricted from public access and development. But, as for Incheon City located in the south of Ganghwa-gun, the size of tidal flats has been dramatically reduced due to urban development, the construction of the Incheon International airport and a waste disposal site (namely 'Sudogwon Landfill site') through continuous landfill and reclamation. Even now, there are ongoing reclamation projects near Songdo and Incheon International Airport.

A tidal flat on Han estuary is inhabited by various salt plants and invertebrate animals as a treasure trove of biodiversity on the Korean Peninsula. It is also an important habitat for migratory waterbirds feeding on these plants and animals. In particular, it serves as a significant stopover for a variety of shorebirds during the spring and autumn seasons. It is of importance as a breeding and foraging site for Black-faced Spoonbills.

b. Geopolitical boundary

Han estuary is right next to Gaepung-gun of DPR Korea in the north while it is included in Gimpo City, Ganghwa-gun, Incheon City, Siheung City and Ansan City in the south. Gimpo and Ganghwa-gun near the borderline areas have a well-preserved coastal line due to the military purpose and most of their lands are used as rice paddies. But, as for Incheon, the estuary is adjacent to large cities and infrastructure created through a reclamation project like the Incheon International Airport and its new town, Cheongna New Town, Incheon Port and Songdo New Town in Free Economic Zone. In proximity, Siheung and Ansan have Sihwa Lake nearby which is an artificial freshwater lake caused by a large reclamation project for creating industrial complex.

3) General description of the site

The West Sea of ROK is a heavily indented ria coast with complex coastal lines. So is Han estuary with small/large islands and irregular coastal lines. There is a large-scale tidal-flat created due to big rivers like the Han River, Imjin River and Yeseong River and strong tides.

The Han River has been a critical strategic point from the era of Three Kingdoms of Korea even before the 9th century. Passing through Koryo and Choseon Dynasties to this date, it serves as a major river that connects capitals like Gaeseong, Ganghwa, Hanyang and Seoul. Thus, it was an important passage for shipment and had a ferry to move toward Imjin River and the upper region of the Han River.

Due to lots of small and large islands and huge tides, Han estuary is a region with strong currents. Based on such geological feature, Ganghwa-gun once served as a capital city during the Koryo Dynasty. Starting from the 13th century, a reclamation project was carried out to connect various islets big and small on Ganghwa Island to secure agricultural foundation as an attempt to maintain the capital. Until the 20th century, the land area of more than 160 km^2 was reclaimed, creating the current landscape of Gyodong, Seokmo and Ganghwa islands.

Afterwards, reclamation projects have continued. After opening a port in 1883, a reclamation project was started to secure urban lands. Since the 1960s, Juan, Bupyeong and Namdong Industrial Complex were created through landfill projects, and Sudokwon Landfill site was built and wastes began to be dumped therein. Starting from 1995, a reclamation project to create Songdo and Incheon Incheon Airport was pushed forward in earnest. After 2010, the reclamation project to create a free economic zone on the shore has steadily reduced the total area of tidal flats and has lost the natural shore.

4) Climate zone and major features

Han estuary belongs to the temperate-climate central region with an average annual temperature of 12.8 C in Incheon, but trees normally thriving in temperate-climate southern region like camellia (*Camellia japonica* L.) and trifoliate orange (*Poncirus trifoliate*) trees are growing, influenced by the oceanic climate. The precipitation had kept the level higher than 1,300 mm, but starting from 2013 it rapidly reduced and recorded at 788.1 mm in 2014. Due to a severe drought in 2015, the accumulated precipitation in Seoul and Gyeonggi Province amounted to 565.4 mm as of November 2015, which is very a low record.

Because of the drought, the volume of most reservoirs, waterways and streams shrank a lot. In particular, islands including Ganghwa and rice paddies located in Siheung and Ansan, which are farmlands created by reclaiming tidal flats, are relying on reservoirs for the supply of water, having a great toll on water supply for rice farming during the spring time. It is considered that such phenomenon has greatly affected breeding of and feed supply to Black-faced Spoonbills and Egrets that need freshwater wetlands such as rice paddies.

5) Soils

Han estuary is a huge alluvial zone caused by tides of the West Sea and incoming silt from streams. In fact, most of this region including tidal flats can be referred to as an alluvial zone except for inland forests and hill lands. In the past, this area was a plain flooded by the Han River and Imjin River or a tidal flat was transformed into rice paddies through river refurbishing and a reclamation project, later becoming urbanized through development.

As for forests and hill lands of Ganghwa Island and inland coastal areas, the soil was made from sand and mud or mostly mud, but silty loam took up the most of rice paddies. It is possible to use them as wetlands once water is supplied for rice farming starting from the spring.

Geologically, islands or forests of inland coastal areas are composed of gneissic rock created during the Mesozoic Age while rice paddies are based on sedimentary rock as an alluvial layer formed during the Cenozoic Age. Sudokwon Landfill site, Incheon International Airport and Songdo New Town in Incheon are a breakaway from them since these areas have been reclaimed after the 20th century.

6) Water regime

The water system that affects the most in the formation and management of tidal flats around Han estuary is the Han River, Imjin River and Yeseon River. As the only natural estuary in ROK, the Han River doesn't have a river-mouth bank. It is natural that silt from the Imjin River and the Han River is coming in.

However, a large island at present, such as Ganghwa, Yeongjong, Seokmo and Gyodong islands has been formed by connecting less small islands through reclamation starting from the 13th century. By the nature of this island with small river basin, it is impossible to create streams. Thus, reservoirs called Giljeong, Insan, Goryeo, Hari on Seokmo Island, Nanjeong and Gogu on Gyodong Island are important sources of water for the local community.

7) Main ecosystem services

The reclamation of the tidal-flat area in Ganghwa, Incheon which started from the 13th century was to produce rice in large quantities. To this date, except for the inland areas and Yeongjong Island of Incheon, rice farming continues in the most of this area including Ganghwa, Gyodong and Seokmo islands, and Maehwa-dong, Siheung.

A tidal-flat serves as a core control tower to purify various pollutants flowing in through streams in times of urban development and floods in the coastal area as well as a source for a variety of fish and shellfish.

Recently, as eco-tourism has invigorated and the environmental awareness among citizens has been raised, Han estuary has served as a cultural place by providing cultural contents such as various experience programs including observation of wild birds and experience of a tidal flat's ecosystem. Such services are being provided at the southern tip of Ganghwa Island and Anam artificial Lake of Sudokwon Landfill site.

8) The sites

[Figure 8] Landscape of Maedo Island, one of BFS breeding sites in Incheon city

[Figure 9] Landscape of the Artificial Island in Namdong reservoir, one of BFS breeding sites in Incheon city

[Figure 10] Northern part of the Aritifical Island in Namdong reservoir

[Figure 11] Northern part of the Artificial Island in Namdong reservoir

[Figure 12] Landscape of Sangyeo rock, one of the BFS breeding sites in Incheon city

[Figure 13] Black-faced Spoonbills in rice paddy in Seokmodo Island (above) and in Gimpo area (below)

1.3.2 Species Information

1) The Black-faced Spoonbill population

a. Numbers of Black-faced Spoonbill in the site in 2014-2015

In 2014, the number of Black-faced Spoonbills spotted in Ganghwa Island, Gimpo, Namdong reservoir and Siheung was 453 out of which 357 were observed in Namdong reservoir. Besides that, one to thirty also appeared by regions like Gimpo, Ganghwa, Seokmo, Gyodong and Yeongjong islands, Paju and Siheung, most of which are feeding at rice paddies.

Black-faced Spoonbills start to appear from early March in Sihwa Lake, Incheon and Han estuary whereas those breeding at Namdong reservoir arrive in mid-March. As for 2015, seven were observed at the southern Ganghwa, Namdong reservoir, Mae Island, Seokmo Island and Maehwa-dong, Siheung on 3th to 4th April. Also, the number of its population spotted on 26th to 27th April was 203, out of which one at Gaksi Rock, 100 at Namdong reservoir and 43 at Mae Island. On top of that, 14 to 28 Black-faced Spoonbills appeared on rice paddies with water in them like the eastern and northern sides of Ganghwa, Gyodong Island and Gimpo which are their feeding sites. On July 6th when field survey was carried out, a population of 581 was spotted in total. There has been an increase in the population of juveniles thanks to successful breeding of 16 at Gaksi Rock, 190 at Mae Island, 221 at Namdong reservoir 52 at Sangyeo Rock. Besides that, a population of 4 to 40 also appeared at the southern end and northwest of Ganghwa and Gyodong Island.

b. Numbers of other associated birds

It has been observed that seagulls such as black-tailed gulls, herring gulls tend to nest on Namdong Latex's artificial island, Mae Island and Sangyeo Rock where Black-faced Spoonbills are also inhabited. Cattle egrets, great egrets and little egrets are also appearing at rice paddies, the source of freshwater feed. In some cases, shorebirds like greenshanks and common sandpipers have also been observed.

During the spring season from March to May, a large number of shorebirds arrive on mud flats. In particular, a variety of shorebirds including Indian curlews, eastern curlews and bar-tailed godwits come to the mud flat at the southern tip of Gaksi Rock and Gojan Mud Flat, west of Songdo Landfill, with a large population.

2) Black-faced Spoonbills behavior at the site

a. Breeding behavior

Black-faced Spoonbills that normally arrive starting from early March breed on uninhabited islands in the West Sea including Han estuary. In 2003, as many as 112 nests were spotted in such five sites as Yu Island, Yo Island, Soori Peak, Bi Island and Seok Island, but the number of breeding sites rose to 17 in 2013 as new sites like Mae Island, Gaksi Rock and Namdong reservoir have been added. (Kisup Lee, 2015) Among them, Yu Island is no longer used as a breeding site since 2009.

The most unique breeding site above all is an artificial island located in Namdong reservoir which is situated south of the Namdong Industrial Complex as an artificial reservoir to adjust the volume of water flowing from Seunggi Stream in case of floods. The artificial island at the center has been created to measure the water depth of the reservoir originally. However, as Yu Island has lost its function as a breeding site, it has been identified that Black-faced Spoonbills have bred on this artificial island since 2009. Currently, it has emerged as a valuable bleeding site for about 161 pairs of Black-faced Spoonbills (Incheon Black-faced Spoonbills Network, 2015). Although it is located at the center of Songdo New Town surrounded by industrial complexes, large-sized apartments and high-rise buildings, the island is considered to be used as a breeding site thanks to its proximity to feeding sites like Gojan tidal-flat and rice-paddies in Maehwa-dong, Siheung city.

According the Incheon Black-faced Spoonbills Network, there were 161 nests in total in Namdong reservoir in 2015. Among them, the birds tried to brood over eggs for hatching after spawning in 156 nests out of which 90 nests succeeded in hatching. Among them, in 85 nests, chicks grew and left their nest, which is only 52.8% of the total. It is redeemed that continuous monitoring is needed in the future to find out reasons behind such a low hatching rate despite the fact that in 116 nests the birds brooded their eggs for enough period of time.

b. Feeding behavior

Black-faced Spoonbills breeding on Han estuary use tidal flats, streams, rice paddies, shallow waterways and reservoirs as a feeding site. Some have been spotted while feeding on rice paddies with a water depth of 10 to 20 cm in Ganghwa and Gyodong islands, Gimpo, and Maehwa-dong, Siheung city from the end of April. Such behavior is believed to earn freshwater feed needed at the early stage of brooding.

However, as they are no longer observed on rice paddies in June after brooding, it is believed that they turn to feed at the tidal-flat. This is because of the difficulties in using rice paddies due to the growth of rice along with juveniles' physiological characteristics and persistent interference from farmers.

c. Roosting behavior

After leaving the nest after growth, Black-faced Spoonbills choose to use a tidal flat for their feeding site and use Gaksi Rock at the southern end of Ganghwa Island for a roosting site. Usually, the birds use the breeding sites as roosting sites. In 2015, a shortage of precipitation led to the exposure of the bottom of a reservoir at the southern tip of Ganghwa. Some Black-faced Spoonbills have been witnessed during the day time in puddles of the reservoir while taking a rest in daytime.

3) Noteworthy fauna and flora

a. East Asian seepweed (*Suaeda japonica* Makino)

It is the main salt plant thriving on the coastline in Republic of Korea's south central district. It grows as high as 15 to 50 cm and forms a large colony in a tidal flat on Han estuary. It is one of important food sources for wintering migratory waterbirds which lack feed during the winter season.

b. Oyster Catchers (*Haematopus ostralegus osculans*)

They are under protection after being designated as the 326th National Natural Monument. Some live in uninhabited islands of the West Sea in ROK. A small number of populations are believed to inhabit the southern tip of Songdo New Town in Incheon and a tidal flat on the southern Ganghwa Island.

1.3.3 Habitat Information

1) Ecological features of the site

a. Ecological Characteristics of Breeding Sites: Mae Island, Gaksi Rock, Sangyeo Rock

Since Mae Island, Gaksi Rock and Sangyeo Rock are small rocky islands naturally created, there is little vegetation. In the vicinity, a tidal flat appears at low tide and can be used as a feeding site although it is covered with water at high tide. Meanwhile, Namdong reservoir and its artificial island inside are artificially-created breeding sites. Though they are surrounded by cities, the land area of the reservoir is large and its water level is not deep thanks to the small volume of precipitation during spring when Black-faced Spoonbills are breeding. Although its water quality is not good due to a steady supply of organic matter from Seunggi Stream, feeding Black-faced Spoonbills are observed thanks to abundant benthic invertebrates like tubifexes. At the artificial island created by stacking stone, there is false acacia which has withered away, but vegetation has not been developed.

b. Ecological Characteristics of Feeding Zones

Their major feeding sites are tidal flats at the southern tip of Ganghwa Island and the west of Songdo New Town in which reclamation is ongoing. These mud flats are the home to various bivalves, gastropods, crabs, and lugworms, providing enough food sources. However, the tidal flats cannot be used twice a day at high tide. It is believed that rice paddies are normally used only during the early stage of brooding after water is supplied. Actually, due to characteristics of an island, there are few water-filled rice fields. Rice paddies are used by Black-faced Spoonbills at the early phase of brooding as they turn into wetlands with water being supplied for rice planting after the end of April.

c. Ecological Characteristics of Resting Zones

They mainly take a rest at their breeding zones. During the daytime, they tend to be observed at secluded rice paddies or reservoirs whose water has receded near feeding sites.

2) Dominant flora communities of the site

At tidal flats which are major feeding sites for Black-faced Spoonbills after the later stage of brooding, there are colonies of East Asian seepweed and glassworts. Reeds are growing in a linear form in a place where the shore and freshwater meets.

Rice paddies, major feeding sites for Black-faced Spoonbills at the early stage of brooding, are managed in order for rice to grow up once rice is planted. In some areas with some water in it, there are Setara chondrachne, cattails and rushes. Since water is not supplied to areas without

rice farming, Short-awn foxtail grass and other grass are dominant species. In the forests along the coast, the dominant species trees are oak trees while some of the false acacia forests are located along with natural forests such as pine trees and queritrons.

3) (Past and) Present land use of the site

In Ganghwa, Seokmo and Gyodong islands, there are some cities which are small in size small and they have been used as rice paddies from the past along with a small-scale settlement. However, in Incheon, the natural coast has disappeared and urbanized due to reclamation projects and urban development, and its land has been mainly used to build large-scale apartment complexes, commercial facilities, and industrial complexes. In particular, Namdong Latex, a breeding site for Black-faced Spoonbills, is located between the Namdong Industrial Complex and Songdo New Town while Mae Island is adjacent to Sudokwon Landfill site.

4) Potential areas to be habitat for species

If the population of Black-faced Spoonbills steadily increases, small rocky islands on Han estuary and the west coast are highly likely to be used as breeding sites for them. Yu Island which is no longer a breeding site but has high potential value as a habitat, if the reasons why BFS are not breeding there are identified, and actions can beaccordingly.

5) Threats

[Table 3] Threats in Incheon and Han Estuary

	Current Threat	Potential Threat
A. Residential and commercial development		
Housing and urban areas	☒	☒
Commercial and industrial areas	☒	☒
Tourism and recreation areas	☐	☒
Others or additional notes: *Shore Reclamation project to create Songdo New Town, Development of an ocean resort in Yeongjong Island*		
B. Agriculture and aquaculture		
Annual and perennial non-timber crops	☐	☐
Wood and pulp plantations	☐	☐
Livestock farming and ranching	☐	☐
Marine and freshwater aquaculture	☐	☒
Others or additional notes: *Loss of roosting sites for Black-faced Spoonbills due to development of shrimp aquafarms on shore of Ganghwa Island*		
C. Energy production and mining		
Mining and quarrying	☒	☒

	Current Threat	Potential Threat
Energy-related activities	☒	☐
Others or additional notes: *Construction plan of Ganghwa tidal power plant to be constructed on the west side of Ganghwa Island where the roosting site of the birds*		
D. Transportation and service corridors		
Roads and railroads	☒	☐
Utility and service lines	☐	☐
Shipping lanes	☐	☒
Flight paths	☐	☒
Others or additional notes: *Baegot Bridge construction plan (Song do New Town in Free Economic Zone –Siheung Baegot New Town)*		
E. Biological resource use		
Hunting and collecting terrestrial animals	☐	☐
Gathering terrestrial plants	☐	☐
Logging and wood harvesting	☐	☐
Fishing and harvesting aquatic resources	☐	☐
Others or additional notes:		
F. Human intrusions and disturbance		
Recreational activities	☒	☐
War, civil unrest and military exercises	☐	☐
Work and other activities	☐	☐
Others or additional notes:		
G. Natural system modifications		
Fire and fire suppression	☐	☐
Dams and water management/use	☐	☐
Landfill and/or Reclamation	☒	☐
Other ecosystem modifications	☐	☐
Others or additional notes:		
H. Invasive and other problematic species and genes		
Invasive non-native/alien species	☐	☐
Problematic native species	☒	☐
Introduced genetic material	☐	☒
Others or additional notes: *Wild cats and dogs*		
I. Pollution		
Household sewage and urban waste water	☒	☐

	Current Threat	Potential Threat
Industrial and military effluents	☒	☐
Agricultural and forestry effluents	☒	☐
Garbage and solid waste	☐	☐
Air-borne pollutants	☐	☐
Excess energy	☐	☐
Others or additional notes:		
J. Climate change and severe weather		
Habitat shifting and alteration	☐	☒
Droughts	☒	☐
Temperature extremes	☐	☒
Storms and flooding	☐	☒
Others or additional notes: *Droughts in rice paddies, reservoirs and waterways*		

1.3.4 Socioeconomic and Stakeholders Information

1) Stakeholders of the site

a. Stakeholders influential to site management

The administrative authorities like Incheon City and Ganghwa-gun have continuously carried out projects for tidal flat reclamation and development. In particular, as for Ganghwa-gun, there are many undeveloped places and a potential demand for development is high since it has been designated as the military protected area to limit any further development. Actually, many locals feel that they suffer in their pocket.

Meanwhile, the Incheon Black-faced Spoonbills Network mainly composed of citizens and experts is taking action for continuous monitoring and conservation of Black-faced Spoonbills.

Recently, Incheon City has made a move to designate a tidal flat of 610 km^2 in Jangbong Island and Ganghwa-gun, but residents from Ganghwa-gun and Ongjin-gun, relatively underdeveloped areas, and the military are opposing it.

b. Stakeholders impacted by site management There is no direct impact from site management except an artificial island in Namdong reservoir since breeding sites for Black-faced Spoonbills are uninhabited islands in most cases. For the breeding site of an artificial island in Namdong reservoir, the reservoir management such as water depth control affects directly the breeding condition of the birds. It is possible that property rights of owners and locals might be infringed if a conservation project is carried out since feeding sites are concerned with development through reclamation of a tidal flat and transformation and development of rice paddies.

2) Socioeconomic significance

a. Relevant cultural/ economic values of the site

Many think that a tidal flat is just part of the marine ecosystem, but it has been formed by accumulating organic matter coming from the land for a long time. Connected from Baek-du-dae-gan Mountain, it is a treasure trove of the marine culture and biodiversity on the Korean peninsula. Furthermore, there are cultures and biodiversity created along with rice farming that is the backbone of Korea's industry and has created the major landscape.

b. Main economic activities and general income

Incheon and Siheung are major industrial cities located on Han estuary. Industrial complexes were created after the 1980s in which a variety of manufacturing and business activities are actively carried out. But, even though the undeveloped farmland takes up 24.5% of Incheon City at present, the economic benefits from agriculture and fishery are little. In Incheon, the population of agricultural households recorded at 12,927 individuals in 2014. Its number has declined continuously, but the land area of farmland slightly increased from 20,630ha in 2009 to 20,986ha in 2014. The number of people engaging in fishery stood at 3,979 individuals, showing a steady downward trend. As of 2013, the gross product price of agricultural, forestry and fishery productions in Incheon amounted to 238 billion KRW, a mere 0.3% of Incheon's GDP.

3) Access and tourism

a. Annual visitor numbers and visitors characteristics

The number of tourists in Incheon stood at 7,591,211 in 2014, showing an upward trend. But, they visited the museum and cultural and historical sites for sightseeing in most cases. Eco-tourism has not been fully invigorated.

b. Access to the site

It is impossible for the public to access Gimpo on Han estuary, surroundings of Sudokwon Landfill site and the northern shore of Ganghwa due to barbed wires for national defense. At least, the southern tidal-flat of Ganghwa is easily accessible. Ganghwa Island can be readily approached since it is connected to Gimpo through Ganghwa Bridge and Choji Bridge from and to Gimpo city. On top of that, a circular coastal road is being constructed. As it is also linked with Gyodong Island through a bridge and is accessible to Seokmo Island by ship, accessibility to this region is favorable.

Although it is impossible to directly access Gaksi Rock at the southern tip of Ganghwa and Sangyeo Rock between Seokmo and Gyodong islands, they can be observed directly from the neighboring shore. However, it is not easy to have access to Mae Island due to coastal roads and barbed wires for national defense. Namdong reservoir can be accessible after a car has to be parked to the side of the road in the industrial complex.

c. Visitor facilities and infrastructure

There is Ganghwa Tidal-Flat Center in Hwado-myeon, Ganghwa-gun. The center has an exhibition and education space for wildlife of tidal-flat and Ganghwa gun in general. Visitors can easily access to the Centre by car or public bus from the coastal road of the Ganghwa Island.

d. Reasons to visit the site

Islands including Ganghwa are visited for cultural sightseeing and purchase of fishery products since they are tourist attractions with easy accessibility from Seoul and other metropolitan areas. In most cases, they draw tourists during the summer time. But, there are no visitors to Gaksi Rock, Sangyeo Rock and Namdong reservoir for sightseeing purpose.

e. Income generated from tourism

No tourism income has been calculated since eco-tourism in the region has failed to garner enough tourists.

f. Research and education facilities

There is Ganghwa Tidal Flat Center in Hwado-myeon, Ganghwa-gun. The center has an educational function but is inadequate as a research institute. The Incheon Black-faced Spoonbills Network also focuses only on monitoring and educational activities without a separate research facility.

1.3.5 Planning and Management Information

1) Tenure and Ownership

a. The site

Namdong reservoir of Incheon is owned by Incheon City and the state has the ownership of all tidal-flats and an artificial island used as a breeding site for Black-faced Spoonbills since they fall into the category of public waters. However, some rice paddies on islands and inland are all privately owned.

b. Surrounding areas

All urban areas, farmlands and mountainous areas except for social infrastructure like a power plant located on the shore are privately-owned lands with exception of some areas.

2) Status of legal protection/ management

a. Current status of legal protection

The southern tidal flat of Ganghwa Island which is a breeding site for Black-faced Spoonbills with a land area of 500 km^2 was designated as the 419^{th} National Natural Monument on July 6, 2000.

On July 10, 2014, a tidal flat near Songdo New Town in Yeonsu-gu, Incheon was designated as ROK's 19^{th} Ramsar site. However, in surrounding areas, reclamation project on tidal-flat is still ongoing, making efforts for conservation and management of wetlands and their surroundings no avail.

Recently, Incheon City is making an attempt to designate a tidal flat of 610 km^2 located in Jangbong Island and Ganghwa-gun as a national park.

b. Administrative authority in charge of management

It is difficult to have integrated management since the same protection areas are being managed under different laws and regulations by different departments. The administrative authority varies such as the Cultural Heritage Administration for natural monuments, the Ministry of Environment for inland wetlands and inland Ramsar sites and the Ministry of Maritime Affairs and Fishery for public waters including tidal flats. Local governments like Incheon City are taking responsibility for direct site-management.

c. Current management measures taken by the authorities

None

d. Current scientific research and facilities

Starting from 2015, Incheon City has embarked on "Study on Incheon's Natural Environment" which is being carried out by the Incheon Development Institute, the University of Seoul and the Incheon National University. This study includes research on wild birds and Black-faced Spoonbills throughout Incheon including islands. An overall plan will be devised for designation of protected species and future management based on the research findings.

3) Participation and cooperation with local community (Any CEPA (Communication, Education, Participation and Awareness) programme for community)

The Incheon Black-faced Spoonbill Network, established in 2009 when the birds first began breeding in the artificial island in Namdong reservoir, is now a representative local environmental organization with about 7 civil society organizations and interested citizens working in Incheon and Ganghwa areas. The Incheon BFS Network has engaged in various public awareness campaigns on the importance of Black-faced Spoonbills and its habitat including regular monitoring of the birds and their habitat, civic and school education programmes, and organizing related meetings and workshops. Besides active civic volunteerism for BFS, Incheon city government, Namdonggu District government of Incheon city, Gyeonggi Sea Grant and EAAFP have mainly supported their activities.

4) International Cooperation

In the Government sector, Incheon city hosted EAAFP Secretariat and has supported the daily operation and projects of EAAFTP since then. On July 2014, Songdo Tidal flat was designated as Ramsar Site and following year in 2015 Incheon city tried to establish sisterhood relationship with Hong Kong for the conservation of Black-faced Spoonbills.

In the private sector, since the Korean Federation for Environmental Movement – Incheon chapter (Incheon KFEM) organized the first International workshop on BFS in 2001, many international workshops, the joint survey on the BFS breeding sites and joint banding programmes took place with the participation of China, Japan, Hong Kong, Taiwan, and others.

1.3.6 Suggestions for Conservation of Black-faced Spoonbills through NEASPEC

1) Suggested strategy for conservation and better management of species and habitat

a. Strategy for management and restoration of scoping survey sites

- ✓ Management of Namdong reservoir

It is necessary to improve the quality of influent water into Namdong reservoir since it is located near the industrial complex and contaminated water and sediment are coming from Seunggi Stream. In addition, facilities and systems are required to block noise and light pollution from the waterside roads.

- ✓ Conservation and management of tidal flats

Tidal flats should be set aside for the most significant protection areas by the government to keep them from future development including reclamation through systematic efforts to designate as a national park, and a professional research institute and an educational institution have to be established for systematic research and promotion of public awareness activities.

- ✓ Protection of potential feeding sites such as rice paddies and freshwater wetlands

It is necessary to conserve rice paddies distributed in the southern, northern tips and western side of Ganghwa; Gyodong Island; Seokmo Island; Anam Lake in Sudokwon Landfill site; and Gimpo north of Anam Lake in a systematic manner, to promote organic farming, to designate further protection areas and to put a support system in place.

- ✓ Invigoration of eco-tourism and public promotion

It is necessary to let the general public know about the importance of the places concerned through continuous PR of the region and Incheon and Ganghwa-gun's efforts to promote local eco-tourism and to put a systematic supportive system in place by creating economic incomes for local communities.

b. Strategy for breeding ground

For conservation and management of breeding sites in ROK, work has to be done to identify a clear reason why Yu Island is no longer used as a breeding site through research, and efforts should be made to maintain the current breeding sites in a sustainable way. Moreover, it is necessary to discover alternative habitats and protect feeding sites in a comprehensive manner. Cooperative governance among civic groups, the administration and experts shall be established to systematically enforce such management and conservation efforts.

c. Joint Action to designate more protected areas for BFS in the region

Northeast Asia's key BFS habitats should not only be protected by national legislation but should also be designated as an international protected area that can reveal their international importance such as IBA, EAAFP Flyway Network Site, Ramsar Site, and UNESCO Biosphere Reserve etc. NEASPEC can send recommendation to each government which is included the

opinion from relevant organizations and experts to designate the areas that have not yet been adequately protected.

d. Cooperation for increasing public awareness

It is once again revealed that the NEASPEC project would double the effectiveness of efforts to promote public awareness of Black-faced Spoonbill in each country combined with international cooperation. It is needed to cooperate for training programme for young conservation researchers, local government and managers for protected area, and civic and school education together.

2) Priority actions/ areas of work for conservation and rehabilitation of key BFS sites in the region

The most important habitat of the BFS is the Yellow Sea ecosystem and its tidal-flats. NEASPEC should seek ways to engage with the international community's existing efforts such as BirdLife International, WWF, Ramsar to conserve and wisely use the large Yellow Sea ecosystem and tidal flats including the East China Sea.

3) Future cooperative project for Black-faced Spoonbills through NEASPEC framework

It is needed that the joint study on the breeding sites of BFS located in the border area between DPRK and ROK as well as the joint study on the east coast of China, the wintering sites of the bird.

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1.4 Scoping Survey in Japan: Hakata bay

Site name (Country)	Hakata Bay (Japan)	**Submitted date**	July 31, 2015
Complier name	Wild Bird Society of Japan Japan Black-faced Spoonbill Network	**Contact Information**	

1.4.1. Biophysical Information

1) Location & site boundary

Hakata Bay is one of the important wintering and stop-over sites for the Black-faced Spoonbill connecting the breeding sites in the East China Sea and wintering sites in South-East Asian areas (Figure 14). Hakata Bay is located at the eastern flyway of the Black-faced Spoonbill (BFS).

The Hakata Bay is located at 33°37N', and 130°21'E and area is 9,000 ha, encircling by the City of Fukuoka In Kyushu, Japan situates as transport hub in East Asia, or windows connecting the Korean Peninsula and East coast China, as the important base of international exchange geographically to Socially. The Distance between Fukuoka and Seoul is 540 km, and the distance to Shanghai is 879 km, which are shorter than 900 km to Tokyo.

In the book of *Important Bird Areas in Asia* (Birdlife International, 2004)[1], Hakata bay is listed as protected A1 (Criterion: The site is known or thought regularly to hold significant numbers of a globally threatened species) and A4i (Criterion: The site is known or thought to hold on a regular basis >1% of a biogeographic population of a congregator water species) Habitat type is categorized as wetlands, actually it includes inland sea area, tidal flats, River mouth and Rivers, and so on. Threatened species listed in it are *Platalea minor, Larus saundersi, Locustella pleskei,* and Congregatory waterbirds: *Numeriius phaeopus*, *Tringa nebularia, Xenus cinereus, Heteroscelus brevioes, Calidris ruticollis, Calidri alpine.*

The boundary of the Hakata Bay is situated along the line connecting between the tip of Uminonakamich and Genkai Island in eastern range, and that between the tip of Itoshima Peninsular and Genkai Island in western range. The size of the bay is roughly 10 km from north to south, and 20 km from east to west. The mouth of the bay is only 7.7 km wide with Genkai Island situating in the middle of the bay mouth. The small bay mouth is well shielding from the waves of the Tsushima Strait to a great extent. The tides bring a 2m change in the water level (Fig.14).

Hakata Bay is divided into three parts; the eastern waters, central waters and western waters[2]. The bay is only 10m deep on average, and shallow in the eastern and central waters, and becomes 23m deep in western waters. Two main routes for ships situated at the eastern water zone where the water depth of the route is 12 to 14m, promoting clean seawater at the closed-off section of the bay along this route.

There are four main tidal flat areas in Hakata Bay; Wajiro flats (80 ha) and Tatara river est uary (32 ha) in the eastern waters, Muromi river estuary (26ha) in the central waters, I mazu tidal flat (80 ha) in the western waters. All the areas are famous for the wild birds' habitats as well as providing familiar places to enjoy natures to citizens.

2) Maps

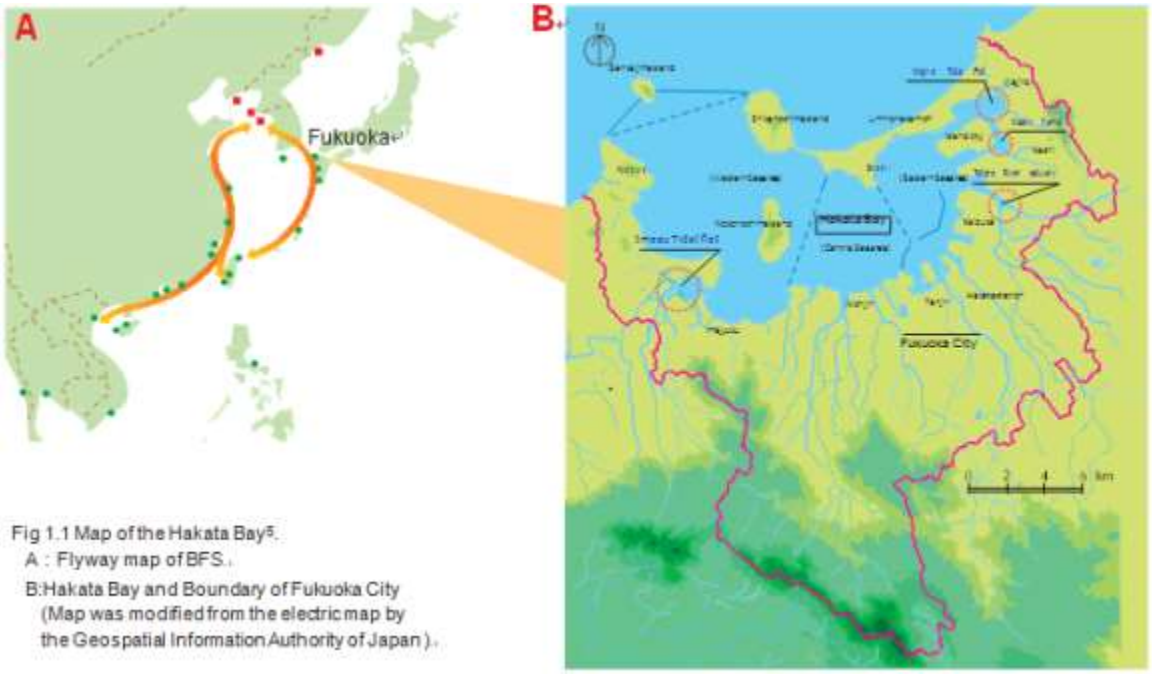


Fig 1.1 Map of the Hakata Bay[5].
A : Flyway map of BFS.
B:Hakata Bay and Boundary of Fukuoka City
(Map was modified from the electric map by
the Geospatial Information Authority of Japan).

[Figure 14] Map of the Hakata Bay

a. Ecological character

Ecological characters of the Hakata Bay are Tsushima warm current run so-called Genkai Open Sea in the north of the Hakata bay, producing rich in marine resources[3]. Tsushima warm current is a fast and sometimes rough current, but it is avoided in the bay. That must be one reason that the Hakata Bay has been prosperity as a port from historical times.

The warm current also affects the flora of the coastal area covered by sub-tropical coastal plants. This warm current may bring cloudy and wet weather in winter, sometimes even snow.

The bay is surrounded by mountains, and water resources start from these mountains and more than 30 small and short rivers are pouring into the bay.

This tidal flat environment has been formed by a complex action, such as the tidal reaction of rising and ebb tides and also sedimentation from rivers. Because of the variety of environments, different fauna and flora are formed influenced by sediment bottom condition and tidal height location. A Wide variety of organisms, such as fishes, shellfish, and crabs are observed at each suitable condition.

Tidal flats are useful habitat for wild birds. These are habitats of resident birds that inhabit

through the year. In winter these tidal flats and estuaries will be wintering ground for migratory birds. During spring and autumn, these become stop-over sites for rest.

Number of the wild birds more than 200 species[4]; gulls and ducks and grebes visited in the winter, and sandpipers and plovers visit the spring and autumn. Endangered or rare species also look like also Karashirasagi, Great Crested Grebe, Black-faced Spoonbill, little tern, Saunders's Gull, common shelduck, falcon, spoonbill, Far Eastern Curlew, Osprey.

b. Geopolitical boundary

The Coastal line of the Hakata bay consists of only Fukuoka City[2]. But Hakata Bay watershed Basin consisted of Fukuoka City, and other 9 cities and towns. Bay watershed area is about 690 km^2. Hakata Bay watershed population is about 195 million people, while the ratio of Fukuoka city population has become about 72% of the total.

In Hakata Bay, only coast area of natural beach and rocky shore, and islands are registered as the quasi-National Park. In the western area, coastal pine forest of Ikinomatsubara and Ohbaru beach are remarkable. In the eastern area, Umino nakamichi is untouched natural beach. Shikanoshima is the island which is known by gold mark (national treasure) has been discovered, as well as a holy place, that is, Shika Ocean.

Many efforts are made to maintain and preserve the natural features and environment both in the bay and on its islands. There are dozens of pine forests and as coastal terrain by basalt and many cultural historic sites related to the interaction with the Korean Peninsula. These areas are used as leisure areas for citizens to enjoy landscape and nature.

3) General description of the site

<History>

The bay and its surrounding settlements were active and significant locations from very early period. Golden Seal was found from the eastern beak of the Hakata bay, which means that has been recognized by China as early as 57 CE. (Na Country or Na Province) [6].

The oldest documentation on Japan is emissaries from the Chinese kingdom of Cao (240BC), and they stay at Ito Country at the western area of the Hakata Bay. By the 7th Century, Hakata was the port through which official missions to T'ang China were sent and received (Fig. 15).

Then, Mongol emissaries had arrived in 1268, and the first of the Mongol invasion to Japan came six years later. Kublai K'han's forces seized Tsushima and Iki Island before landing on the shores of Hakata Bay in 1274 invaders were eventually repelled and the second invasion arrived in 1281, and was similarly repelled. Both of these invasion attempts are frequently referred to in English sources as the "Battle of Hakata Bay"(Fig. 16).

Through the Edo period (1603-1868), Hakata handled only for domestic trade, as international trade or travel was forbidden by the Tokugawa shogun except at designated ports. Hakata reopened to international trade in 1899. Following the end of World War II, this was one of the primary ports through which Japanese soldiers and civilian residents of the colonies were repatriated. Hakata remained an important port throughout the post-war period, and still serves this function today.

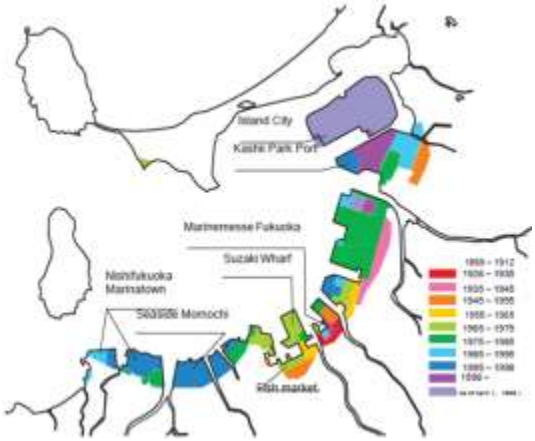
Active land reclamation began to be undertaken from the Meiji period, and continued into the post-war period8. It produced 1813 ha, primarily to improve or reinforce the effective functioning of the port. In 1994, an artificial island was begun to created and called "Island City". This reclamation is complex type composed of port function, residential function and ecological

function. A total of 2713 ha of land were reclaimed until now, which represents 8% of total area of Fukuoka City (Fig. 17) 8.

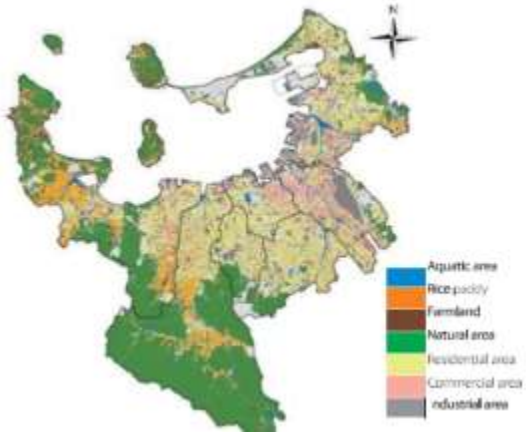
Current land use in Fukuoka City2 is composed business and services at 5.0%, industry at 4.5%, housing at 19.7%, park and roads at 20.0%, river, water routes and open areas at 8.9%, forest at 33.3% and agriculture land at 8.6%. These numbers did not change so much in these 20 years. Characteristics of land use in Fukuoka are that about 80% is occupied by the tertiary industry of administrative population, and the first and secondary industry population has become small (Fig. 18).

[Figure 15] Route of diplomacy with China[6]

[Figure 16] Showing routes in 1274 (blue) and in 1281 (orange), and defensive stone wall (red)[7].



[Figure 17] Active land reclamation in Modern Age[8]

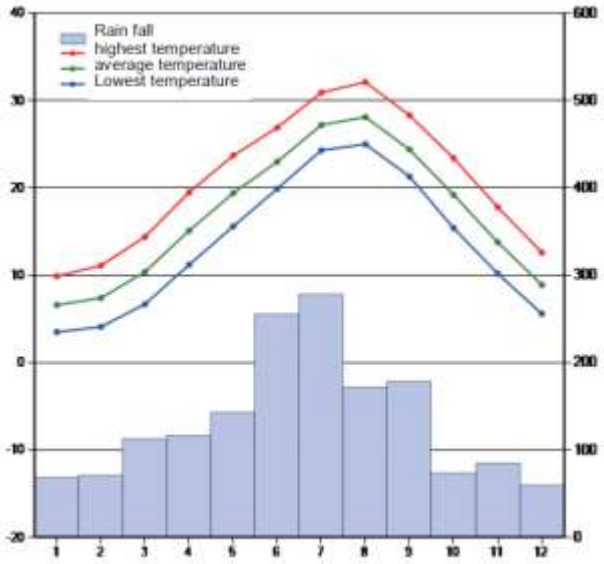


[Figure 18] Active land reclamation in Modern

1.4 Climate zone and major features

Fukuoka has a humid subtropical climate and it has hot humid summers and relatively mild w inters[3]. The city also sees on average about 1,600 mm of precipitation per year, with a stretch of more intense precipitation between the months of June and September. Fukuoka City has a moderate climate with an annual average temperature of 16.3 ℃, average h umidity of 70% and 1,800 annual daylight hours. Roughly 40% of the year is cloudy. Win ter temperatures rarely drop below 0℃, but it rarely snows (Fig. 19).

Since Hakata Bay situates at the southwest of Japan, and is facing the Sea of Genkai of th e Tsushima warm Current, the climate elements throughout the year. But it is located in th e Sea of Japan side, northern Kyushu region is affected by the cold air blown from the conti nental high pressure in winter, Hakata Bay has also features the "Sea of Japan type" climate. Precipitation of Fukuoka City is high in summer, suggesting the difference from the typical the "Sea of Japan type" of climate, rather close to the pacific type of climate[3].

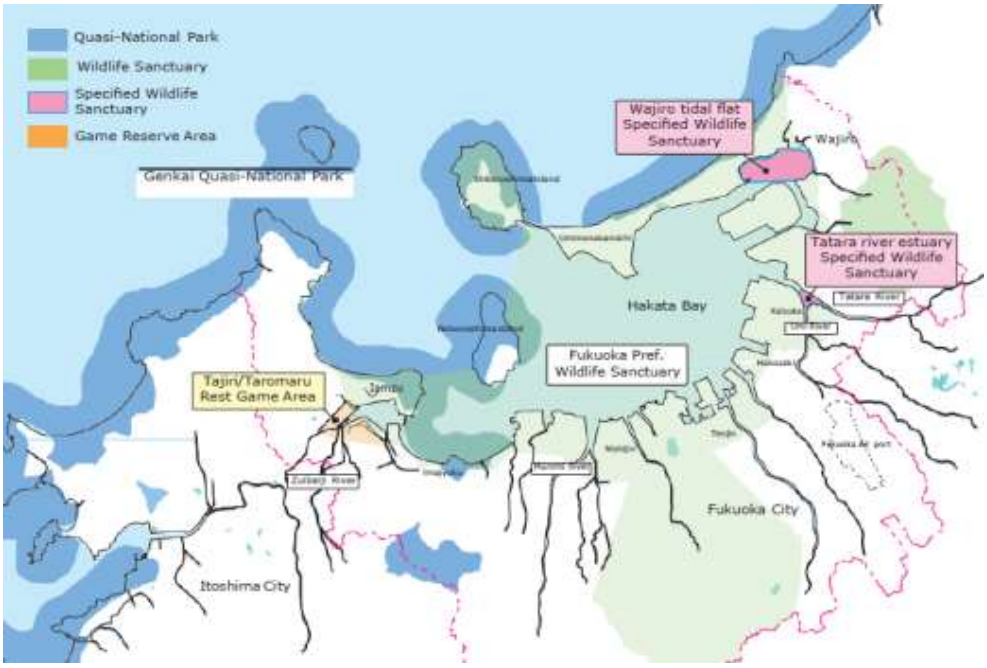


[Figure 19] Temperature and Rain fall in Fukuoka City[3]

Most parts of the Hakata bay are a part of Genkai Quasi-National Park (Fig.20), which was fo unded in 1956[8]. The Genkai Quasi-National Park located at the coastal area of the Genkai o pen sea of Fukuoka Prefecture, Saga Prefecture and Nagasaki Prefecture, and has an area of 105.6 km2in total. The Quasi-Park is registered by the Ministry of Environment, but mana ged by each prefecture. In Hakata Bay, only coast area of natural beach and rocky shore, and islands are registered as the quasi-National Park. In the western area, coastal pine fore st of Ikinomatsubara and Ohbaru. In the eastern area, Umino nakamichi is protected natural beach. Shikanoshima is the island which is known by gold mark (national treasure) has bee n discovered, as well as a holy place that Shiga Ocean shrine is enshrined. These areas are used as leisure areas for citizens to enjoy landscape and nature.

Tidal flats and river estuaries are excluded as the quasi-national Park, but most of the coastal areas are registered as game reserve. Washiro flats and Tatara river estuary are registered as Specified Wildlife Sanctuary by the Ministry of the Environment[9]. Imadu tidal flat situa tes at the western side of Hakata Bay. Surrounded area is registered as game reserve ar ea by Fukuoka Prefecture.

Considering to the Ramsar Classification of Wetland Types[1], habitat of the Black-faced Spoonbill should be included to category (G) Intertidal mud, sand or salt flats, at Saline or brackish water and Intertidal, in Marine/coastal wetlands type.



[Figure 20] Protected Areas in Hakata Bay and Fukuoka City[8]

5) Soil and Geology

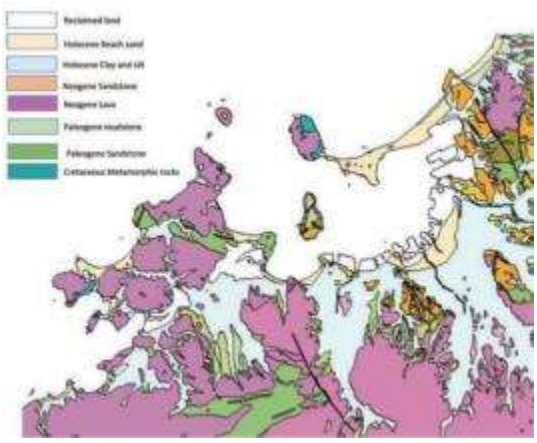
The geological structure of the peripheral Fukuoka[10/11] is quite complex. As shown in (Fig 21), the oldest bedrock of Fukuoka is a metamorphic rock of Paleozoic (about 260 million years ago) distributed in eastern Fukuoka. In Cretaceous age (approximately 65 million years to 1 billion years ago), granitic rocks permeated into the Paleozoic rocks on a large scale. These granitic rock area forms outline of the Hakata Bay: Sefuri Mountains of Fukuoka southern region, Itoshima, the main portion and Shikanoshima of Genkai Island is composed of this granites.

Then, in the Tertiary (about 30 million to 50 million years ago), coal included Tertiary layers were formed in the middle basin area in Fukuoka. The coal mining industry had been carried out until the middle of the 20th century. In the end of the Tertiary, there is a large-scale volcanic activity of alkali basalt (about 2 million to 5 million years ago) Basalt lava domes in the summit are found in such Nokonoshima and Genkai Island. In the Quaternary Pleistocene (18000-1700000 years ago), diluvial group of higher and lower terraces has been formed along the major rivers. Deposits are composed of sand, mud and sand dune sand.

So-called "Kego fault, about 50m of the difference in depth of base formation is observed in central Fukuoka[12]. The Kego fault runs northwest from Genkai Islands through the Fukuoka city center from inner Fukuoka Prefecture, active fault length of about 27km. But it should be noted that under the seabed on the northwest of the extension, in total of about 55km. These two faults are together referred to as "Kego fault zone". According to the Earthquake Research Committee report, latest activity time of Kego fault was estimated as 4,300 years ago, and activity interval as about 3,100 years to 5,500 years. Earthquake of magnitude will be about magnitude 7.2, and the violent shaking of intensity 6 upper in a wide range of Fukuoka area.

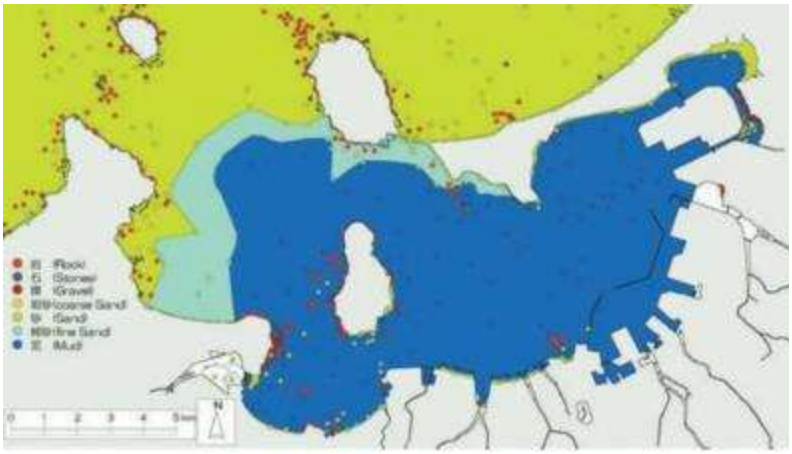
Soil of Hakata Bay at the mouth of the bay and the coastal beach at Shikanoshima and Ohbaru is sand or fine sand. While mud is widely distributed in the east and central coast, as well as the artificial coast area[2].

A



B

C.



[Figure 21] Soil and Geology of Hakata Bay

A: Geological map of Fukuoka City (modified from seamless geological map by Geological Survey of Japan11)

B: Position of Kego Active Fault12

C: Sediment distribution in Hakata Bay2

6) Water regime

A total of 40 of rivers, such as Zuibaiji, Tatara, and Muromi flowed into the Hakata Bay (Fig. 22). These rivers are categorized as the second class of river, which are managed by prefecture. Since all the fresh water and drainage of treated water produced by offices and residents in Fukuoka run into Hakata Bay through these rivers, sewage is treated by both the purification center of water treatment of Fukuoka City and jurisdiction of Fukuoka Prefecture. According to the public sewage treatment in the 2006 in Fukuoka, population penetration rate has become a 99.4%. Amount of water flowing from the water purification centers to Hakata Bay has become the average daily amount of 670 000 m^3.

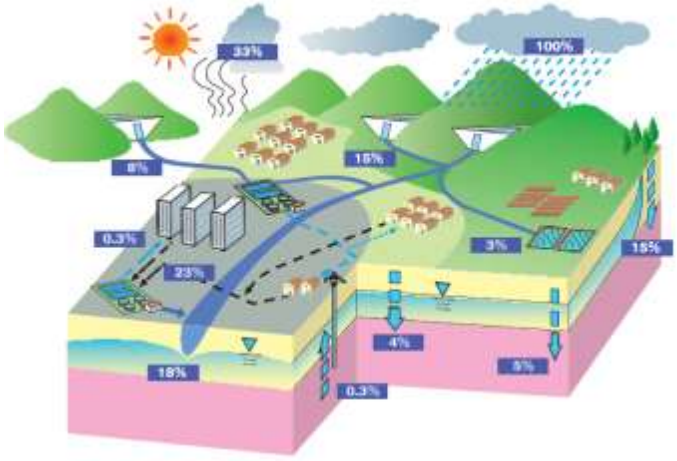
Water quality survey in the rivers in Fukuoka[2], BOD (biochemical oxygen demand) was all below the standard value of the Ministry of Environment. These results are due to the high sewage penetration in Fukuoka City (Fig. 23). The amount of COD (chemical oxygen demand) immediately above the bottom mud (the seabed on 0.1m) in Hakata Bay is low from June to July, particularly in the central waters. In addition, the occurrence of poor oxygen water mass has mainly become more likely to occur in the western coastal areas, where tidal current speed is small[2].

Water quality (COD/ BOD), total phosphorus, total nitrogen, ammonium, the number of E. coli in Hakata Bay and rivers in Fukuoka City has been published as preliminary measurements on the home page of the City.

Fukuoka City indicated Water balance policies in 1998 in the "water recycling urban development basic concept". In recent years, water balance around the Hakata Bay has changed from 1955 (1) evapotranspiration is reduced from 42% to 33%; (2) surface runoff increased from 31% to 46%; (3) underground seepage amount has reduced from 18% to 5%; (4) underground runoff into rivers was reduced from 27% to 18%; (5) water intake for water supply has increased by 8% from outside the Fukuoka City; (6) sewage treatment amount has increased.

In response to an increase in water demand in the Fukuoka metropolitan area, Fukuoka water guide business has started from 1983. From the 2005 seawater desalination project was carried out. Thus water balance has changed in these years[2] (Fig.23).

[Figure 22] Soil and Geology of Hakata Bay



[Figure 23] Water Balance of Fukuoka City about in 2005

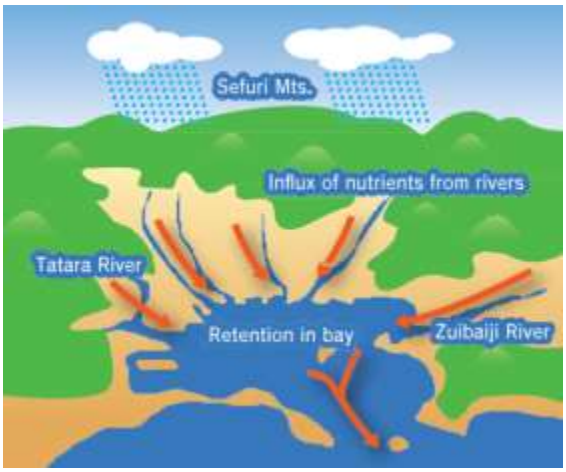
7) Main ecosystem services

In the awareness survey of municipal administration in 2009, 90.2% of citizens in Fukuoka have answered "livable". In particular, "abundant fresh and delicious foods", "richness of the natural environment", "artistic and cultural level", "educational environment", and "enhancement of leisure and recreation facilities" are the items of ecological diversity[8].

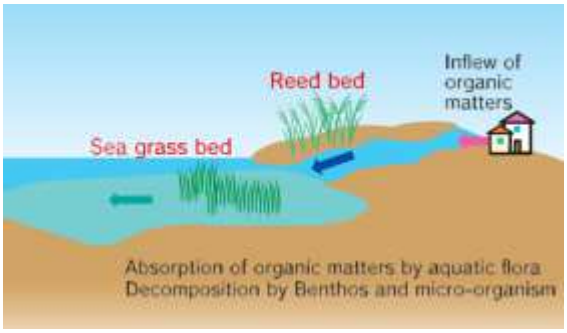
Fukuoka City is composed of Fukuoka Plain surrounded by the mountains, and many rivers are connecting between them. These environments form a variety of ecosystems such as Hakata Bay and its coastal areas and rivers. Various grace of biodiversity brings four main ecosystem services: Infrastructure service, adjusted service, supply services and cultural services (Fig. 24).

Appropriate conservation of forest has been promoting the development of diverse of flora and fauna, conservation of river provide good habitat and growth of creatures. When viewed as a whole basin, nature conservation contributes to the securing of mountain disasters and soil and safe drinking water.

In addition, the green space is useful to prevent the high temperature in urban areas of so-called "heat island phenomenon" by evapotranspiration action, or the effect of cooling the surrounding air, with little green space.



[Figure 24] Water circulation system in Fukuoka[8]



[Figure 25] Water purification system at the tidal flat[8]

Even today, agricultural products and seafood caught in Hakata Bay enrich the diet, natural experiences, such as shellfish gathering and bird watching. (Fig.25).

This strategy for a biodiversity regional strategy was set out in "Fukuoka New Master Plan 2012"[13] as well as "Fukuoka City Environmental basic plan 2014"[14], to promote the sustainable use and conservation of biodiversity of Fukuoka was decided based on "Basic Act on Biodiversity 2008"[15] by the Ministry of Environment.

8) The site

Monthly bird watching at Imazu

Drawing of BFS to make a poster exhibition

BFS flying in residential area

BFS at the Sunset at Wajiro

BFS under the railway at Tatara

Night feeding at Wajiro

Poster to aware risk of fishing debris to BFS

BFS cookies sold at bakery at Tatara

Flock of BFS fly surprised by shell-collector

Leisure shell collecting at Wajiro

1.4.2 Species Information

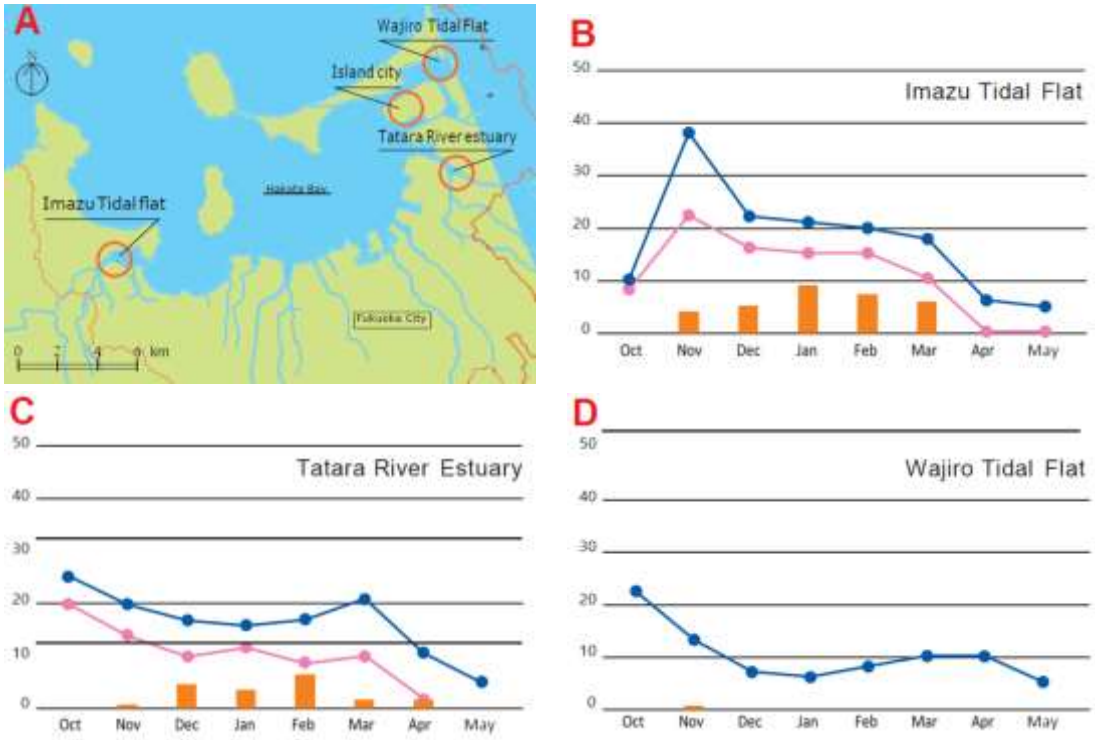
1) Black-faced Spoonbills population

a. Numbers of Black-faced Spoonbills in the site in 2014-2015

Monitoring surveys for BFS are conducted in several organizations; 1) monthly counting for all BFS wintering sites in Japan by Japan Black-faced Spoonbill Association, (2) monthly bird watching for all kinds of bird at several sites in Fukuoka by Wild Bird Association of Japan, Fukuoka Branch, and (3) monitoring survey for water birds by Port Authority of Fukuoka City. In this chapter, the data has been summarized following the purpose of the Information Sheet of this project.

The first observation of the year for the Black-faced Spoonbill is difficult, because of over-stay individuals through the summer. At the Midorikawa Tidal flat of Kumamoto city, three juveniles were observed through the summer. One juvenile at Imazu and sometimes at Kafuri must be an over-stay juvenile[16].

The first certain observation of the year 2014 at Imazu tidal flats should be on September 27 (7 birds), among which had a tag of perhaps J17. On September 29, two adult birds are confirmed at Wajiro tidal flats. At Tatara River estuary, a few birds appeared from October 4. According to information by Japan BFS network, early intensive migration of BFS to Fukuoka must be around the middle of October; 10 individuals (8 adults, 2 sub-adults and 1 juvenile) at Imazu on October 18, 8 individuals at Tatara, and 17 birds at Wajiro on October 17 (Fig. 26)[17].



[Figure 26] Numbers of BFS at the Hakata Bay in 2014-2015, showing total number (Blue line), number of juvenile (pink line) and number of Eurasian Spoonbill (Orange bars) **A: Location of BFS wintering sites; B: Numbers of BFS at Imazu Tidal Flat; C: Numbers of BFS at Tatara River Estuary; D: Numbers of BFS at Wajiro Tidal Flat**

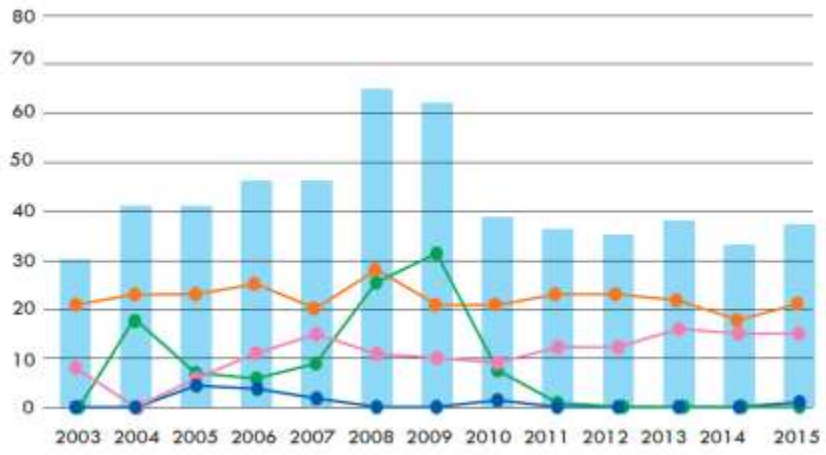
Numbers of birds during early migration season are higher than wintering season during December, January, and February. These phenomena were observed both Imazu and Tatara areas. Especially the Wajiro area must be used mainly for the stop-over site in these years.

During wintering season, numbers of BFS at both roosting sites seem to be stable; around 20 birds in Imazu and around 17 birds at Tatara.

The north-migration season is from March to May, and numbers of birds increase again in late March when BFS use Hakata Bay as stop-over site again. These data strongly indicated that Hakata Bay is one of the most important stop-over sites for BFS, providing enough foods and resting areas during migration before and after Korea.

Several European Spoonbills seem to stay at Imazu and Tatara as wintering sites. Some of them roosted together with BFS, or a few birds are independent of BFS.

b. Numbers and trends of Black-faced Spoonbills in the site from 2003[1] to 2015



[Figure 27] Numbers of BFS at the Hakata Bay in 2003 to 2015

[Fig.27] shows number of BFS at the Hakata Bay from 2003 to 2015, which are reported to the International Census of Hong Kong Birdwatching Society[18] by the Japan BFS network.

During the wintering season reported, numbers of wintering birds at Imazu is stable in these 10 years, keeping around 20 or more birds, while those at Tatara showed a gradual increase up to 17. Numbers of birds at Island city had increased dramatically during the construction from 2000 to 2008.

In Hakata Bay, BFS has appeared middle of 1980's, first at the Imazu tidal flats[16]. Numbers of birds gradually increased year by year, reaching more than 50 birds during migration season and around 30 birds during wintering season in recent years (Fig.31).

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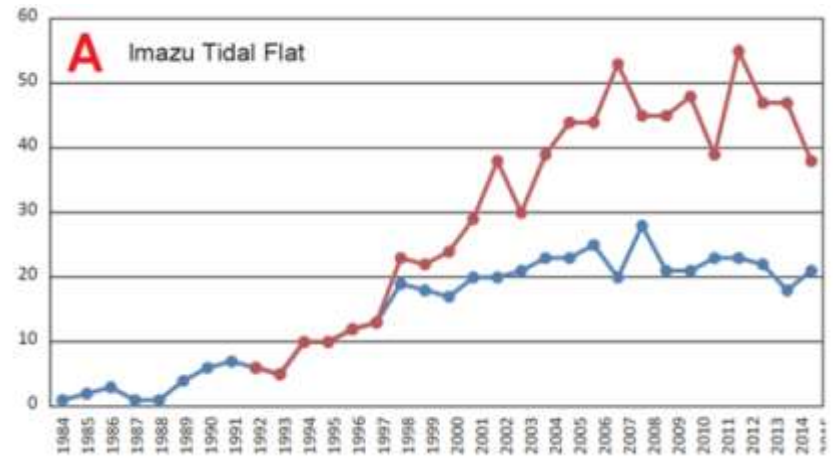
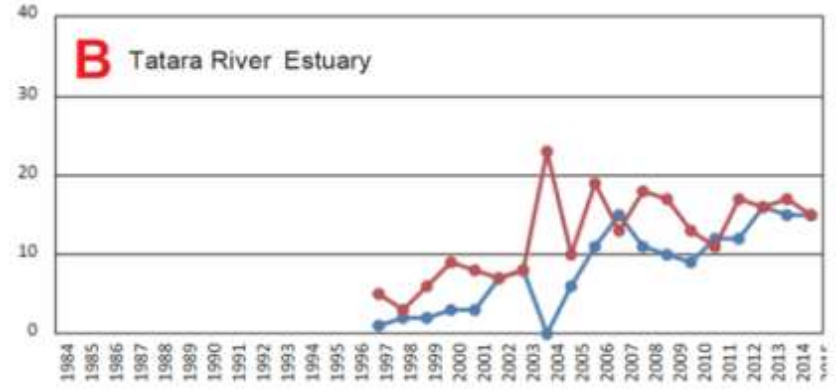
[1] The year launched the International Black-faced Spoonbill Census. For more information, see www. Hkbws.org.hk

One reason might be the construction of the Island City, where new declamation area provides good habitat to water birds during under construction; Nearly 70 species of birds used the newly reclaimed area during 2004 and 2008. Total number of BFS in Hakata Bay has reached more than 140 in migration season and more than 60 in wintering season.

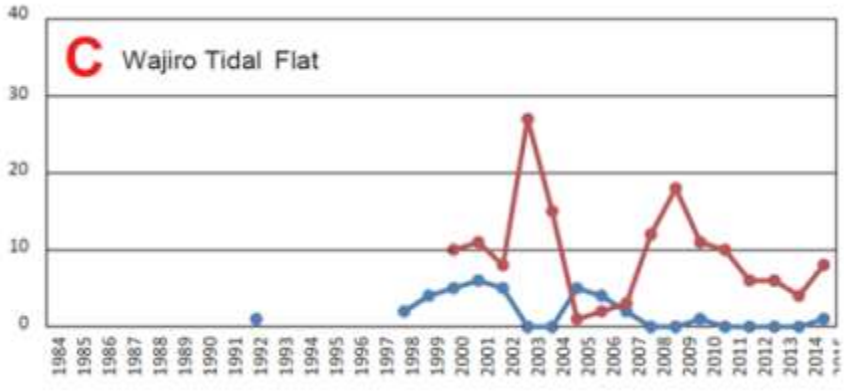
After the construction of declamation at the Island City was over, waterbirds scattered to a neighboring habitat of Kitakyushu (Sone tidal flat), Fukutsu (Tsuyazaki estuary) and even at Yamaguchi Bay in Honshu (see section 1.4.3.d).



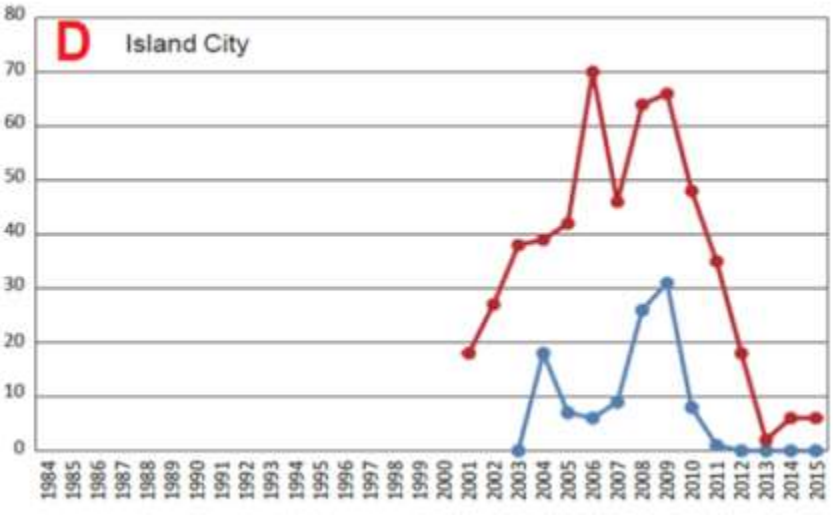
A: Numbers of BFS at Imazu Tidal Flat



B: Numbers of BFS at Tatara River Estuary



C: Numbers of BFS at Wajiro tidal Flat



D: Numbers of BFS at Island City

E: BFS at the Island City around 2006

[Figure 28] Numbers of BFS at Hakata Bay from 1984

c. Numbers of other associated birds

Associated 92 species of water birds at Hakata Bay is listed in Table 2.119. Endangered categories are based on the IUCN Red List, as CR, EN, VU, NT, LC, and DD. The numbers of birds are described as rare, less than 10, 100, or 1000. Migration types are classed into residential (R), winter birds (W), summer birds (S) and migrating birds (M). Counted numbers at Imazu and Eastern Areas are offered by the Port Authority of Fukuoka City.

[Table 4] Associated Birds in Hakata Bay

Classification				IUCN	Migration	Breeding	Numbers			trend	Habitats	
Order	Family	*Scientific Name*	English Names	Red List			Approximate	Imazu	Eastern		marine	tidal
Podicipedida	Podicipedidae	*Tachybaptus ruficollis*	Little Grebe		R	e	10 ~ 100	22	12			◦

		Podiceps nigricollis	Black-necked Grebe		W		100 ~ 1000	4	17	↓	◦	
		Podiceps cristatus	Great Crested Grebe		W		100 ~ 1000	6	34	↓	◦	
Suliformes	Phalacrocoracidae	*Phalacrocorax carbo*	Common Cormorant		W	e	1000 ~	149	316	↑	◦	◦
Ciconiiformes	Ardeidae	*Botaurus stellaris*	Bittern	EN	W		1 ~ 10					
		Ixobrychus sinensis	Chinese Little Bittern	LC	S	e	1 ~ 10			↓		
		Nycticorax nycticorax	Night Heron		R	e	100 ~ 1000	0	1	↓		
		Butorides striata	Green-backed Heron		S	e	10 ~ 100	0				
		Bubulcus ibis	Cattle Egret		S	e	10 ~ 100	0		↓		
		Ardea alba	Great Egret		R	e	100 ~ 1000	39	34		◦	◦
		Egretta intermedia	Intermediate Egret	LC	S	e	10 ~ 100	3	0	↓		
		Egretta garzetta	Little Egret		R	e	100 ~ 1000	19	26	↓		◦
		Egretta eulophotes	Chinese Egret	NT	T		1 ~ 10	0				◦
		Egretta sacra	Eastern Reef Heron		R	e	10 ~ 100	0			◦	
		Ardea cinerea	Grey Heron		R	e	100 ~ 1000	59	40	↑	◦	◦
	Threskiornithidae	*Platalea leucorodia*	Eurasian Spoonbill	LC	W		1 ~ 10	9	6			◦
		Platalea minor	Black-faced Spoonbill	EN	W		10 ~ 100	43	38			◦

Anseriformes	Anatidae	*Tadorna tadorna*	Common Shelduck	EN	W		100 ~ 1000	54	145			◦
		Aix galericulata	Mandarin Duck	DD	W		1 ~ 10	0	6			◦
		Anas platyrhynchos	Mallard		W	e	1000 ~	4777	378		◦	◦
		Anas zonorhyncha	Spotbill Duck		R	e	1000 ~	733	230		◦	◦
		Anas crecca	Teal		W		100 ~ 1000	192	109			◦
		Anas formosa	Baikal Teal	VU	W		10 ~ 100	59				◦
		Anas falcata	Falcated Duck		W		100 ~ 1000	52	124	↓	◦	◦
		Anas strepera	Gadwall		W		100 ~ 1000	21	363	↓		◦
		Anas penelope	Wigeon		W		1000 ~	434	1757	↓	◦	◦
		Anas americana	American Wigeon		W		1 ~ 10					◦
		Anas acuta	Pintail		W		1000 ~	1009	681			◦
		Anas querquedula	Garganey		M		1 ~ 10	0				◦
		Anas clypeata	Shoveler		W		100 ~ 1000	14	54			◦
		Aythya ferina	Pochard		W		1000 ~	139	269		◦	◦
		Aythya fuligula	Tufted Duck		W		1000 ~	2	925		◦	◦
		Aythya marila	Scaup		W		1000 ~	3	2559		◦	
		Bucephala clangula	Common Goldeneye		W		10 ~ 100	6	91		◦	◦
		Mergellus albellus	Smew		W		10 ~ 100	2				

		Mergus serrator	Red-breasted Merganser		W		100 ~ 1000	18	35		◦	◦
		Mergus merganser	Common Merganser		W		rare					◦
Accipitriformes	Accipitridae	*Pandion haliaetus*	Osprey	NT	R	e	10 ~ 100	5	18		◦	◦
		Milvus migrans	Black Kite		R	e	100 ~ 1000	6	18		◦	◦
	Falconidae	*Falco peregrinus*	Peregrine Falcon	VU	R	e	1 ~ 10	0	3		◦	◦
		Falco tinnunculus	Kestrel		W		1 ~ 10	1	2			
Gruiformes	Gruidae	*Grus monacha*	Hooded Crane	VU	M		rare					
		Grus vipio	White-naped Crane	VU	M		rare					
	Rallidae	*Rallus aquaticus*	Water Rail		W		10 ~ 100	0				
		Porzana fusca	Ruddy Crake	VU	R	e	10 ~ 100	1				
		Gallinula chloropus	Moorhen		R	e	100 ~ 1000	5				
		Fulica atra	Coot		W	e	100 ~ 1000	81	329		◦	
Charadriiformes	Rostratulidae	*Rostratula benghalensis*	Painted Snipe		R	e	10 ~ 100			↓		
	Charadriidae	*Charadrius dubius*	Little Ringed Plover		S	e	10 ~ 100	0	27			
		Charadrius alexandrinus	Kentish Plover	LC	R	e	100 ~ 1000	7	176	↓		◦
		Charadrius mongolus	Mongolian Plover		M		10 ~ 100	0		↓		◦
		Pluvialis fulva	Pacific Golden Plover		M		10 ~ 100	0	1	↓		

		Pluvialis squatarola	Grey Plover		W		10 ~ 100	1	17	↓		◦
		Vanellus vanellus	Lapwing		W		10 ~ 100	31				◦
	Scolopacidae	*Calidris ruficollis*	Red-necked Stint		M		100 ~ 1000	0	1	↓		◦
		Calidris subminuta	Long-toed Stint		M		1 ~ 10	0		↓		
		Calidris temminckii	Temminck's Stint		M		1 ~ 10			↓		
		Calidris acuminata	Sharp-tailed Sandpiper		M		10 ~ 100			↓		
		Calidris alpina	Dunlin		W		100 ~ 1000	73	423	↓		◦
		Calidris canutus	Red Knot		M		1 ~ 10			↓		◦
		Calidris tenuirostris	Great Knot		M		10 ~ 100	0	4	↓		◦
		Calidris alba	Sanderling		W		100 ~ 1000					◦
		Eurynorhynchus pygmeus	Spoon-billed Sandpiper	CR	M		rare			↓		◦
		Philomachus pugnax	Ruff		M		1 ~ 10			↓		
		Limicola falcinellus	Broad-billed Sandpiper		M		1 ~ 10			↓		◦
		Tringa erythropus	Spotted Redshank		M		1 ~ 10	1	9	↓		◦
		Tringa totanus	Redshank	LC	M		1 ~ 10	26	0	↓		◦
		Tringa stagnatilis	Marsh Sandpiper		M		1 ~ 10					

		Tringa ochropus	Greenshank	VU	W		10 ~ 100					◦
		Tringa guttifer	Nordmann's Greenshank	EN	M		rare					◦
		Tringa ochropus	Green Sandpiper		W		10 ~ 100	0	0			
		Tringa glareola	Wood Sandpiper		M		10 ~ 100	0				
		Heteroscelus brevipes	Grey-tailed Tattler		M		10 ~ 100	2	16			◦
		Actitis hypoleucos	Common Sandpiper		W		10 ~ 100	3	15			◦
		Xenus cinereus	Terek Sandpiper		M		10 ~ 100	11	8			◦
		Limosa limosa	Black-tailed Godwit		M		1 ~ 10					
		Limosa lapponica	Bar-tailed Godwit		M		10 ~ 100	0	4			◦
		Numenius arquata	Curlew	NT	W		1 ~ 10	1	5			◦
		Numenius madagascariensis	Far Eastern Curlew	VU	M		10 ~ 100	4				◦
		Numenius phaeopus	Whimbrel		M		100 ~ 1000	0				◦
		Numenius minutus	Little Whimbrel	EN	M		rare					
		Gallinago gallinago	Common Snipe		W		10 ~ 100	7				
		Gallinago megala	Swinhoe's Snipe		M		10 ~ 100					
		Gallinago hardwickii	Japanese Snipe		M		10 ~ 100					

	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	VU	M		1 ~ 10	0				
	Laridae	*Larus ridibundus*	Black headed Gull		W		1000 ~	39	107		。	。
		Larus argentatus	Herring Gull		W		1000 ~	25			。	。
		Larus schistisagus	Slaty-backed Gull		W		100 ~ 1000	2	1		。	
		Larus canus	Common Gull		W		100 ~ 1000	16	5		。	。
		Larus crassirostris	Black-tailed Gull		W		1000 ~	36	124		。	。
		Larus saundersi	Saunders's Gull	VU	W		10 ~ 100	11	1			。
		Sterna albifrons	Little Tern	LC	S	e ・	100 ~ 1000	0			。	

2) Black-faced Spoonbills' behavior in the site

a. Feeding behavior: Feeding and roosting survey of BFS in Hakata Bay was conducted by bird specialists[19] using questionaries' sheets and maps.

[Figure 29] Map of Imazu Tidal Flat area with Feeding zones (red circles) and roosting spots (orange circles)

<Feeding during migration season>

BFS in the migration season during October to November used to stay Hakata Bay as a stop-over site. They at first visit open space of wetland such as tidal flat and estuary. They use these sites not only for resting but also for feeding.

At the tidal flat, the autumn season is also migration season of fishes after they grow up then return to the brackish waters and rivers. How to feed these fishes must depend on where they can catch these fishes. Low tide and ebb tide hours are most efficient feeding time for BFS to get these fishes, yellow goby, and other gobies, Dotted gizzard shad, Japanese shad, so on. These fishes are concentrated to shallow water zone during low tide where BFS can catch these fishes using their bill moving right and left. When flock of fish concentrated along the water route, many BFS gathered to feed them along the routes intensively. Detailed fish distribution is described in the next section.

In the tidal flats, water pools during ebb tide are also a good spot for BFS. These mud flats are suitable for small crabs and shrimp's, which even juvenile individuals can catch these benthonic animals [Fig.30].

A: group feeding near the bank

B: Feeding at along the water route during low tide

C: Feeding crabs at tidal pool

[Figure 30] Feeding behavior at tidal zone

<Feeding during wintering season>

During wintering season between December and February, the numbers of aquatic animals decrease. At the tidal flats, they feed scattered in wide range separating with each other along the water routes. Most of the fishes found in winter are residential fish, which are found especially in the river mouth. (Fig. 31, Fig.32, Fig. 33 and Fig. 34).

Another characteristic of the feeding behavior of BFS in this season is "inland feeding." They used inland aquatic resources such as storage ponds, most of which are constructed in historic times. In winter, water level becomes lower than rainy season, providing suitable foods for BFS. BFS use not only marine resources but also freshwater aquatic resources must be very important for them. Usually, BFS feed early in the morning just after sunrise, and/or in the evening near sunset. (Fig. 35).

Feeding is active at pond or reservoir where reeds grow keeping various kinds of creatures. BFS feed along the reed beds to catch carps and crucian carps and benthonic animals. These ponds are only used for feeding of BFS during low level of water or timing of drain the water.

A: Feeding (Blue zone)

B: River Mouth area of brackish water with edible shellfish of Corbicula species collected privately but for commercial purpose, which somehow disturb feeding of water bird

C: Flocks of grey mullets at exit of water purification plant

[Figure 31] Feeding at Zuibaiji River

A: Feeding area at Sankakuike (Triangle pond) which has water gate to regulate of seawater level. Salinity of this pond a slightly brackish (about 15‰)

B: Feeding during low level of water

C: Resting at reed bed cut by local citizen

[Figure 32] Feeding at Sanka kuike Area

A: Map of feeing zones (blue) and resting zone (green) at water trench and ponds

B: Feeding at lotus root field of Hutatsuike with low salinity

C: Eurasian Spoonbill staying at these brackish ponds together with BFS

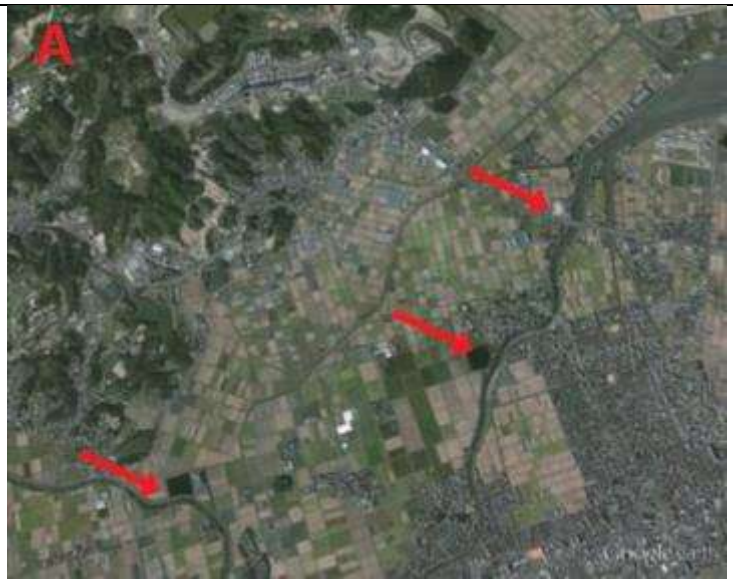
[Figure 33] Feeding at the southern bank area

A: Map of feeding zones at Enokuchi River Area

B: Intensive feeding of gray mullet and freshwater fishes

C: Catching one of these fish

[Figure 34] Feeding at Enokuchi River Area

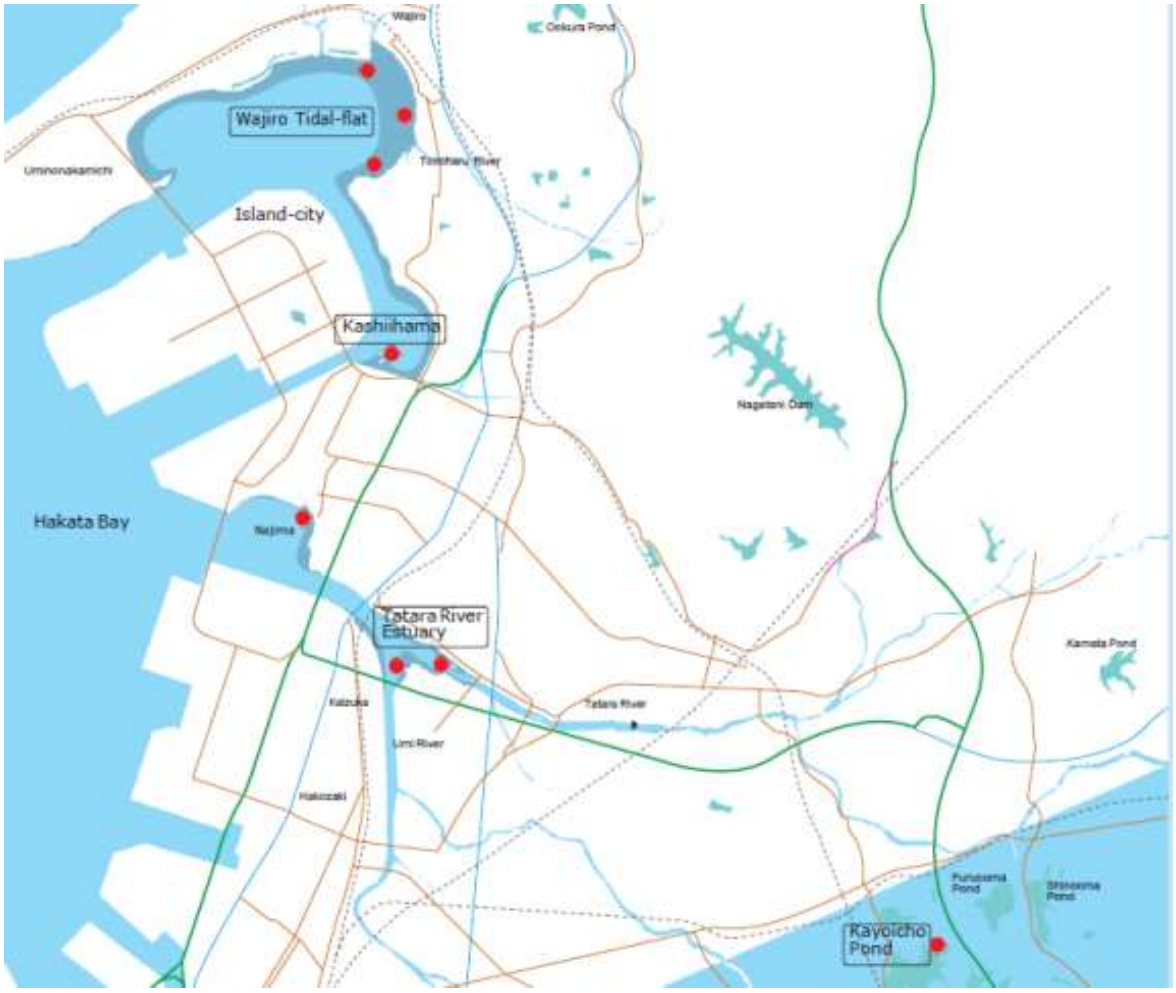


A: Ponds around Zuibaiji river and Raizan river used by BFS

B: Kanoubaru Pond of the Itoshima High School side

C: Shinkai pond along Route 202

[Figure 35] Storage ponds in inland area



[Figure 36] Map of the Eastern Area with Feeding zones (square-marked names) and roosting spots (red circle).

The Eastern area [Fig. 36]

<Feeding during migration season>

Open spaces where BFS used to inhabit as stop oversites distributed at Tatara River Mouth, Wajiro Tidal Flat, Kashiihama, Najiro and Island City. This area has different feature in each spots (Fig. 37, Fig.38, Fig. 39 and Fig.40).

[Figure 37] Feeding at Wajiro Tidal Flat

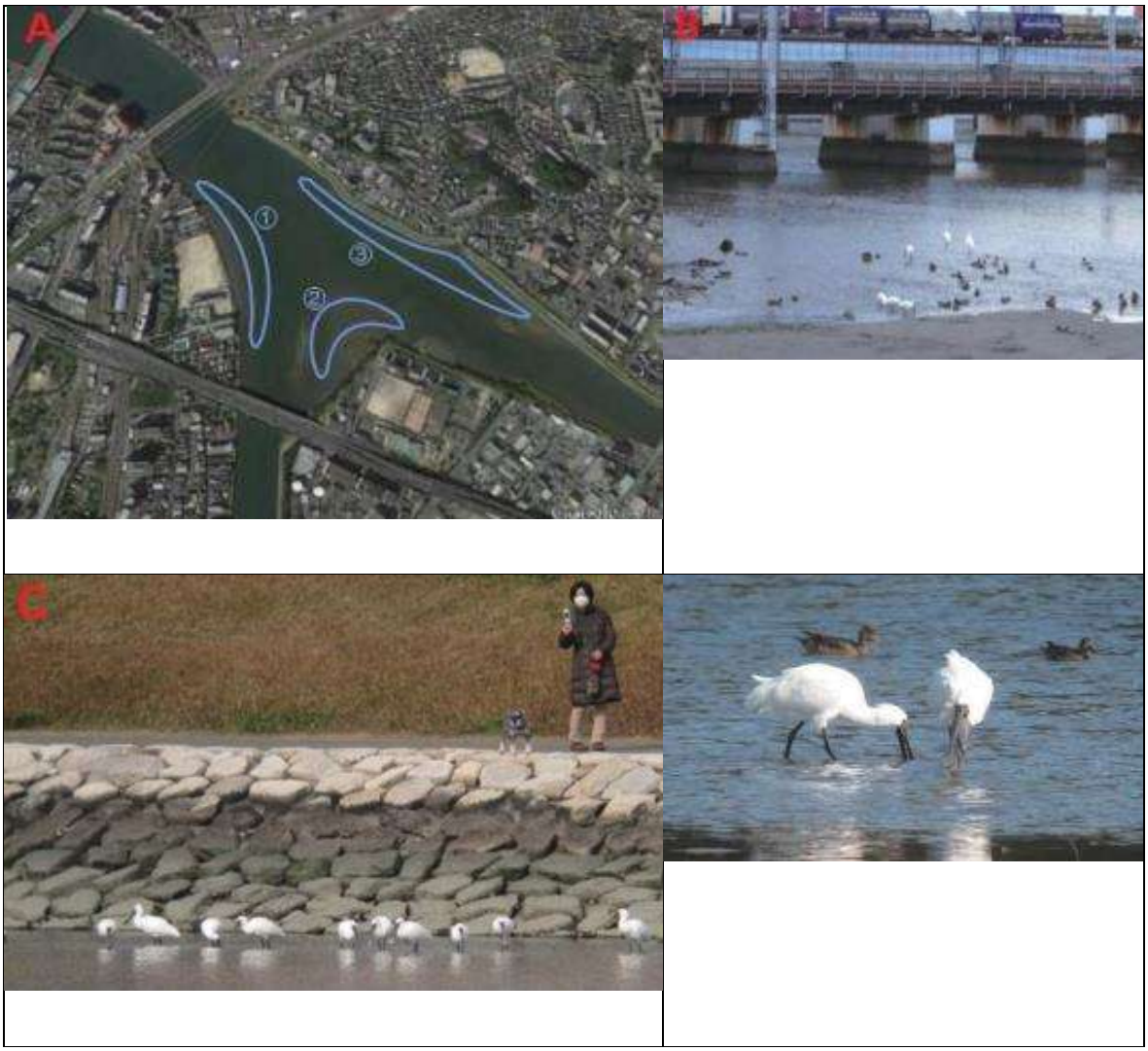
A: Map of feeding zone, B: Feeding near the Island City

[Figure 38] Feeding Kashii Mud Flat

A: Map of feeding zones facing Island City

B: Map of feeding zones (blue) and resting spot (orange)

C: Resting spot at Kahii



[Figure 39] Feeding at Tatara River mouth

A: Map of feeding zones which are surrounded by urban area
B: Feeding at zone ① near railway bridge
C: Feeding at zone ③ along the walking trail
D: Catching fish at zone ② near the outlet of water purification plant

[Figure 40] Feeding at inland storage ponds.

A: Map of feeding zones in ponds at Kasuya-cho

B: Feeding at zone ①

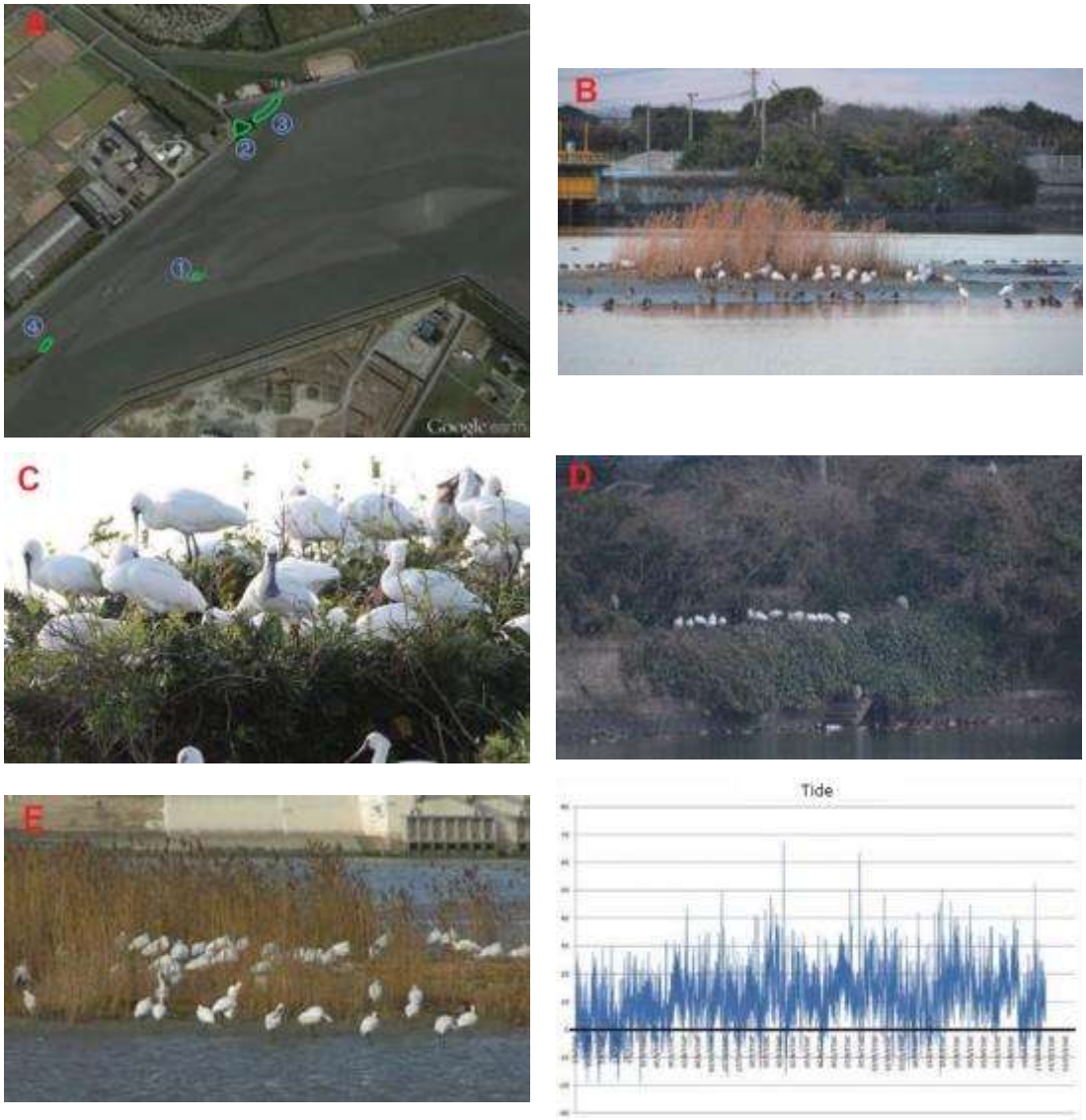
C: Garbage in these ponds, now removed before migration season

b. Roosting behavior

<Roosting behavior at Imazu tidal flat>

So called "nakasu" (cay, or low sandy bank in the river mouth and estuary) at Imazu tidal flat was the first roosting site for BFS in Japan (Fig 41), and still most frequently used as the roosting site in Hakata Bay.

Now "nakasu" is sometimes submerged especially at large tidal days in autumn migration season. The reason is not clear, but recent global change of sea level must be one reason; actual measurements of sea level at Hakata Bay are around +10 to +20 cm higher than those of estimated level[20]. The decrease of sedimentation from the river must be another reason. When "nakasu" are submerged BFS use the refuge in high trees nearby, or on the embankment of the surrounding areas. During wintering season, BFS choose a roosting site with reed beds or bush to avoid the cold strong wind.



[Figure 41] Roosting spots at Imazu Tidal Flat

A: Map of roosting spots, B: Roosting at spot, B: Roosting at spot ①"Nakasu", C: Roosting at spot ② on big trees, D: Roosting at spot ③ on the bank near trees at spot ②, E:nakasu of Tidal Flat around 2008, F: Sea level change at Hakata Bay estimated by ▵tide(differences of actual level from calculated level)

<Roosting behavior the Eastern Area>

The main roosting spot at Tatara river estuary (Fig. 42) is also "nakasu" with reed beds, which BFS use most frequently during wintering season in the Eastern Area. When "nakasu" is submerged, BFS and other water birds such as cormorants and herons use the refuge "perch" or bar, which was constructed by Fukuoka City, collaborated with NPO.

Most of roosting time for BFS during wintering season is daytime because BFS feed at night toward inland storage ponds. BFS choose safer and quiet spots: NPO people arranged a trench of water route between the bank and reed beds, and planted trees along the bank to make a hedge to keep out from human influence.

Such an attractive movement of NPO is prepared before migration of BFS; cutting or trample down of reeds for the roosting site, and remove the garbage in the estuary, especially fishing lines and fish hooks to avoid to injury BFS.

[Figure 42] Roosting spots at Tatara River Mouth

A: Map of roosting spots, B: Roosting at spot ① "Nakasu", where reeds are trampled down before migration of BFS, C: Roosting at spot ② , so-called Smith's Island where cannel was dug between bank and reed bed, D: Roosting spot ③, showing several types of perch, E&F: Signs of caution for BFS.

c. Other noteworthy behavior

<Migration flocks>

Hakata Bay situate along the flyway route of BFS. In autumn, flocks of birds can be occasionally observed which may be migrating southward (Fig. 43). Hakata Bay must be a landmark during migration for BFS.

<Accustomed to living in urban area>

As mentioned above, BFS utilize not only marine resources but also fresh-water resources. This means BFS must enter into residential and urban areas and become familiar with people. BFS lovers from abroad are surprised with BFS feeding in the river which is close to the bustling street in an urban area (Fig. 44). The river has a guardrail, and people cannot enter into the river usually. BFS usually feed with herons, and they look like, collaboration each other, because herons are more careful to look around the periphery, while BFS always head down concentrating to feeding, and ride into shallow waters.

<Relationship with the Eurasian Spoonbill>

The first one or two individuals of Eurasian Spoonbill had observed at Hakata Bay together with BFS. They must come from Breeding sites where is also observed inhabiting together with BFS. Recently some Eurasian Spoonbills seem to be more independent from BFS and stayed wintering season at Imazu. They prefer more freshwater fishes than BFS and roost at reed beds of storage ponds (Fig. 45).

<Group Fishing>

Most impressive feeding behavior is so-called "group fishing", which happened especially in the river mouth during migration season (Fig. 46). Not only BFS but also great cormorant and herons collaborate to get a school of fish. Cormorant can dive into the waters to drive fish into shallow waters, BFS moves their bill intensively consequently fishes are driven to the shallow waters. Herons are waiting jumping fish. The more birds drive fish efficiently, the more food they can get.

[Figure 43] Flock of BFS flying toward south-west

[Figure 44] BFS familiar with urban situation

[Figure 45] Eurasian Spoonbill wintering with BFS

[Figure 46] Group fishing during feeding migration season seen at Imazu tidal Flats.

2) Noteworthy fauna and flora

<Horseshoe crab>

The Horseshoe crab inhabit in Japan is only *Tachypleus tridentatus* now DD (data deficient) in IUCN Red List. They become adults (about 85 cm for ♀, and about 70 cm for ♂) through the hatched dozen times of molting. Horseshoe crab in Hakata Bay is well protected by the city and citizens. Most of adults inhabit in the mud flat, and returned to sandy beach for the spawning season in the summer. At the Imazu tidal flat, sandy bottoms are found near the exit of the tidal flat. In summer adults visit these spawning sites, and eggs are found in sand at the higher level of the tidal range. Some of the spawned eggs are protected by artificial hatching and released by school student (Fig.47)[21].

<Ringworm fiddler crab>

Although the size of *Uca lacteal* is only about half of the fiddler crab (*U. arcuata*), large and white scissors of male made this animal one of the symbols of mud flats. Due to reclamation of estuary, dredging, and environmental pollution has become a threat of their habitat, the Ministry of the Environment Red List, in 2006, this species determined as VU. Their habitat in Hakata Bay is near the high tide line in estuaries, where is not dry out even during low tide. In Imazu, they can be observed at the fringe of reed bed during ebb tide (Fig. 48)[10].

< Hibiscus hamabo>

Hibiscus hamabo or hamabou in Japanese is one of halophyte plants with salinity resistant inhabitant at the brackish intertidal zone of coast, cove and the estuary, but not directly reached by sea water. Because of river improvement and beach protection construction has increased, a good community has disappeared rapidly. Fukuoka prefecture registered the species as endangered species10. BFS prefer reed beds as roosting spots, and *Hamabou* community is also preferred because it is useful to prevent from strong and cold wind (Fig. 49)

<Butterflies >

Some unique species of butterflies also inhabit in the region. *Tongeia fischeri* (Fig. 50) is a kind of butterfly depending on the Lepidoptera. Coastal subspecies *T.f. shirouzui* is an endemic subspecies of NT in northern Kyushu area. Their food of larvae depends on Crassulaceae

species, such as stonecrop and orostachys, which grow on dry poor nutrition soil. *Zizina Otis* of Lycaenids and *Ypthima motschulskyi* (The Japanese Rings) are also butterflies attracted attention.

[Figure 47] Horseshoe crab

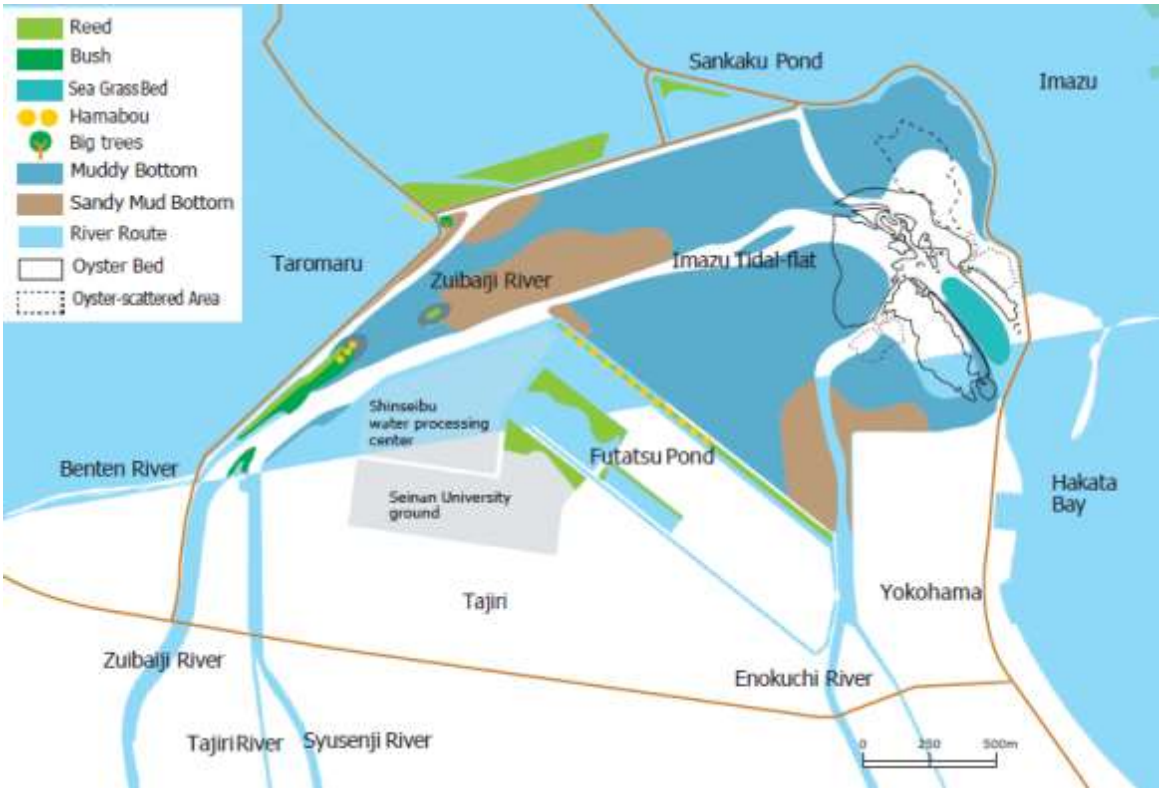
[Figure 48] Ringworm fiddler crab

[Figure 49] ***Hibiscus hamabo***

[Figure 50] ***Tongeia fischeri***

1.4.3 Habitat Information

1) Ecological features of the site



[Figure 51] Map of Imazu Tidal Flat showing bottom condition and main flora 24/25

<Topography and Sediments at the Imazu tidal flat>

Imazu tidal flat is characterized narrow by the exit of tidal water, which has about 2 m of tidal range in a day. These conditions results very flat and muddy bottom during high tide whole area covered by water. While, during the low tide, most of the area is exposed, except for the river route. Main river route is formed from Zuibaiji river to tidal flat exit where is rich in fish even during the ebb tide[22].

The sediment in almost whole tidal flats is very muddy. Sandy bottom is found only at the river route area and higher tidal zone which are well sorted by stream or tide[23]. Near the exit of the tidal flat is slightly deep, seagrass bed is grown, surrounded by the oyster bed. As mentioned previous chapter, BFS can only feed at shallow water zone with muddy bottom, while herons can feed at the bottom with pebbles, and cormorants can feed diving at deeper zones in the tidal flat. Therefore it is important to investigate distribution of their food resources in the aquatic field in details (Fig. 51).

<Primary producers in the ecosystem>

Each ecosystem at tidal flat and brackish water area is composed by unique primary producer;

planktonic unicellular diatom, muddy diatom, brackish- freshwater poly-cellular diatom, seagrass and seaweed. These primary producers had different carbon and nitrogen stable isotopic values diatom which can apply to food web analysis[26]. Muddy diatom is imcorpolated by various crabs and shellfish. Seagrass bed is one of important factors of tidal flat ecosystem, because it is called as "marine cradle", which brings up to grow juvenile fish and shrimp.

Once oyster bed developed, circulation of chemical condition of the bottom became worth, although total biomass at the oyster bed increased. BFS would not enter the oyster bed zone because of oyster has high ability of purification of waters, and vulnerable condition.

<Benthos>

General survey by Fukuoka city for the Imazu tidal flat are investigated at 10 points in 4 seasons, monitoring 30 species of polychaetes, 8 species of gastropods, 11 species of bivalves and 20 species of arthropod (Fig. 52)[23].

Summering up these monitoring results, 10 points examined had characters as followed;

1) B-1 and B-2 points are strongly affected from the fresh water inflow from such Zuibaiji River, consisted of brackish aquatic species: Ithome bristle worm, corbicula clam. Many *Cyathura muromiensis* (Isopoda) which is an indicator species of brackish water is distributed throughout the year.

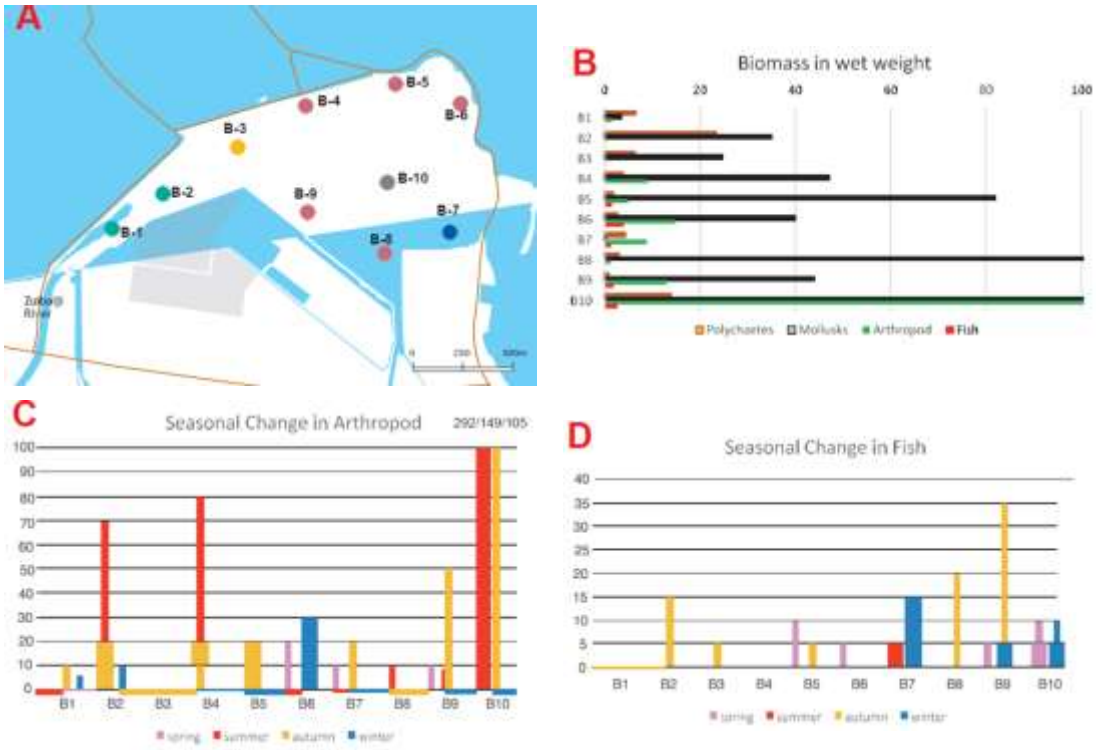
2) B-3 point strikes in the vicinity of river route of Zuibaiji River. Here, *Ceratonereis erythraeensis* (Isopoda) which may prefer sandy bottom.

3) B-4, B-5, B-6, B-8, B-9 points are located at the peripheral area of the tidal flats near the bank, where exposed during ebb tides. *Heteromastus* sp. (Isopoda) is common through the year, and *Macrophthalmus japonicas* (Ocypodidae) appears to feed during ebb tides.

4) B-7 point is situated at the most sea side. Accompanied with such as *Haploscoloplos* sp. (Orbiniidae), widely distributed Polychaeta species are found as the other points.

5) B-10 point is located at the central part of the flats and relatively low ground elevation. Pacific oyster *Crassostrea gigas* forms oysters beds, providing suitable habitat for *Balanus albicostatus* and *Amphibalanus eburneus*. These oysters and barnacles take their food by filtering a suspension in water. Unique species in *Spaheromatidea* (Isopoda) and scud (Amphipoda) are also observed showing the specific composition of this point.

It is an interesting number of fish during the autumn season had increased along the main water route, when BFS migrating to here.



[Figure 52] Benthos survey at the Imazu Tidal Flat [23].

A: Map of Imazu Tidal Flat showing bottom condition and main flora, B: Biomass in wet weight at each point, C: Seasonal change in Archropods at each point, D: Seasonal change in Fish at each point.

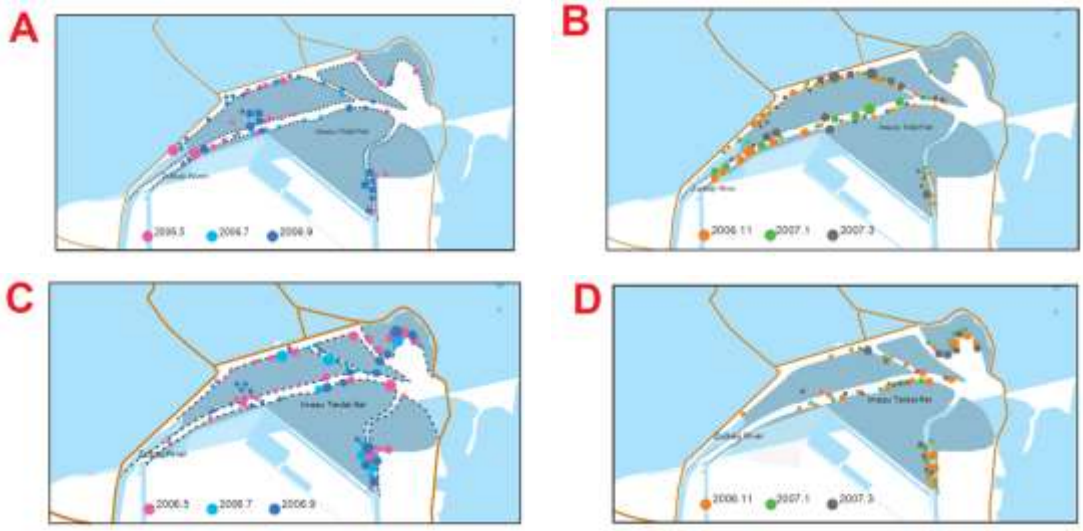
<Fish>

More detailed monitoring research was carried out by Tanaka et al.(2008) at Kyushu University P & P project 2007[28]. A total 40 points at the Imazu tidal flat were examined bimonthly using seine network of about 30m^3.

Among 21 species of Gobioidei was detected, sujhaze goby (*Acentrogobius* sp. A), White-limbed goby (*Acanthogobius lactipes*), Yellowfin Goby (*A.flavimanus*), Whitebait goby (*Favonigobius gymnauchen*), and Masago goby (*Pseudogobius masago*), were dominant. These are probably residential fish in the tidal flat, providing useful food to BFS.

Other 5 species, such as Big-jaw goby registered as endangered species in Red List (Ministry of Environment, 2014) were confirmed, suggesting that Imazu tidal flat is rich in fish fauna. White-limbed goby (Fig. 53 A & B) distributed at river route where is more brackish than the open area. They gathered at the northern bank in spring, which is coincided to the observation of BFS. While, Sujhaze goby (Fig. 53 C & D) distributed along the main routes, and the number of this species decreased in winter.

At the Tatara River Mouth, fish composition at four points were examined[29], indicating that biring (*Gymnogobius breunigii*) and Japanese seabass (*Lateolabrax japonicas*) were dominant in spring.



[Figure 53] Seasonal change of distribution of two dominant fish species[28].

A: white-limbed goby during spring and summer, B: white-limbed goby during autumn and winter, C: Sujhaze goby during spring and summer, D: Sujhaze goby during autumn and winter.

<Regulation ponds and water routes>

In Fukuoka City, a total of reservoirs of 337 regulation or storage ponds are registered[30]. Most of these ponds were constructed in historical periods for rice agriculture. But now these ponds are well protected for unique aquatic environment inhabiting rich fauna and flora by local people. Now it provides peace waterside to new residents. Most of these ponds have a rich in fish, such as carp, crucian carp, and weather loach as well as alien species. Japanese rice fish which is registered as VU in Red List is still found in some ponds and watercourses.

For birds, most of these ponds are safe because of surrounded net fence. Fishing at these regulation ponds is prohibited, although some people enter into them. To avoid accidents by fishing lines and garbage, removal of garbage campaign are conducted voluntary by NPO and local citizens.

[Figure 54] Freshwater fish survey at the storage ponds and water routes around the Imazu Tidal Flat. BFS only visit to the storage ponds during shallow waters. Blue dots indicate spots of on fish survey, and yellow dots indicated fish-inhabit spots[31]

2) Dominant flora communities of the site

Sehuri Mountains, situating at the south of the basin of Hakata Bay, are more than 1,000 m in height which are almost lower limit of the beech zone of aestatilignosa, and also the upper limit of Cyclobalanopsis and Castanopsis, which is typical species of top laurel forest zone. Hills near residential areas are covered by cedar and cypress, bamboo[32].

Primary producer at the tidal flat must be adhesive diatoms on sand and mud. Seagrass grows only in mouth of the tidal flat, which provides useful habitats for juvenile fish and arthropod. Local fishermen and researchers try to spread the seagrass bed, but it is difficult now in shallow water due to sediments. (Fig. 55).

Storage ponds and water routes have rich flora of floating plants, which is preferable to ducks. In most of these ponds need for allowances, such as eutrophic conditions. The administrator of storage ponds is the Fukuoka City, and each of the ponds is a management by local agricultural

union association.

BFS has a close relation to reed beds, both feeding and roosting. However, reed grows only brackish waters, which is limited in several regulation ponds and river mouth. (Fig. 55). Peripheral of the Imazu tidal flats is agriculture promotion area of Fukuoka City and still, has many paddy and agriculture field. Vegetables cultivated in a greenhouse are pleased as direct-marketing vegetables.

[Figure 55] Map around the Imazu Tidal Flat, showing land use and vegetation map. Vegitation Map 2014 by Ministry of Environment[33]

3) Present land use of the site

Several shell mounds have been discovered from the peripheral area of hills (Fig. 56A). These distribution indicates the higher sea level than present (so-called the Jomon sea transgression). Shellfish composition from these sites includes a number of marine bivalves, indicating that salinity must be higher than now. These dense prehistoric sites may indicate exploitation of both mountain and marine food resources[34]

During the Medieval Ages, Hakata Bay has developed as an international trading port. Around 12th century, Hakata had construct a new port (Imazu means new port) in western part of the bay, because of middle port was poor security. Pictorial drawing map during the early Edo period (1695) [35] the ferry area at Imazu (Fig. 56 B).

During Edo period, the peripheral Imazu was reclaimed one after another, creating new rice paddy and villages, finally coastal line of the tidal flat changed into triangle shape. Reclaimed area was used not only paddy fields, but also salt pans and routes paddy were appeared (Fig. 56C).

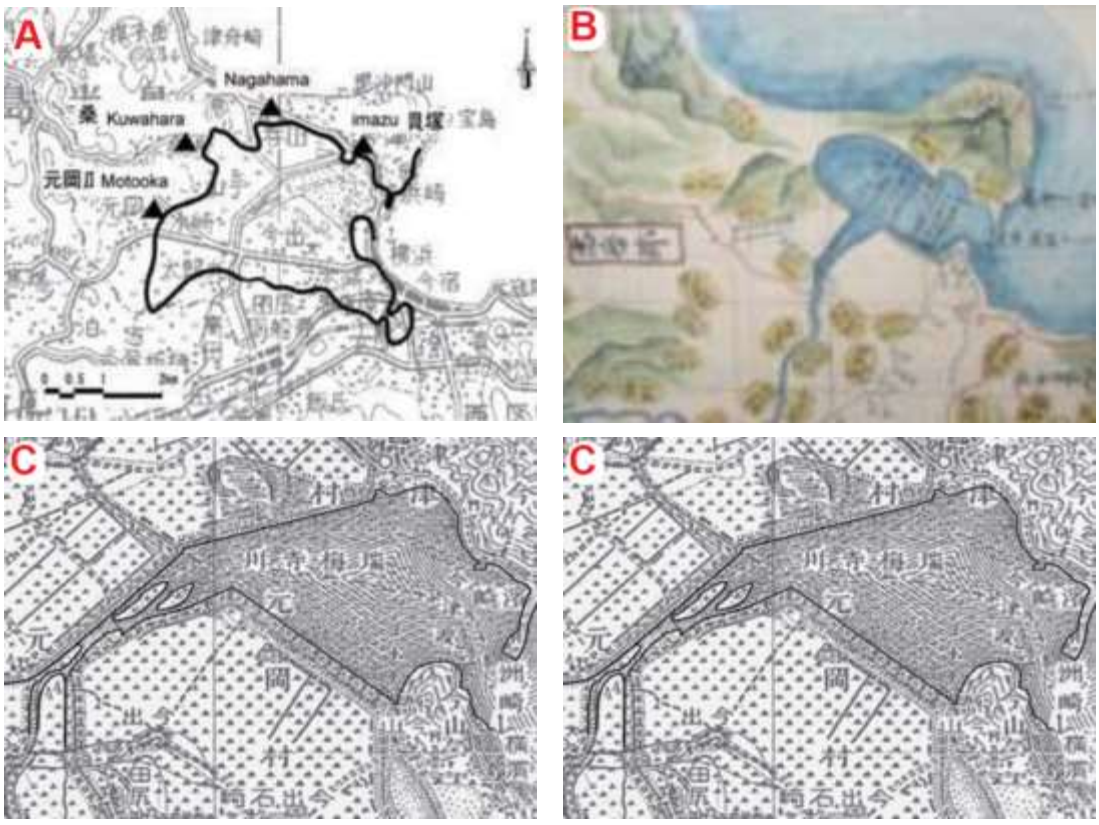
Fishery during the Edo period is primarily in sardine seine. In the river mouth of the tidal flat was marked to produce the eel and shrimp which economically supported the farmers[36].

During Modern age (the Meiji and Taisho ages), fishery was developed from bay fishing to coastal

fishing at the Genkai Sea. Seaweed laver culturing started first in Kyushu at the Imazu area in late 19th century, but it decreased in the late Showa, because of shallow waters of tidal flats due to the dam construction[37].

Aerial photo in 1972 (Fig. 56D) showed gravel extraction and bridge construction at the tidal flat. Shape of the tidal flat has slightly changed by bank and road construction surrounding the tidal flat. At the tidal exit, bridge was constructed to connect both sides. New fishing port was constructed outside the bridge, because inside was too shallow to fishing boats.

After Zuibaiji Dam was constructed upstream, amount of waters decreased, and subsequently amount of sediments from the river decreased. Now since tidal condition is too muddy and shallow, bottom of rivers are dredged to keep running water condition and prevention of flood from rivers.



[Figure 56] Historical Change around the Imazu Tidal Flat

A: Prehistoric shell middens about 2000 BC[34]. B: Drawing map around 17th Century before reclamation[35]. C: First detailed map around 1900[37]. D: Aerial photo map in 1972 with road of gravel extraction[22].

4) Potential areas to be habitat for species (if any)

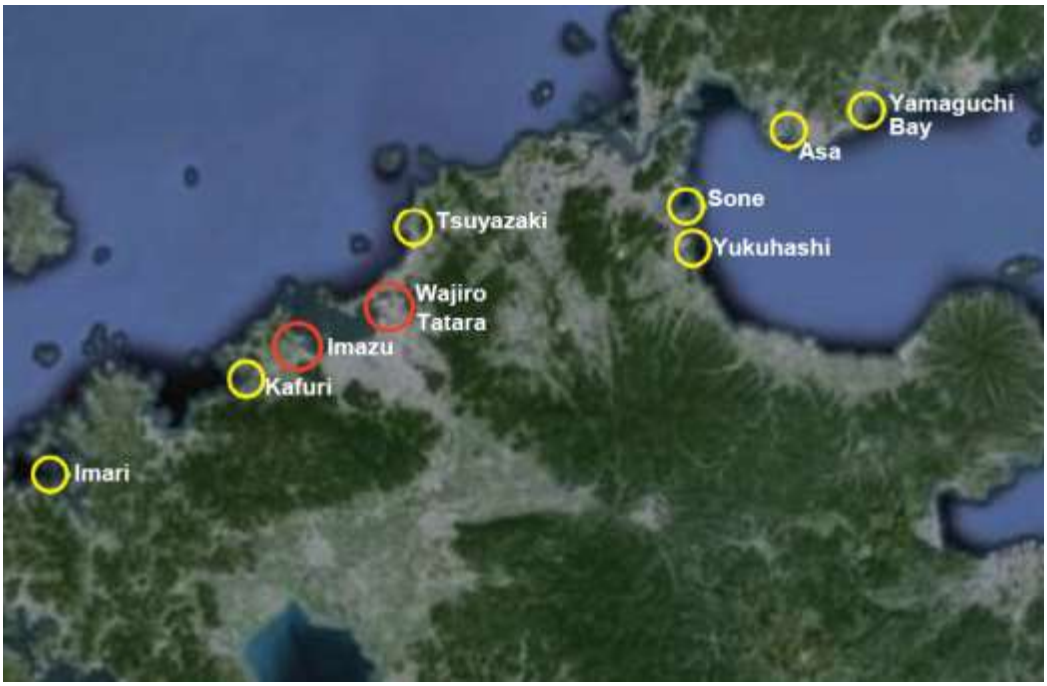
The number of individuals of BFS has been steadily increasing at the Hakata Bay (see Fig. 28). The emergence of temporary artificial wetlands by the reclamation construction of Island City, has resulted a rapid increase of water bird including BFS. Once BFS who has been visited in Hakata Bay, must stop here during the migration, and if condition has changed, then began to spread to find new site in various areas in northern Kyushu (Fig.57) [17].

In the westward of the Hakata Bay, Kafuri tidal flats at Itoshima City situating at the western side of Itoshima Peninsula now became a stable roosting site. Further to the westward of the Genkai area, BFS began to inhabit the Imari Bay area at Imari City which has various type of habitat estuary. These two sites are still in a good natural condition.

BFS population at eastern area of the Hakata Bay visited outside estuaries only for feeding in mid-winter, but now BFS may roosting during whole wintering season at Tsuyazaki estuary in Fukutsu City, Sone tidal flats in Kitakyushu City, and Yukuhashi estuary in Yukuhashi City. These are somehow urban and industrial areas, but still provide natural tidal flats suitable for BFS and other water birds.

Also recently, new wintering site at Honshu was found in Yamaguchi Bay. One juvenile BFS tagged with S08 which was attached solar GPS tracking in 2012 visited at the Yamaguchi Bay. GPS tracking data for S08 (2012-15) showed that S08 stayed the same roosting spot in the middle of the bay through the winter. Flock of BFS is between 8 to 10 individuals, and BFS frequently feed at the tidal flat zone, and also they feed wide range of inland area, such as water routes and regulation ponds as seen in Hakata Bay.

It is important to exchange the information on the observation of BFS as soon as possible. Japan Black-faced Spoonbill Network is open to communicate with any person through internet mailing system. Also members of the Wild Bird Society of Japan are collaborating with our network to provide valuable observation of BFS in new frontier area.



[Figure 57] Recently formed rooting sites of BFS near Hakata Bay

5) Threats

	Current Threat	Potential Threat
A. Residential and commercial development		
Housing and urban areas	☒	☐
Commercial and industrial areas	☐	☒
Resort areas	☐	☒
Others or additional notes: Urbanization accompanied with Kyushu University relocation near Imazu.		
B. Agriculture and aquaculture		
Annual and perennial non-timber crops	☐	☒
Wood and pulp plantations	☐	☒
Livestock farming and ranching	☐	☒
Marine and freshwater aquaculture	☐	☒
C. Energy production and mining		
Mining and quarrying	☐	☒
Energy-related activities	☐	☒
Others or additional notes: Small scale of solar power using panels and wind power generators may constructed around the area, but no affects for BFS.		
D. Transportation and service corridors		
Roads and railroads	☐	☒
Utility and service lines	☐	☒
Shipping lanes	☐	☒
Flight paths	☐	☒
Others or additional notes: Imazu Bridge will be rebuilt very soon, and construction will be carried out carefully after environmental assessment in accordance with the law.		
E. Biological resource use		
Hunting and collecting terrestrial animals	☐	☒
Gathering terrestrial plants	☐	☒
Logging and wood harvesting	☐	☒
Fishing and harvesting aquatic resources	☐	☒
Others or additional notes: Basically fishing or hunting of wildlife is prohibited in these areas. A few people collect *Corbicula* shells (freshwater clam) at the Zuibaiji River. At embankment and ponds of BFS, illegal leisure fishing has been carried out and fishing line damage is a concern.		

	Current Threat	Potential Threat
F. Human intrusions and disturbance		
Recreational activities	☒	☐
War, civil unrest and military exercises	☐	☒
Work and other activities	☐	☒
Others or additional notes: Increase leisure fishing and leisure boats.		
G. Natural system modifications		
Fire and fire suppression	☐	☒
Dams and water management/use	☒	☐
Landfill and/or Reclamation	☐	☒
Other ecosystem modifications	☒	☐
Others or additional notes: Decrease of sediment due to the reduction of river water by the dam at Zuibaiji river. Small construction such as river embankments and river dredging..		
H. Invasive and other problematic species and genes		
Invasive non-native/alien species	☐	☒
Problematic native species	☐	☒
genetically modified organisms	☐	☒
Others or additional notes: Increase of great cormorant which has similar habitat with BFS.		
I. Pollution		
Household sewage and urban waste water	☐	☒
Industrial and military effluents	☐	☒
Agricultural and forestry effluents	☐	☒
Garbage and solid waste	☒	☐
Air-borne pollutants	☒	☐
Excess energy	☐	☒
Others or additional notes: Increase of marine and fishing debris.		
J. Climate change and severe weather		
Habitat shifting and alteration	☒	☐
Droughts	☐	☒
Temperature extremes	☐	☒
Storms and flooding	☒	☐
Others or additional notes: Heave rain and sea level change caused by recent global warming may affect size reducing of roosting delta.		

1.4.4 Socioeconomic and Stakeholders Information

1) Stakeholders of the site

a. Stakeholders influential to site management

1) Legal administrators: Ministry of Environment for the Genkai Quasi-national Park and Wajito-Tatara Nature Reserve, Fukuoka Prefecture for river management, and Fukuoka City for Hakata Bay, Imazu Game Reserve, and any other land area[9].

2) Administrative governments: Fukuoka City for environmental managements, waterworks department, urban planning and development, facilities management, and social education[8].

3) Organizations: NGO on nature conservation, such as Fukuoka Branch of Wild Bird Society, Japan Black-faced Spoonbill Network, Fukuoka wetland Conservation Research Group, Wetland Forum Fukuoka, JA (Japan Agricultural Cooperative), Fukuoka, JF (Japan Fishery Cooperative) Fukuoka[8].

4) Entities: Kyushu University, Seinan Gakuinn University and some business entities near the sites.

5) Local resident associations and neighborhood association of the sites, and educational organization of elementary schools, middle schools, and high schools.

6) Individual (landowners including farmers and fishermen, and residents.

b. Stakeholders impacted by site management

1) Mater Plan of Fukuoka City[13] and "Green Asia International Strategic Comprehensive Special Zone" is focusing on Green innovation of environmental infrastructural new attempt, life innovation, and science, technology, information, and communication[14].

2) Environmental Council of Fukuoka City, and Administration Committee of Nature Reserves, Imazu Tidal Flat Council of Environmental Agency of Fukuoka City[27].

3) Local NGOs are active to environmental improvement, for example, so-called "Sato-Umi" movement which tries to recover coastal area as the historical condition of rich resources and high human activity.

2) Socioeconomic significance

a. Relevant cultural/economic values of the site

Fukuoka City has announced Master Plan of the city, and "Basic Environment Plan" was published 2014[14]. The goal is a "rich and blessed city with nature and history, and urban development connecting to the future generation".

In the plan of Island City (new reclaimed island at the eastern Hakata Bay), so-called "eco-park zone" (550ha) is underway as environmental conservation8.

On the other hand, Imazu flats are positioned in the city plan as "flats co-existence zone" where citizens become familiar with rich tidal, because of the nationally renowned bird watching site, such as wintering site of endangered bird, BFS and also spawning site of so-called "living fossil",

horseshoe crab.

The variety of wildlife at the Imazu in the west and Tatara in the East, makes Hakata Bay as a hot spot for many endangered species.

b. Main economic activities and general income

Total production of the recent fiscal year of Fukuoka City was 6.7 trillion yen nominal, and a 4.4% increase in real terms after removing the effects of price fluctuations in these 5 years. Economic activity of Fukuoka City is characterized by the dominance of the tertiary industries accounted for more than 90%. Wholesale and retail trades (25.8%) and the service industry (22.7%) are larger proportion among them. Trade exports of 2.2 trillion yen, import of 1.6 trillion yen.

3) Access and tourism

a. Annual visitor numbers and visitors characteristics

Estimated number of tourists in Fukuoka in 2013 was 1.2 million people, an increase of 2.4% year-on-year. Among hotel guests, became the 5.4 million people, an increase of year- on-year 3.0%. Numbers of foreign guests through Fukuoka Airport and Hakata Port was over one million people, an increase of 11.0% by year[38].

The majority of the People who visit the sites, both Imazu and Eastern sites, are the neighboring residents, for a walk as jogging, walk with the dog, or a natural search.
More than 100 people in a month are visiting each area for bird watching; 20 people on Sunday, and 15 people on Saturday.

b. Access to the site

1) To enter to Fukuoka City, where Hakata Bay located, Fukuoka International Airport is most convenient from abroad, or JR Hakata Station by railway or to the Fukuoka Urban Highway through Kyushu Expressway is common.

2) Accuse to the Eastern sites by trains is to use Kaizuka Station of Fukuoka Urban Subway, or several stations along Uminonakamichi line, Nishitetsu Railway, where are almost within the distance of 500m to the respective site. Kaizuka junction is close to the site by the urban highway.

3) To the Imazu tidal flats, Imajuku Station or Gakkentoshi station at JR Tsukushi line is commonly used. By car, Imajuku exit of the Western Kyushu Highway is available. In reference to walking map for each site, some of the walking courses and Genkai bike path has been set.

c. Visitor facilities and infrastructure

1) As for the facilities for environmental learning in Fukuoka, "Mamorumu Fukuoka" with exhibition hall at the city health institute, Scientific and Cultural Center for youth, Animal Science Museum at Fukuoka animal park, Green Information Center at the Fukuoka botanical garden are available.

2) At the Imazu in the tidal flats, you can use a rest spot with guide panels of wildlife and historical places and toilets, surrounded by original halophytes of protected plants.
So-called "Horseshoe Crab Café" managed by NGO provides information on conservation activities. Embankment of the southern side of the tidal flat, the entry of vehicles is prohibited, for walking and bird watching. At the north, the Imadu athletic park and a shared farm are located.

3) In the Eastern Area of Hakata Bay, Nature Reserve by Ministry of Environment was establishes in 2014 at Wajiro and Tatara, subsequently, these areas are well-supported for nature conservation and maintenance.

d. Reasons to visit the site

Ranked 10th of the world's most livable cities in the global affairs and lifestyle magazine Monocle in 2014, Fukuoka was praised for its green spaces in a metropolitan setting. Many tourists come to tour in Fukuoka City, recommend, at first, good access and delicious food culture. Next are historical sites e.g. Dazaifu and Munakata Shrines and then natural beauty, e.g. Genkai National Park which has beautiful coast of pine forest and sunset, or green mountains such as Mount Sefuri. The Marine Park Uminonakamichi is located on a narrow cape on the northern side of the Bay of Hakata. The park has a large marine aquarium, an amusement park and, gardens, beaches, and hotels.

Concerning to the World heritage, Coal Mining site is registered in Fukuoka Prefecture as "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining". Adjacent to the north of Fukuoka City, "Sacred Island of Okinoshima and Associated Sites in the Munakata Region" was submitted by the Agency for Cultural Affairs to UNESCO, and is under review.

Concerning to the cultural events," Hakata Dontaku" festival in May (2 million people), "Gion-Yamagas" in July, which started from the 8th century, and "Houjoue" by Hakozaki Shrine in September from the 7th century (about 1 million people) are 3 big events in Fukuoka.

e. Income generated from tourism

Tourists visiting Fukuoka City increased year by year at 2.4% estimated growth up to 340 million yen, consisting of 190 million yen by 12 million people of day-tour and 150 million yen by 5.3 million people of accommodation.

f. Research and educational facilities

Ito Campus (main campus) of Kyushu University is located Near the Imazu tidal flat, and educational course of nature conservation is carried out. Maritime Affairs and Fisheries Technology Center of Fukuoka Prefecture situates north of the tidal flat. Kyushu Sangyo University located at the Eastern site investigates pollution and environmental monitoring research.

Environment and Health Institute of the Fukuoka City manages general concerns of the site.

1.4.5 Planning and Management Information

1) Tenure and Ownership

a. Site

Aquatic space of the site in both Imazu tidal flats and the Eastern area is a nationally-owned area, while management has been entrusted in different ways: Hakata Bay is managed by Fukuoka City, and river mouths concerns are all grade 2 rivers which are managed by Fukuoka Prefecture.

Storage ponds nearby the site are owned and managed by either city or irrigation association of farmers.

b. Surrounding areas

At the surrounding area of the Imazu tidal flat, water purification plants, water regulation ponds, the athletic park, welfare facilities, and schools are owned by the city. The Athletic ground of Seinan Gakuin University is a private property. Rest of farmland and residential land are private properties.

As for the Eastern area, water purification plants and park-promenade areas are a city-owned land, and the other majority is the residential land of private-owned.

2) Status of legal protection/management

Administrative authority of the aquatic zones in Imazu tidal flats, Wajiro and Tatara River Estuaries is governor of Fukuoka Prefecture, and not the Mayer of Fukuoka City on river, coastal and general waters administration.

a. Current status of legal protection

International law is secured by the domestic law of the Japanese Government. Domestic legal regulations of the site are composed of the "regulation of the natural environment" and "act limitations in the public water". Examples of the former are Wildlife Protection Law, the National Parks Law, and Nature Conservation Law, and those of the latter are Coastal Law, the River Law, Urban Planning Law, and Public Water Reclamation Law.

For the site, National Park Law (a part of Natural Park Law) by Ministry of Environment, "Urban Green Space Conservation Act" and “Wildlife reservation Law on regulation of Wild-life Protection and Hunting” including “Wildlife Sanctuary Act” should be concerned.

In the aquatic area of the Eastern site, Tatara and Wajiro area were registered as national Wild-life reservation, and that of the Imazu tidal flat is Wildlife reservation area of Fukuoka Prefecture. Surrounding area of the Imazu tidal flat was registered as Wildlife Sanctuary of Fukuoka City.

b. Administrative authority in charge of management

Administrative authority of the aquatic zones in Imazu tidal flats, Wajiro and Tatara River Estuaries is governor of Fukuoka Prefecture, and not the Mayer of Fukuoka City on river, coastal and general waters administration.

c. Current management measures taken by the authorities

In the Eastern area of Hakata Bay, so-called "Eco-Park Zone" is set in the waters and the coastal region around the Island City (see Fig.58).

"Environment conservation creativity Committee for Eco-Park Zone" composed of academic experts and citizens is organized, to recommend conservation policies in both sides of the hard and soft reviews, for examples, (1) dredging shallow water zone to improve seawater condition, (2) construction of seagrass beds to keep biodiversity, (3) upgrading of walking promenade, beach nourishment, and bank to maintain reasonable habitat of crabs and water bird, (4) waterfront equipment to feel and play with the sea.

As Biodiversity Conservation Support Project by the Ministry of Environment, the Imazu tidal flats conservation council (2010-2013) had been organized, and still continued by the support of the city, promoting (1) adding appropriate sand and setting rows of wooden pile or sandbag to protect spawning grounds of the horseshoe crab, (2) removal of oyster shells to protect horseshoe crab larvae, together with monitoring survey, (3) setting rafts using local bamboo with floats for bird resting and roosting place, (4) public lectures for awareness of the importance of these wildlife.

[Figure 58] So-called "Eco-park Zone" at the Eastern Area in Fukuoka

d. Current scientific research and facilities

Fukuoka City continues monitoring survey around Eco-Park Zone and Imazu Tidal Flats, etc according to the "Fukuoka Strategy for Biodiversity"[8].

3) Participation and cooperation with local community

a. During "Love Earth, Clean up Week" in Fukuoka City, local residents near the coast join as volunteers, collect garbage, such as marine debris, plastics, and empty cans. This act is supported by the city providing staff and garbage collection vehicle.

b. "Fukuoka Environment Foundation" invested by Fukuoka City contributes in conservation and awareness-raising activities on the environment, in order to create the sustainable society. For an example, the recycling of oyster shells from the tidal flats was recycled to the fertilizer.

c. "Fukuoka Environment Festival" is performed every year in the Uminonakamichi Seaside Park, where NGOs in each booth, such as from Imazu, Wajiro and Tatara, interact with each other.

4) International Cooperation

a. International partners cooperating for site conservation

BFS Working Group was organized in 2014 in the East Asian-Australian Flyway Partnership (EAAFP), and the representative of Japan is a researcher of Hakata Bay, therefore, situations of BFS in Hakata Bay with those of the various parts of Japan are introduced in detail, and well-understood. Because Global COE International symposium "Ecology, migration, and conservation of the Black-faced Spoonbill" was held in 2009 at Nishijin-plaza, Kyushu University, under the auspices of Birdlife International and Fukuoka City. Invited speakers from Korea, China, Taiwan, Hong Kong and Macao visited BFS sites in Hakata bay, and conservation efforts for BFS were highly evaluated.

Member of the IUCN Horseshoe Crab Specialist Group is a specialist on Hakata Bay, well-introduced at the Third International Workshop on the Science and Conservation of Horseshoe Crabs held in Kujukushima, Saikai National Park, located in the northern Kyushu.

b. Potential international partners' influential to site conservation

Many scientists and NGO members visited Hakata Bay and discussed on the conservation of BFS, for examples of EAAFP, Ramsar and Ramsar Network Japan, IUCN and IUCN Japan, WWF and WWF Japan, Birdlife International and Hong Kong Bird Watching Society.

1.4.6 Suggestions for Conservation of Black-faced Spoonbills through NEASPEC

1) Cooperation for increasing public awareness

Along the flyway of BFS, an international exchange program for children is useful in future. And their parents also feel familiar with BFS.

International Workshop in China is important for awareness of BFS in wetlands, where researchers of foreign countries are also very interested in it.

2) Priority actions/ areas of work for conservation and rehabilitation of key BFS sites in the region

Concerning to the breeding site, now new breeding sites are formed in south of Korea. Concerning to the wintering sites, BFS in Taiwan seems to be dangerous. Not only too many numbers in a site, but also high tide due to sea level change. BFS is spreading in these days into Inland freshwater wetland, but they have the conflict with resident and urban development. This new inland area must be protected.

More wintering sites should be listed from China. If NEASPEC support international survey for BFS wintering behavior in China, it will make a big progress.

3) Future cooperative project for Black-faced Spoonbills through NEASPEC framework

To be EAAFP flyway site is very difficult at this moment, because not so many precedents for it. Guideline for EAAFP flyway site is urgently needed. It will help to be a Ramsar registration.

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Acknowledgments

NEASPEC (North-East Asian Subregional Programme for Environmental Cooperation) organized expert group meeting "Conservation and Rehabilitation of Habitats for Key Migratory Birds in North-East Asia," on 10-11 October 2013, and scoping survey program started in several migration sites. We are deeply grateful to NEASPEC who conducted it as 2015 project. Ministry of Environment of Japan gives us constructive comments and suggestions.

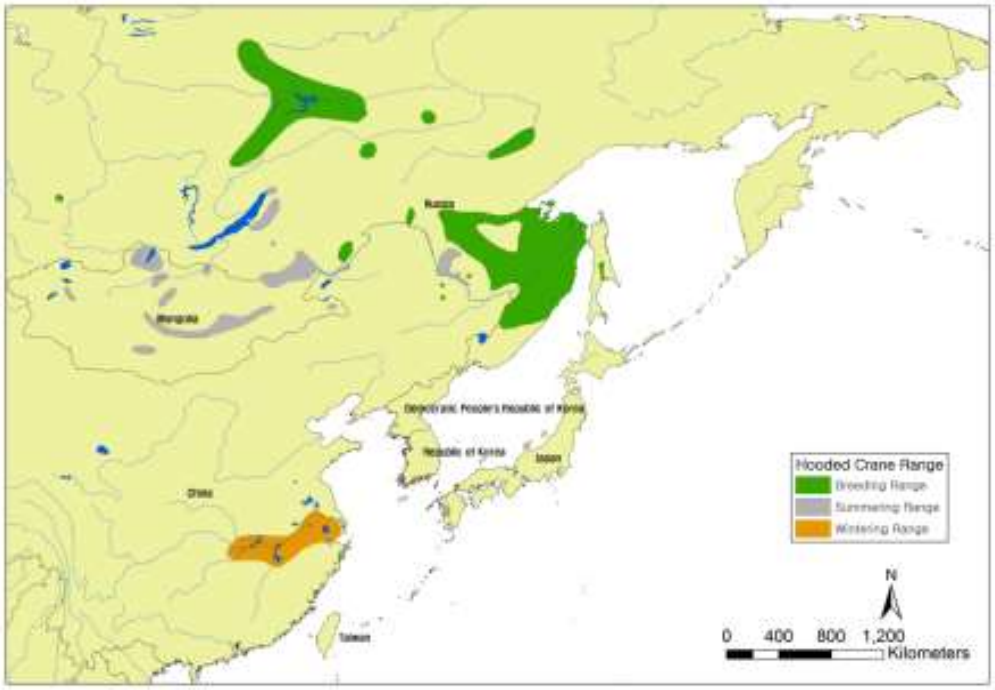
Officials of environmental agency and port agency of Fukuoka city gave important information and suggestions. Members of Fukuoka Branch of Wild Bird Association of Japan, Fukuoka wetland Research Group and Japan Black-faced Spoonbill Network, especially, Dr. Shigeki Takano, Mr. Satoru Matsumoto, Mr. Kaito Okabe, Mr. Takurou Hattori, Mr. Kousaku Tamura, Mr. Michio Kamizono, Mr. Kazuhisa Oue, Mr. Hiroshi Tomida, Mr. Yuta Tomiyama, Ms. Junko Minami, and Ms. Masuko Kinoshita, had great efforts to this project.

2. Hooded Crane (*Grus monacha*)

2.1 Current status of the bird

Hooded Cranes *Grus monacha* is listed as a globally vulnerable species due to its small population, restricted to fewer than ten wintering sites whose combined area is relatively small. Given the substantial threats to its habitat, it is likely to continue declining in the near future. Owing to these factors it is listed as Vulnerable since 2000 (BirdLife International 2016).

The birds breed in south-central and south-eastern Siberia, Russia (BirdLife International 2001). Breeding is suspected in Mongolia and two breeding sites have recently been found in the region of Heilongjiang, China (Yuming et al. 2006, Guo Yu-min et al. 2007). It migrates along the Yellow River to its wintering grounds in the Yangtze basin, mainly at Dongting hu, Poyang hu and Chongming Dongtan and along the west coast of the Korean peninsula to Suncheon bay, Korea and to Izumi, southern Kyushu in Japan. Though its global population was estimated to be c.11,500 birds (J. Harris in litt. 2006) but 13,472 individuals were recorded at Izumi in Kyushu, Japan during the field study of WBSJ in November 2014. The majority of the population winter at Izumi, southern Japan, with small numbers in China and Republic of Korea. It has been estimated that 1,050-1,150 birds winter in China, including between 300-400 at Poyang, over 600 at Shengjin and Caizi and over 100 at Chongming Dongtan. The wintering number in Suncheon bay, Korea has been increasing since the birds found in Suncheon bay in 1996 and recorded over 1,000 individuals from 2014.



[Figure 59] Range of Hooded Cranes in East Asia (* source from ICF)

2.2 Scoping Survey in China: Lindian

Site name **(Country)**	**Lindian County (China)**	**Submitted Date**	DEC, 2016
Complier name	National Bird Banding Centre, China	**Contact Information**	

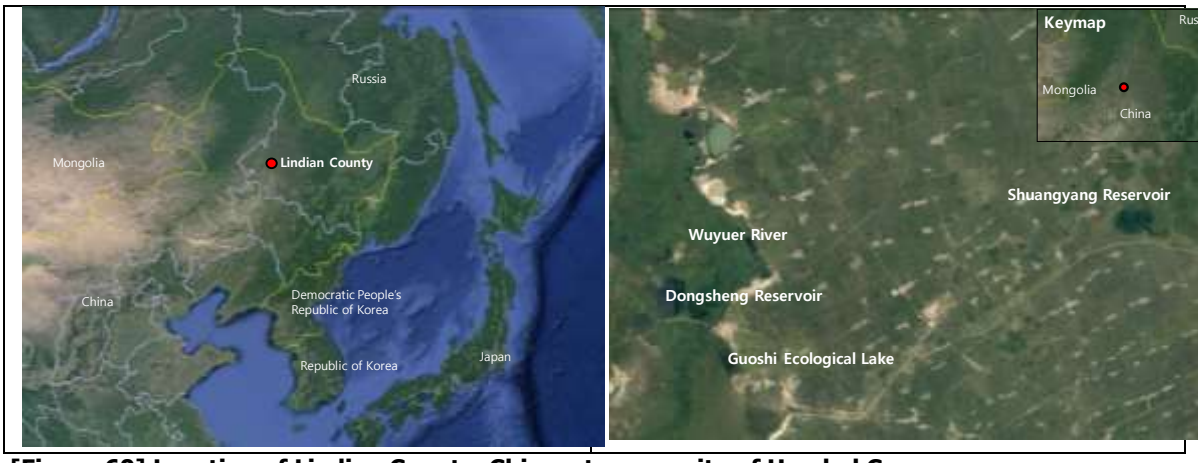
2.2.1. Study area

Lindian County is located in mid-west Heilongjiang Province, in the north of the Songnen Plain. The geographic coordinates are 46°44'–47°29' N, 124°18'–125°21' E. It adjoins the downtown area of Daqing City in the south, Qiqihar City in the north, Dorbod Mongolian Autonomous County in the west, Mingshui, Yian, and Fuyu Counties in the east. Lindian County is located in the lower reaches of the Wuyuer. Within its NNR, there is the Dongsheng Reservoir and the Wuyuer and Shuangyang Rivers; the water area is 320,000 acres and the wetland is 1230,000 acres. The core area is the Guoshi Ecological Lake. It is one of the largest, mature, l and most intact original wetland areas in China. It comprises 30,000 acres of wetlands, grasslands, lakes, and reed meadows.

Lindian County has a flat terrain and is situated between 142.7–172.4m; it is high in the east and north and low in the west and south. The NNR belongs to the north temperate continental climate zone, the continental climate is obvious and it has four distinct seasons. It is dry and windy in spring, hot and rainy in summer cool in autumn, and cold in winter. There is a large temperature difference between the four seasons. The annual average sunny time is 110 days. The annual sunshine time is usually 2,536 hours, annual average air temperature is approximately 4°C, the frost-free period is 129 days, and annual precipitation is 300–400mm.

At the junction of Sanhe Town and Yuweichang in the northwest, there are large areas of grasslands, ponds, and rivers. There are 13 species of crane, including red-crowned, common, demoiselle, and Siberian crane, as well as over 50 species of rare birds, such as the scaly-sided merganser *Mergus squamatus*. In northwest Lindian County, there is a large area of grasslands, swamps, and marshes.

2.2.2 Maps



[Figure 60] Location of Lindian County, China, stopover site of Hooded Cranes

2.2.3 Methods

According to the terrain and water system distribution in Lindian, several centralized waterfowl distribution areas were selected and 2–5 observation points were set up in each site, investigated the status of waterfowl resources, and carried out observations as close to the lake as possible. A total of two surveys were conducted, and each survey lasted 3 days or so. Each time the survey point was fixed.

2.2.4 Results

1) Hooded Crane abundance and distribution

The field survey was conducted in April and May of 2015, and 230 and 450 Hooded Cranes were recorded, respectively. Some individuals were resting in swamps, others were feeding in the corn field.

2) Abundance and distribution of other important waterfowl

Apart from Hooded Cranes, other birds were also observed including 14 red-crowned, four white-naped, 47 common cranes, and four oriental white storks, relatively large numbers of common cranes, red-crowned cranes and oriental white stork had started breeding. Other waterfowl included the black-winged stilt, pied avocet *Recurvirostra avosetta*, mallard, and spot-billed duck *Anas poecilorhyncha*.

2.2.5 Recommendation for Site Conservation

1) There are currently no effective management measures for the protection of cranes at Lindian Wetland. A national nature reserve should be established in the area.

2) There is some wetland pollution at Lindian Wetland. Previous polluting enterprises, such as chemical plants and paper mills, have now been closed. At present, it is mainly domestic waste pollution from local farmland.

3) Illegal hunting is also a serious threat to the cranes and other wildlife at Lindian Wetland, and local governments should increase monitoring efforts, conduct public awareness, and strictly prohibit the illegal hunting.

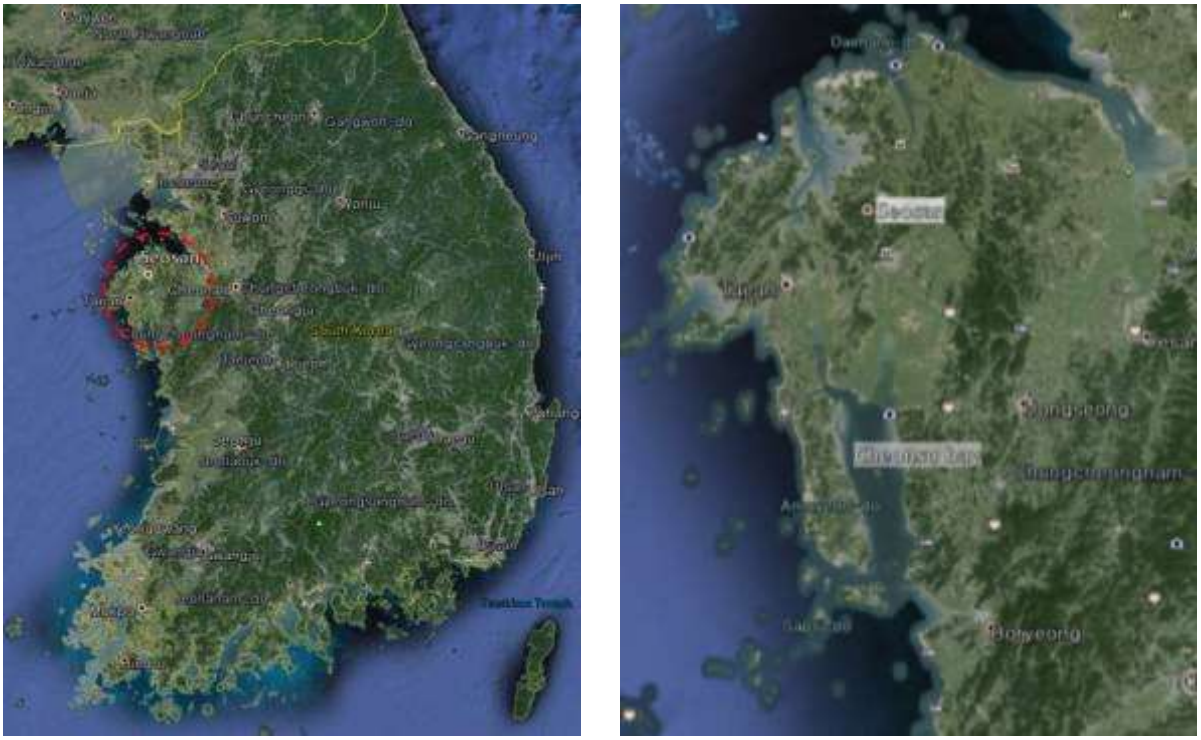
2.3 Scoping Survey in Korea: Cheonsu Bay

Site name (Country)	**Cheonsu Bay (Korea)**	**Submitted Date**	Feb., 2016
Complier name	Korean Society of Environment and Ecology & Environmental Ecosystem Research Foundation (ERF Korea)	**Contact Information**	

2.3.1 Biophysical Information

1) Location & site boundary

Cheonsu Bay (36°35'~ 36°41'N, 126°17'~126°28'E) is a narrow but long bay, located on the western coast of South Chungcheong Province and Anmyeon Island with a width of 2 km, an indent length of 40 km, a water surface area of 200 km^2 and a coastal length of 1,199.8 km. Its administrative district belongs to Chang-ri, Buseok-myeon, Seosan-si, and South Chungcheong Province. The area covered by this study is 386.7 km^2 including farmlands and lakes of Cheonsu Bay and neighboring streams, forests, reservoirs and rural villages.



[Figure 61] Location map of Cheonsu Bay

2) Maps

Cheonsu Bay was typical inner bay with a low influx of seawater from the West Sea. As this region is located on the Taean Peninsula protruding on the northwest of South Chungcheong Province, it has played a leading role in importing Chinese culture thanks to its frequent contact with the nation from earlier on. Cheonsu Bay belongs to the Yellow Sea Eco-region. The high tidal range was a suitable place to coastal fishery and fishing farm. In the land area of the shore, there are farmlands and traditional villages whose livelihood is based on agriculture and fishery.

From 1980 to 1995, tidal flats had been changed to reclaimed land by Hyundai E&C (Hyundai Engineering & Corporation, hereinafter Hyundai E&C). Beginning in 1996, the corporation started farming at the reclaimed land by using heavy machinery. Wild teals and geese adapted to paddy fields and freshwater lakes. Fallen grains on the paddy fields and fish in the two lakes attract them. According to the Seosan Birdland, the Wetland Education Centre in Cheonsu Bay, wild birds of 265 different species were observed.

Recognized its importance as an important flyway for migratory water birds, Cheonsu Bay joined the EAAFP in 1999. Cheonsu Bay is a home to Chinese Egrets, Spoonbills, Oriental-white Storks, Whopper Swans, Baikal Teals. Also, it is a stopover as well as a wintering place of Hooded Cranes that breed in Russia and migrate to Suncheon Bay or Izumi in Japan.

[Figure 62] Map of Cheonsu bay in 1919

[Figure 63] Map of Cheonsu bay in 2015

3) General description of the site

Cheonsu(淺水) means shallow water, in the past, the Bay was shallow water with less 10m water-depth. Cheonsu Reclamation Project has pushed ahead with the purpose of territory expansion and an increase in food production in the past 1970s. In the latter of 1978, the project proceeded with using construction equipment brought from overseas construction sites.

In 1980, Hyundai E & C began building sea walls, 7.7km in total. Two freshwater lakes, Bunamho and Ganwolho were created as a result of this project. For 13 years starting from 1982, more than ten thousands hectares of paddy fields had been made, which accounts for about 1% of paddy fields in Korea. It has been huge areas.

[Figure 64] So-called Jeong Joo-yeong Method (Blocking water flow by sinking abandoned oil tankers)

4) Climate zone and major features

Cheonsu Bay is situated in the central-western area of the Korean Peninsula and has four distinct seasons throughout the year. It has mild temperature since it belongs to the middle latitudes of temperate monsoon climate. The hallmark of this weather is a strong northwest monsoon. Adjacent to the West Sea, the bay has heavy westerlies and its monthly temperature from October to Next March, a wintering period for migratory birds, stood at 4.8℃ with the high of 12.8℃ in October and the low of -0.3℃ in January, which is 4℃ lower than that of Junam Reservoir or Nakdong River where migratory birds frequently visit for wintering on the Korean Peninsula. However, the bay has about 1 to 2℃ higher temperature than inland areas in the same latitude thanks to the influence of the oceanic climate.

5) Soil and Geology

Geographically, Cheonsu Bay is based on biotite granite of the Jurassic Period. Most of farmlands and lakes in the bay used to be tidal flats in the past and their soil had the nature of the alluvial deposit. There is a tendency that soil gets finer from the head of the bay to seawalls. In fact, gravel is dominant at the bay head while sand is prevailing at the middle and mud is dominant from the middle to seawalls.

6) Water regime

Seosan City encompassing part of Cheonsu Bay has no large streams due to no high mountains and many low hills. Haemi and Dodang are representative local streams and reservoirs called Jamheung and Inpyeong are located. Many small waterways are well developed due to paddy fields created through reclamation. Waterways and reservoirs are very significant habitats and feeding sites for migratory birds coming to Cheonsu Bay.

Sea walls or banks built at the basin of Cheonsu Bay block watershed run-off from flowing into the coastal line. Streams can only go inside a flood gate which is blocked up by sea walls or banks. The content of salt in freshwater lakes is high in the south, affected a lot by currents while it is low in the north of the inner bay which is influenced by streams.

7) Main ecosystem services

The primary ecosystem services of Cheosu Bay are to produce rice. As large as 6,400ha of rice paddies were created by reclaiming the area which used to be a tidal flat. Herein, rice is being produced in a large quantity. Although the population of shorebirds which used the tidal flat in the past has gone down, it serves as a "supportive service of ecosystem" by providing large farmlands, lots of fallen grains, aquatic plants on freshwater lakes and habitats for many migratory birds like seagulls and ducks thanks to sandbanks and spacious resting sites.

8) Photographs

[Figure 65] Landscape of Cheonsu bay in Spring (A site)

2.3.2 Species Information

1) Numbers of Hooded Crane in the site in 2014-15

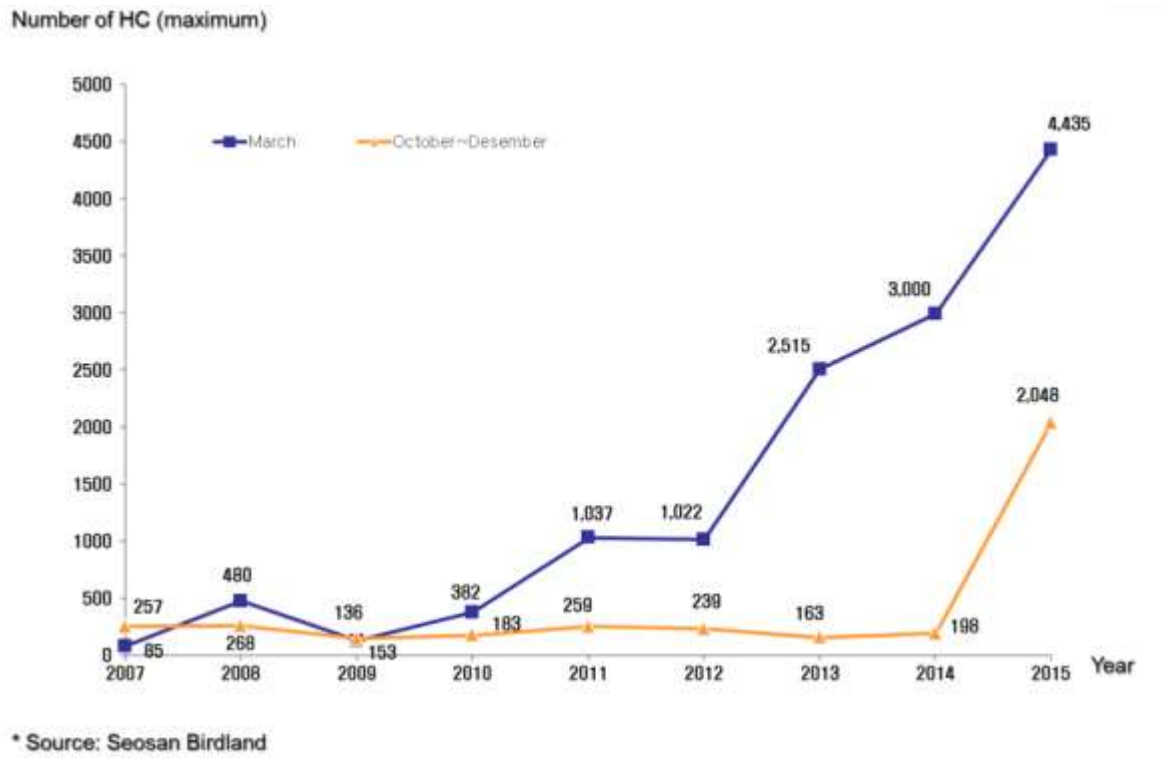
Hooded Cranes started to arrive at Cheonsu bay at the end of October in 2014 and once sleeping zones were no longer available due to frozen Ganwol Lake at the end of December, only a few remained and the rest left to South. And then they came back to the bay at the end of January to early February. According to the monitoring of migratory birds by Seosan Birdland, as of the date of the study, 198 were witnessed in November 2014 while 15 were spotted in January 2015 and 4,435 were observed in March 2015. Each year, Hooded Cranes arriving at Cheonsu Bay use the bay as a stopover, but since 2014 at least seven of them have started to stay there for whole wintering.

2) Numbers and trends of Hooded Crane in the site from 2003 to 2015

The Seosan Birdland's monitoring on migratory birds from 2007 to 2015 shows that there is a steady increase in arriving population of migratory waterbirds thanks to continuous activities to give food since 2009. In particular, more than 1,000 Hooded Cranes have used Cheonsu Bay as a stopover as of the date of study since 2011. The population moving north observed during a day

amounted to 2,515 in March 2013 with more than 3,000 in March 2014 and 4,435 in March 2015, showing a rapid growth. For the first time in October 2015, a pack of Hooded Cranes with a population of 2,048 were spotted during a period when they normally move south, which is a telltale sign that Hooded Cranes have used Cheonsu Bay as an important wintering site.

According to the Korea Waterbird Network's monitoring, Haepyeong wetlands in Gumi which had been famous wintering site for Hooded Cranes in the past disappeared owing to the 4 River Project, and many Hooded Cranes which used to travel through the center region of the Korean Peninsula along the route of Nakdong River from Izumi, Japan have changed their route to the western coast through Jeju Island. It is estimated that almost all Hooded Cranes moving north are traveling via Cheonsu Bay.



* Source: Seosan Birdland

[Figure 66] Number of Hooded Crane at Cheonsu Bay in 2007-2015

3) Numbers of other associated birds

Seosan City has created water-filled rice paddies near feeding sites of Hooded Cranes in Cheounsu bay which are also shared with Oriental White storks (*Ciconia boyciana*) wintering at Cheonsu Bay. Scores of wintering Storks are often observed at streams and rice paddies of Cheonsu Bay each year. Originally, Oriental White-Storks bred numerously in Korea in the nineteenth century, however, the breeding population of the Storks in nature was extinct in the mid of 1990s and small wintering population regularly visit Korean wetlands including Cheonsu bay.

In September 2015, 8 Oriental White-Storks that had been born through artificial breeding at Oriental White-Stork Restoration Center of the Korea National University of Education (KNUE) were released to the Oriental White-Stork Park in Yesan-gun near Cheonsu Bay. It is expected that they would come to Cheonsu bay in the future. In fact, "Bongsuni" an Oriental white stork J0051 set free in Japan and "Miho" an Oriental white stork lost by the KNUE were spotted at Cheonsu Bay in the winter of 2014.

Source from: Seosan City

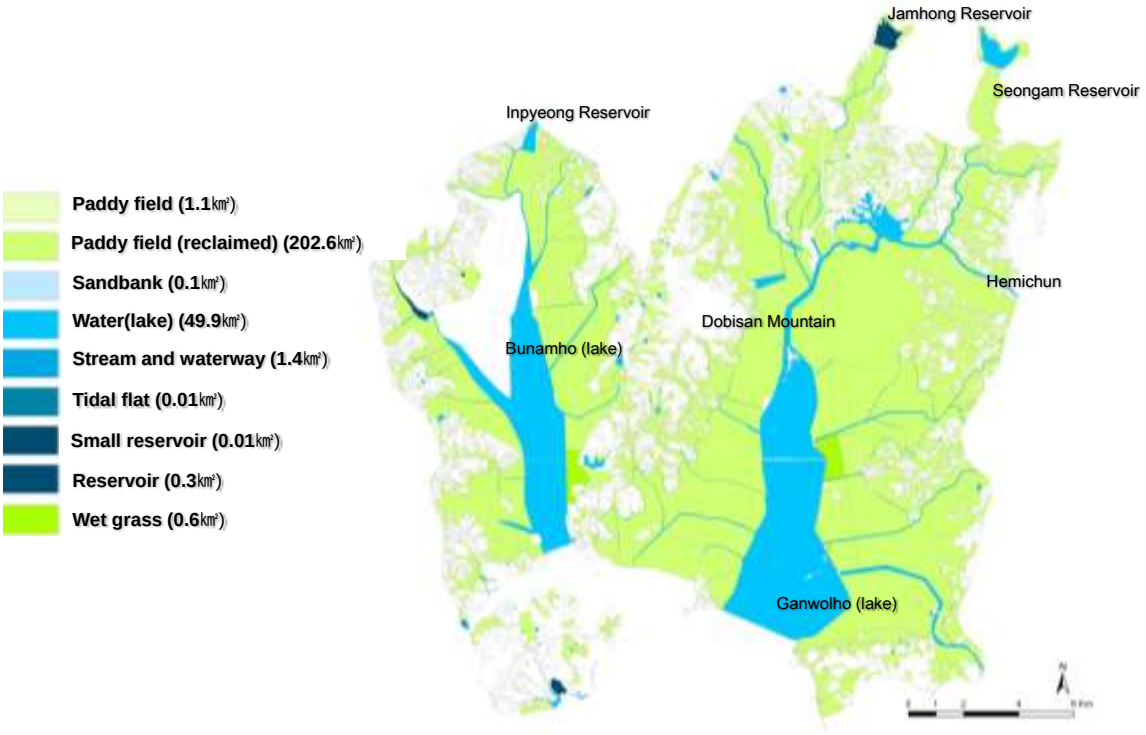
2.3.3 Habitat Information

1) Ecological features of the site

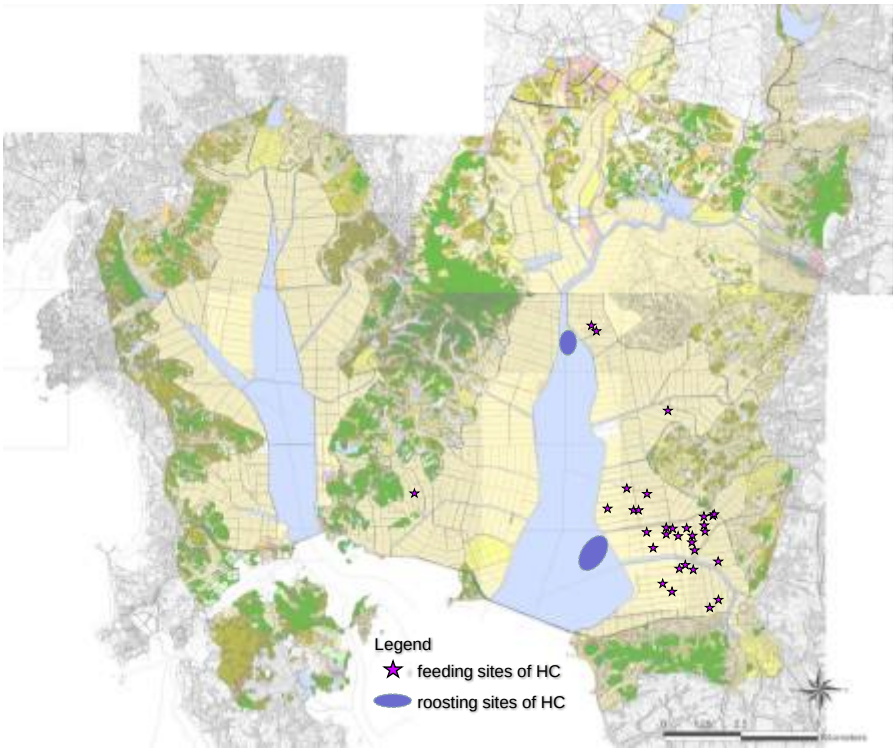
Cheonsu Bay offers various habitat types such as farmlands, estuaries and sandbanks which can be used as feeding and roosting sites for a flock of Hooded Cranes moving between breeding sites and wintering sites. Rice paddies created through a reclamation project have a vast land area of 202km^2. The paddy fields are feeding sites for Hooded Cranes and Geese eating fallen grains left behind after harvest. Since 2009, stable feeding sites have maintained by giving feed on rice paddies and farm roads on the eastern Ganwol Lake, a place Hooded Cranes frequently visit. Their roosting (sleeping) sites are sandbanks created on the lake, shared by other winter migratory birds like Geese. They usually use the sandbanks on the eastern side of Ganwol Lake and turn to sandbanks on the upper part of Ganwol Lake and the lower part of Haemi Stream once the population increases. KSEE and ERF Korea have produced the habitat map that shows feeding and roosting grounds for wild birds. This map is essential tool for environmental ecological planning.

2) Dominant flora communities of the site

Reeds are distributed in a linear form at the edge of Ganwol Lake where sand is deposited. There are also reeds, cattails and common reeds that are dominating species at agricultural waterways and slopes of streams. Forests and villages have vegetation landscape of secondary forests where black pine and pine trees are prevailing.



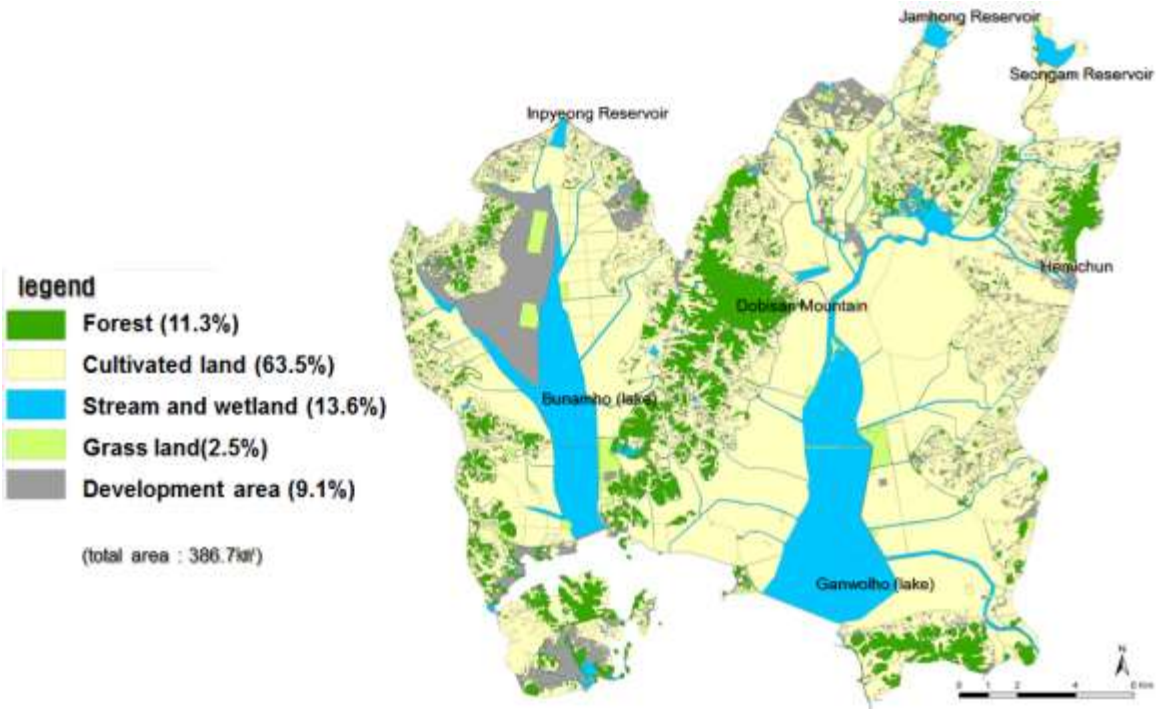
[Figure 67] Habitat map of Hooded Crane at Cheonsu Bay



[Figure 68] Feeding and roosting sites of Hooded Crane at Cheonsu Bay

3) (Past and) Present land use of the site

Before the reclamation project, Cheonsu Bay was tidal flats where residents made their living and it was a stopover site of shorebirds mainly and habitats of benthos. From 1980 to 1995, tidal flats had disappeared together with mud flat species and local communities with tidal living culture. Beginning in 1996, Hyundai E&C started farming at the reclaimed land by using heavy machinery. Even if shorebirds looking for tidal flats were disappeared, wild teals and geese adapted to paddy fields and freshwater lakes. Fallen grains on the paddy fields and fish in the two lakes attract them. Also, relatively low disturbance of human makes the place good habitats. According to the result of the survey of land use in 2014 by KSEE and ERF Korea, cultivated land take up 64% of the reclaimed land and its surrounding areas, stream lake and reservoirs 14%, forests including Dobi mountain 11% and development areas 9%.



[Figure 69] Landuse map at Cheonsu Bay

4) Potential areas to be habitat for species (if any)

None

5) Threats

	Current Threat	Potential Threat
A. Residential and commercial development		
Housing and urban areas	☐	☐
Commercial and industrial areas	☐	☐
Tourism and recreation areas	☒	☒
Others or additional notes: At Bunam Lake of Cheonsu Bay, the reclaimed farmland with a land area of 15 million m^2 was selected as a corporate city for leisure sightseeing in 2006 and a golf course and various accommodations are being constructed.		
B. Agriculture and aquaculture		
Annual and perennial non-timber crops	☐	☐
Wood and pulp plantations	☐	☐
Livestock farming and ranching	☐	☐
Marine and freshwater aquaculture	☐	☐
Others or additional notes: Since 1999, Hyundai E&C have sold paddy fields to individuals. After then, individual farmers harvest grains and collect straws intensively. As the result, living conditions for birds were deteriorated with less food. Farmers tend to reap rice later so that migrants that come before the harvest cannot settle down in Cheonsu Bay. Also, frequent presence of human and vehicles disturbs birds and threatens their habitats.		
C. Energy production and mining		
Mining and quarrying	☐	☐
Energy-related activities	☐	☐
Others or additional notes: N/A		
D. Transportation and service corridors		
Roads and railroads	☐	☒
Utility and service lines	☐	☐
Shipping lanes	☐	☐
Flight paths	☐	☐
Others or additional notes: Agricultural waterways and sightseeing roads are being built on farmlands near Ganwol Lake.		
E. Biological resource use		
Hunting and collecting terrestrial animals	☐	☐
Gathering terrestrial plants	☐	☐
Logging and wood harvesting	☐	☐
Fishing and harvesting aquatic resources	☐	☐
Others or additional notes: The rate of fallen grains fell from 20% to 5% since Hyundai Farming Association Corporation began to sell farmlands to the general public in 2009. There is a considerable drop in food for winter migratory birds as a large-sized combine has been gone and straws are wrapped to make silages which are sold for cows' feedstuff.		
F. Human intrusions and disturbance		
Recreational activities	☒	☐
War, civil unrest and military exercises	☐	☐

	Current Threat	Potential Threat
Work and other activities	☒	☐
Others or additional notes: Cargo vehicles for construction of agricultural waterways and photographers' vehicles to take a picture of winter migratory birds are approaching close to feeding sites of Hooded Cranes, threating their habitats.		
G. Natural system modifications		
Fire and fire suppression	☐	☐
Dams and water management/use	☐	☐
Landfill and/or Reclamation		
Other ecosystem modifications	☐	☒
Others or additional notes: As currents are not circulating in a freshwater lake, contaminants are accumulated in the like, causing eutrophication and reducing biodiversity of fish.		
H. Invasive and other problematic species and genes		
Invasive non-native/alien species	☐	☐
Problematic native species	☐	☐
Introduced genetic material	☐	☐
Others or additional notes: N/A		
I. Pollution		
Household sewage and urban waste water	☐	☒
Industrial and military effluents	☐	☐
Agricultural and forestry effluents	☒	☐
Garbage and solid waste	☐	☐
Air-borne pollutants	☐	☐
Excess energy	☐	☐
Others or additional notes: The use of pesticides has caused a reduction in species and population of aquatic organisms including fish living in agricultural waterways and streams, simplifying food resources for wild birds. Although contaminants coming into streams and lakes are under control, it is concerned with a loss of sandbanks, a resting and sleeping site for Hooded Cranes, due to a steady demand for dredging to solve eutrophication.		
J. Climate change and severe weather		
Habitat shifting and alteration	☐	☐
Droughts	☐	☐
Temperature extremes	☐	☐
Storms and flooding	☐	☐
Others or additional notes: N/A		

2.3.4 Socioeconomic and Stakeholders Information

1) Stakeholders of the site

a. Stakeholders influential to site management

Seosan City and its city council should be the one who determine policies related to sustainable conservation and use of Cheonsu Bay. Moreover, it is essential to work with Taean-gun Office and Hongseong-gun Office that lie throughout Cheonsu Bay. There is also a lot of influence from agriculture and biodiversity policies by the local government of South Chungcheong Province and the Council for Green Chungnam 21. On top of that, the Ministry of Environment should play an important role in pushing ahead with the designation of protected area and biodiversity programs by the central government.

Farmlands on Cheonsu Bay can be divided into two groups: lands owned by farming association corporations like Hyundai Farming Association Corporation and individuals. Since many owners choose not to do farming themselves and lend land lots to farmers, it is necessary to draw cooperation with these land owners. The core stakeholder concerned with activities of the local community's nature conservation is the Korean Federation for Environmental Movement – Seosan Taean branch, the environmental NGO in Korea.

b. Stakeholders impacted by site management

Stakeholders directly impacted by management of farmlands on Cheonsu Bay are farmers who are currently farming here. In cooperation with farmers, there should be actions to encourage them to limit the use of pesticides, adjust the harvest time and increase the rate of fallen grains by growing biologicially-diverse crops. Cooperation with locals in the neighborhood is also needed to ensure stable staying of winter migratory birds. Policy has to be made in a direction that can pursue economic benefits through eco-tourism while imposing no discomfort to villagers' lifestyle.

While working on the field, the role of staff and nature interpreters of Seosan Birdland is crucial in monitoring and managing winter migratory birds including Hooded Cranes and in providing exhibitions, experience and education programs for visitors.

2) Socioeconomic significance

a. Relevant cultural/ economic values of the site

Cheonsu Bay was selected as one of the top ten eco-tourism sites in Korea by the Ministry of Culture and Tourism and the Ministry of Environment in 2010 and received aid from the central government until 2015. Agricultural products produced from reclaimed large farmlands and salted oysters with hot pepper from Ganwol Island have high economic values. Cultural values of historical sites such as Buseoksa Temple on Mt. Dobi and Haemieupseong Fortress are high.

b. Main economic activities and general income

Most of the residents at Cheonsu Bay and its neighborhood engage in agriculture. Some living near the costal line is working in the tourism and fishery industries such as fishing and oyster harvesting. On the paddy fields reclaimed, rice is farmed while garlic, ginger, and flowers are grown on slanted fields. Recently, agricultural products from Cheonsu Bay are sold with its own brand such as "Geomeunyeo Rice", "Goose-coming Rice" and "Seosan Six-piece Garlic." The per-capita income for farmers making and selling traditional sweet cookies with ginger, the local specialty, stands at about 100 million KRW on an average which is very high.

3) Access and tourism

a. Annual visitor numbers and visitors characteristics

Cheonsu Bay is mainly visited by those from the metropolitan areas since it is not far from Seoul, the capital of ROK, and Gyeonggi Province. Families and students as a school group visit there for experience of the nature or a field trip. They tend to stay there for just one day since there are not enough accommodations for visitors and no tour programs in which visitors can stay overnight. Otherwise, they go to the neighboring Taean haean National Park to find a place to stay.

b. Access to the site

Visitors to Cheonsu Bay bring their own passenger vehicles or take a tour bus. It takes two hours from Seoul by car. There are intra-city buses going to Cheonsu Bay from Taean-gun, Seosan city, but it is inconvenient for visitors to use them since intervals are long and their routes include many villages.

c. Visitor facilities and infrastructure

With 25 billion KRW of investment for the eco-tourism development project starting from 2010, infrastructure like Seosan Birdland has been created. The Birdland which opened in 2013 is core infrastructure to promote eco-tourism based on systematic conservation and management of Cheonsu Bay and experience and educational programs. Its migratory bird museum features various specimen, exhibitions, video materials and bird songs regarding more than 200 species of migratory birds like Hooded Cranes, Bean Geese, spectacled Baikal Teals, Eurasian Spoonbills and Whooper Swans. The 4D theater shows charged movie clips while a special exhibition hall is up and running. At the migratory bird observatory, there is a conference room to observe migratory birds and hold various seminars. Outside, a variety of convenience facilities are located such as an eco-pond, an outdoor performance stage, a forest ecosystem experience center, a forest playground, an observatory deck for ducks and geese and a labyrinth garden.

d. Reasons to visit the site

Since 2002, the Seosan Birds Watching Fair has held under the slogan of "pleasant encounters between human and birds" as annual event. This eco-tourism fair consists of bird-watching tours

and international events. More and more people visit Cheonsu Bay since they like wild birds, but activities like watching of Hooded Cranes have not been known to the public.

[Figure 70] Seosan Bird Land, the Wetland Centre

[Figure 71] 4D theater

[Figure 72] Migratory bird observatory

[Figure 73] Observatory deck for ducks and geese

e. Income generated from tourism

Information is not available.

f. Research and education facilities

Seosan Birdland is equipped with an educational facility for visitors and a research facility regarding migratory birds. It runs an educational facility where visitors can learn the natural environment of Cheonsu Bay and the ecosystem and culture of migratory birds by utilizing an exhibition hall and space for experience learning of the migratory bird museum. Wild Animal Treatment Center takes care of treatment and rehabilitation, breeding support and research on migratory birds.

[Figure 74] Wild Animal Treatment Center

***Source: Seosan Birdland**

2.3.5 Planning and Management Information

1) Tenure and Ownership

a. The site

Most farmlands of Cheonsu Bay used to belong to Hyundai E&C from 1980 to 1995. But, as it started to sell them to the general public in 1996, many individuals and some farming association corporations own farmlands.

b. Surrounding areas

Except for public waters, villages, farmlands and forests adjacent to Cheonsu Bay are mostly privately owned.

2) Status of legal protection/ management

a. Current status of legal protection

A land area of 31.84 km^2 at Cheonsu Bay was designated as a wildlife reserve in 2009 in accordance with the Wildlife Protection and Management Act. Under the domestic law, it has not been designated as other protected areas such as wetland protected area or ecological landscape conservation area.

b. Administrative authority in charge of management

Eleven employees at Seosan Birdland under the authority of Seosan city take charge of operation and management of facilities, creation of ecological environments for wintering sites of migratory birds, monitoring on wetlands, eco-tourism, a tour for observing migratory birds and ecological programs.

c. Current management measures taken by the authorities

In order to provide feed and resting grounds to migratory birds, Biodiversity Management Contract was adopted in 2003. Korea's Biodiversity Management Agreement is a payment system of ecosystem services. Under this agreement made between local governments and residents to conserve an outstanding ecosystem, incentives are provided by local governments when locals sincerely fulfill their duties.

[Figure 75] Rice straws are stored

[Figure 76] Water-filled rice paddies

d. Current scientific research and facilities

The status of winter migratory birds arriving at Cheonsu Bay has been collected through a census of winter migratory birds conducted nationwide by the Ministry of Environment in every January starting from 1999. A result report has been created after monitoring on birds twice a month by nature interpreters of Cheonsu Bay since 2007.

3) Participation and cooperation with local community (Any CEPA (Communication, Education, Participation and Awareness) programme for community)

The Korean Federation for Environmental Movement – Seosan branch started "School for Winter Migratory Birds at Cheonsu Bay" in 1998. Since then, Seosan City has conducted a program called "World Migratory Birds Tour Exhibition" in which people can experience Cheonsu Bay firsthand on a tour bus to watch migratory birds with a goal of "beautiful encounter between birds and humans." Along with the partial opening of Seosan Birdland in 2011 and 2012, a festival for migratory birds was held whose name was changed into "Migratory Birds Tour" in 2013. Since 2007 locals have formed a group of nature interpreters who conduct programs of birds-watching at migratory birds' sanctuary and educational programs for visitors.

[Figure 77] Various CEPA activities took place in Cheonsu bay * source from Seosan city

4) International Cooperation

a. International partners cooperating for site conservation

At present in 2015, there is no particular international partner cooperating for conservation and wise use of Cheonsu bay in regular basis. However, Seosan city government and local NGOs have cooperated with various international organizations through hosting workshops, seminars etc. Since Cheonsu bay was designated as the Site Network of Anatidae Working group in 1999, Seosan city has cooperated with Asia-Pacific Migratory Waterbird Committee and later EAAFP. On November 2013, Seosan city supported the workshop on 'Best practices and management of Wetland Education Center' in Seosan city which was co-organized by Ramsar Convention and ERF Korea. During the CBD COP12 in 2014, Seosan city had a side-event with ERF Korea on importance of rice paddies in Cheonsu bay and Ramsar Convention and RamNet Japan were invited.

b. Potential international partners' influential to site conservation

As mentioned above, Seosan city and local NGOs have cooperated with various international organizations for Cheonsu bay during last 15 years, but to develop these partners into concrete network for Cheonsu bay, it is needed to form tangible advisory network or committee to discuss

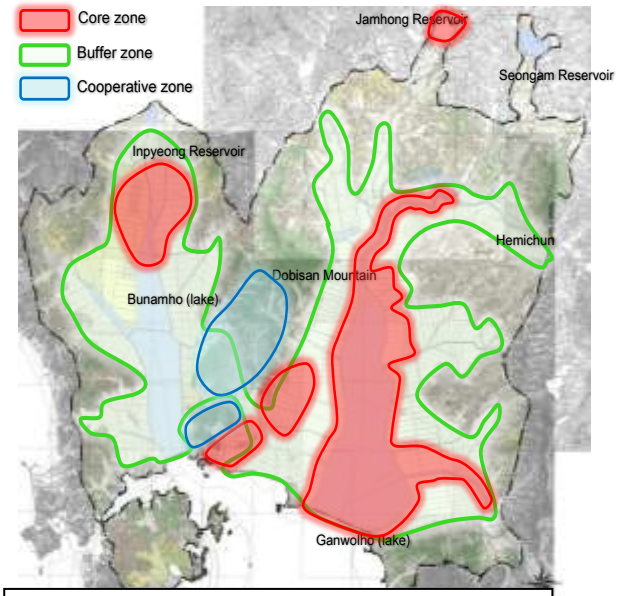
conservation and wise use of Cheonsu bay in regular basis. Ramsar Convention, EAAFP, BirdLife International, WWF and RamNet Japan for rice paddies will be able to include.

2.3.6 Suggestions for Conservation of Hooded Cranes through NEASPEC

1) Suggested strategy for conservation and better management of species and habitat

a. Strategy for management and restoration of scoping survey sites

In 2013, ERF Korea and the University of Seoul set a plan supported by Seosan city about Environmental and Ecological Planning for Conservation of Habitat and Sustainable Development of Cheonsu Bay. Seosan city has been preparing to designate Cheonsu Bay as a national wetland protected area and Ramsar site. It is a stopover as well as wintering habitats of Hooded Cranes. It is also populated by endangered migratory birds including Oriental White-Storks, Whopper Swans, Spoonbills, and others. Hundreds of thousands of baikal teals and geese come to Cheonsu Bay regularly and it is an East Asian-Australian flyway. Hooded Cranes, spoonbills, whooper swans and others that stop over at Cheonsu Bay make up 1% of the total water birds.



[Figure 78] Zoning plan of Cheonsu Bay

In order to protect bird habitats and ensure sustainability, they break down Cheonsu Bay into core zone, buffer zone, and cooperative zone. The core zone includes Ganwol lake, Inpyung and Jamheung reservoirs and streams and some paddy fields where birds inhabit. The buffer zone is all paddy fields. The cooperative zone contains the Seosan Birdland and Buseok village where cooperative programs with local communities are possible.

As to streams in the core zone, prevention of pollutants and restoration of ecosystem come first. Concerning lakes, water circulation and management of sediments are crucial. In particular, it is necessary to restore wetlands with a low water level where aquatic plants are growing near reclaimed lakes and to bring back salt marshes by circulating currents in some space.

With respect to paddy fields in the core zone, eco-friendly farming, flooded paddy fields and wetland restoration should be scaled up. Especially, farmlands owned by Hyundai should be restored as a core habitat for migratory birds. As to paddy fields in the buffer zone, grains should be stored in the field to feed migratory winter birds.

In the cooperative zone, eco-tourism led by local communities should be a priority. Traditional landscape of villages should be maintained and local accommodations, food and eco-tourism programs be developed. Engagement should also be considered to include not only Seosan city but also Hongseong-county and Taean-county in joint efforts to protect Cheonsu Bay.

b. Strategy for breeding ground

Not available

c. Joint action to designate more protected areas for HC in the region

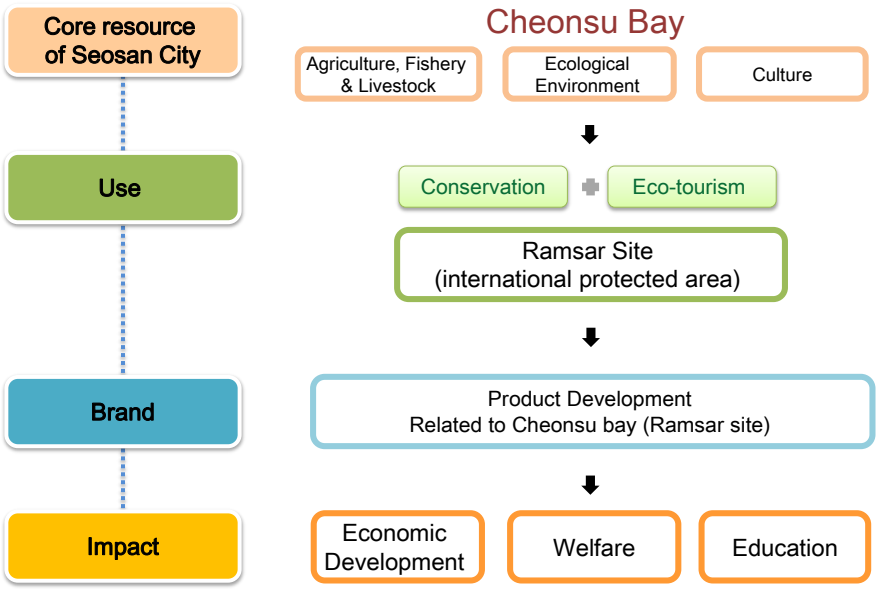
There is need to expand the protection area of Cheonsu Bay's ecosystem by linking with farmlands in Hongseong-gun near the bay and Taean Seashore National Park as well as Seosan City. Attention and willpower of the local community are absolutely needed for the expansion of and linkage with the protection area. Thus, cooperation is suggested by offering economic synergetic effects through eco-tourism in a wide range.

International cooperation and attention are needed to create a major wintering site for Hooded Cranes along with China's Chongming Dongtan and Japan's Izumi.

d. Cooperation for increasing public awareness

As for Suncheon Bay of ROK, more than 1,000 Hooded Cranes have started to arrive at the bay since 2014. In response, Suncheon City has created its brand as "City of Cranes" and has raised the public awareness regarding self-esteem of Suncheon Bay which is famous for Hooded Cranes.

At Cheonsu Bay, hundreds of Hooded Cranes on average are observed during the winter season and the number even exceeds 4,000 in March when they are moving north. But, this is not well known to the public since there is a lack of locals' attention. Thus, there should be a change of local governments' policy that can turn protection of habitats for Hooded Cranes and eco-tourism into a new driving force behind the regional development, thereby changing the perception of locals.



[Figure 79] Concept of sustainable local development at Cheonsu Bay

2) Priority actions/ areas of work for conservation and rehabilitation of key

HC sites in the region

There are roles of governments, local communities, experts and the local media to set up a cooperation network for sustainable regional development. Chungnam province and Seosan city should try together to have Cheonsu Bay designated as a Ramsar site. And they should establish sustainable regional development plans and support eco-tourism marketing. Experts need to carry out professional monitoring and analysis of bio-cultural diversity. They should suggest environmental ecological planning integrated to the sustainable regional development plan.

Local communities should cultivate related biodiversity and local residents should serve as eco-interpreters actively running eco-tourism programs. Local farmers should leave grains and straws on fields, have some flooded paddies fields and restore habitats for Hooded Cranes. The local media should develop stories unique to Cheonsu Bay and promote it so that it can be designated as a Ramsar site to contribute the local development.

Lastly, the cooperation network should expand Chungnam province including Hongseong county, Taean county and spread out the best practice of good management between sustainable agriculture and protecting habitat of water bird in the reclaimed land around yellow sea.

[Figure 80] Cooperation network for sustainable local development at Cheonsu Bay

3) Future cooperative project for Hooded Cranes through NEASPEC framework

Cheonsu Bay should be developed into a stable wintering site from a long-term perspective to disperse the population of Hooded Cranes concentrated at the Izumi wintering site of Kyushu, Japan. More cooperation is needed to manage habitats, in order to make Cheonsu Bay a more stable stopover during a period when Hooded Cranes are moving north.

References

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2.4 Scoping Survey in Japan: Izumi

Site name (Country)	Izumi (Japan)	**Submitted Date**	June 10th 2015
Complier name	Wild Bird Society of Japan	**Contact Information**	hogo@wbsj.org/ +81-3-5436-2633

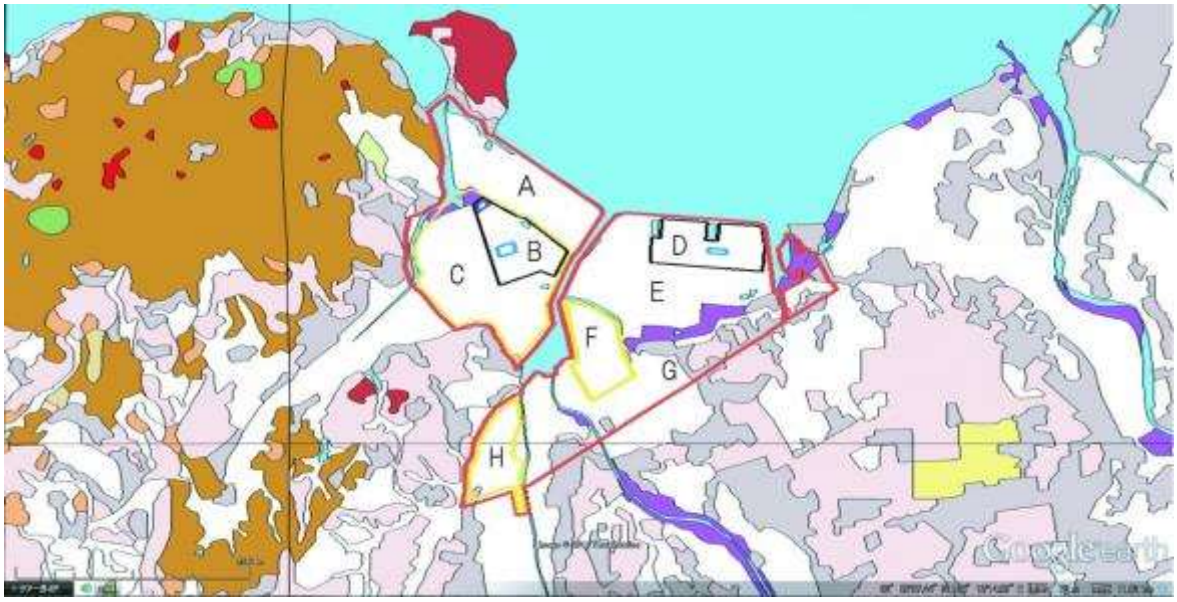
2.4.1 Biophysical Information

1) Location & site boundary

The site is a reclaimed land in the Izumi Plain, which lies in the northwest part of Izumi City, Kagoshima Prefecture, and southern Kyushu. The Izumi Plain is surrounded by the Yatsushiro Sea in the north and by mountains with an altitude of around 200 to 1000 m in the east and south, including the main peak, Mt. Shibisan (1066.8m). In the plain, three rivers, the Komenotsugawa, Takaono-gawa, and Noda-gawa rivers, flow towards the Yatsushiro Sea, and deltaic lowlying lands and reclaimed lands formed near the mouths of the rivers are the center of migration grounds for cranes. The site is nationally designated as Izumi/Takaono Wildlife Protection Area and Special Natural Monument designated under the Act for the Protection of Cultural Properties. Its area is 875.2 ha. Its coordinates are 32.103550, 130.274495.

2) Maps

[Figure 81] Location of Izumi and Izumi city



[Figure 82] Site (enclosed by red lines)

[Color coding for vegetation] White: Rice paddies and weeds; Purple: Reed beds; Light blue: Open waters; Pink: Residential areas

A: West reclaimed land; B: Arasaki (leased land); C: Arasaki; D: East reclaimed land (leased land, national Wildlife Protection Area (special protection area)); E: Higashi reclaimed land; F: Kohama; G: Shimozuru; H: Sho Yellow lines (C, F, H): Area designated as a special natural treasure Areas within red lines other than H: national Wildlife Protection Area

3) General description of the site

The site used to be a shallow mudflat, and was developed as a reclaimed land from t he 1690s to 1960s. Today, it is one of the best known reclaimed lands in the prefecture. It is used as farmland and a built-up area; on the farmland, mainly rice is grown during summer, and potatoes, barley, broccoli, broad beans, grass, and others are grown during winter. Hooded Cranes and White-naped Cranes migrate to the farmlands in winter, and therefore, farmlands in B and D in [figure 86] are leased by the national government or Izumi city, and access to the lands is prohibited. In coastal mudflats in the west reclaimed land, seaweed is grown.

A likely explanation for when cranes started to migrate to the site is after the old bank in Euchi was developed around the year 1700, but details are unknown. In documents of the Satsuma(old name of Kagoshima) clan, ”Sangoku Meishozue” or ”Seikei Zusetsu” in the 1840s, names of the Satsuma peninsula and the Osumi peninsula was cited as landing zones for migrating cranes, and there was no mention of Izumi. However, it is on record that bones of cranes were unearthed from the Euchi midden (current wintering ground site) in the middle to late Jomon period (about 5000-3000 years ago).

In the Edo period, hunting cranes were strictly prohibited because they were regarded as a symbol of the Shogunate’s authority, but after the Meiji Restoration in 1868 cranes had been hunted and they drastically decreased in number throughout Japan. At that time, hunters came to Izumi from other prefectures, and the number of migrating cranes temporarily became zero, according to a record. The Game Act was established in 1895, and the Akune, Arasaki, and Sho districts were designated as game reserves in 1916 and 1917. Around these years, since paddy fields in Arasaki

were wet paddies, the rice acreage of the paddy fields was only one third of the current rice acreage and winter cropping was almost impossible there. In the 1920s and 1930s, horse-drawn carriages and eating facilities were provided for visitors who came to see cranes, and feeding was conducted by local people. In 1919, 150 to 160 Hooded Cranes and White-naped Cranes were observed. Around this year, cranes foraged in Euchi, Sho, Noda, etc., and roosted in Akune. In 1921, the Cranes in Kagoshima Prefecture were designated as a Natural Monument under "the Law for the Preservation of Historical Sites, Places of Scenic Beauty and Natural Monuments" of the Interior Ministry, and the Education Ministry and the Agriculture and Commerce Ministry started to subsidize feeding stuffs. The number of migrating cranes gradually increased to 440 in 1927 and to 3908 in 1939. As the population of cranes increased, damage to barley farming, which was a thriving industry around those years, became a problem. In 1936, the Education Ministry started to subsidize feeding stuffs in order to prevent damage to agricultural crops.

The Sino-Japanese War and the Pacific War, which broke out in 1937 and 1941, respectively, forced the protection of cranes to be halted, and the number of cranes decreased to less than 300 after the Wars. In 1952, Arasaki and cranes migrating there were designated as a Special Natural Monument referred to as "the cranes in Kagoshima Prefecture and their migrating site", and feeding was resumed. The west and east reclaimed lands were completed in 1962 and 1965, respectively; since it was likely that this would make it possible for them to provide roosts for cranes, so in 1964, Izumi city bought 1.5 ha of paddy fields in Arasaki and provided them with a moderate amount of water to create roosts.

These protective measures helped increase the population of cranes to more than 3000, but as the population increased, the agricultural damage became problems again. In 1972, therefore, 11 ha of paddy fields in Arasaki were leased as a feeding ground for cranes during winters (the area was enlarged to about 50 ha in 1979). The leased lands were enclosed with nets, and access to them was prohibited, making them the center of the area used by cranes.

The concentration of overwintering cranes into Izumi also became another problem, so about 53 ha of the east reclaimed land was additionally leased in 1996 to provide feeding grounds and roosts.

4) Climate zone and major features

The altitude is 0 to less than 10 m, and the climate is humid subtropical. The annual average rainfall is 1959.4 mm, and rainfall tends to be highest during the rainy season from June to July (in Izumi city). The average temperature is 17.5ºC. During winter, it is relatively warm thanks to the effect of the ocean, but in the Izumi Plain, strong north-northeast winds blow throughout the year, and it makes feel colder than temperatures in winter. Cool breezes blow during summer.

Although the site is not designated Ramsar site yet, it satisfies criteria 2 and 6 for Hooded Crane and White-naped Crane, and criterion 6 for Eurasian Wigeon, and is selected as a potential candidate. It is expected to be classified as class 3 of Human-made wetlands, "Irrigated land, including irrigation channels and rice fields."

5) Soil (structure and color) and Geology

The west and east reclaimed lands and Arasaki are reclaimed lands. The Shimozuru, Noda, and Sho districts are silty alluvial areas.

6) Water regime

The headwaters of the Komenotsu-gawa, Takaono-gawa, and Noda-gawa rivers, which flow accross the site, are the Shibisan massif and Mt. Yahazu-dake (the Hisatsuyama massif). The levels of ground water at the center of the plain are 2 to 3 m at the shallowest point and about 10 m at the deepest point (Onohara-cho). There used to be many springs, after which Izumi is said to have been named, throughout the edge of the alluvial fan near the site. Tidal level: The Sum of tidal harmonic constant is 318 cm (Akune city).

7) Main ecosystem services

Supply of food (rice), and recreation (sightseeing focusing on cranes, bird-watching, etc.). Regional symbol (the city's bird is the crane), and inspiration for culture and art. Environmental education, maintenance of genetic diversity (conservation of endangered species).

8) Photographs

[Figure 83] The site during winter

[Figure 84] East reclaimed land. During winter, leased lands are enclosed with shading nets, and observation huts are set up.

[Figure 85] Hooded Cranes and White-naped Cranes rest in paddy fields with water during winter, which were developed on leased land in Arasaki.

[Figure 86] Cranes are foraging wheat on the feeding station in Arasaki.

2.4.2 Species' Information

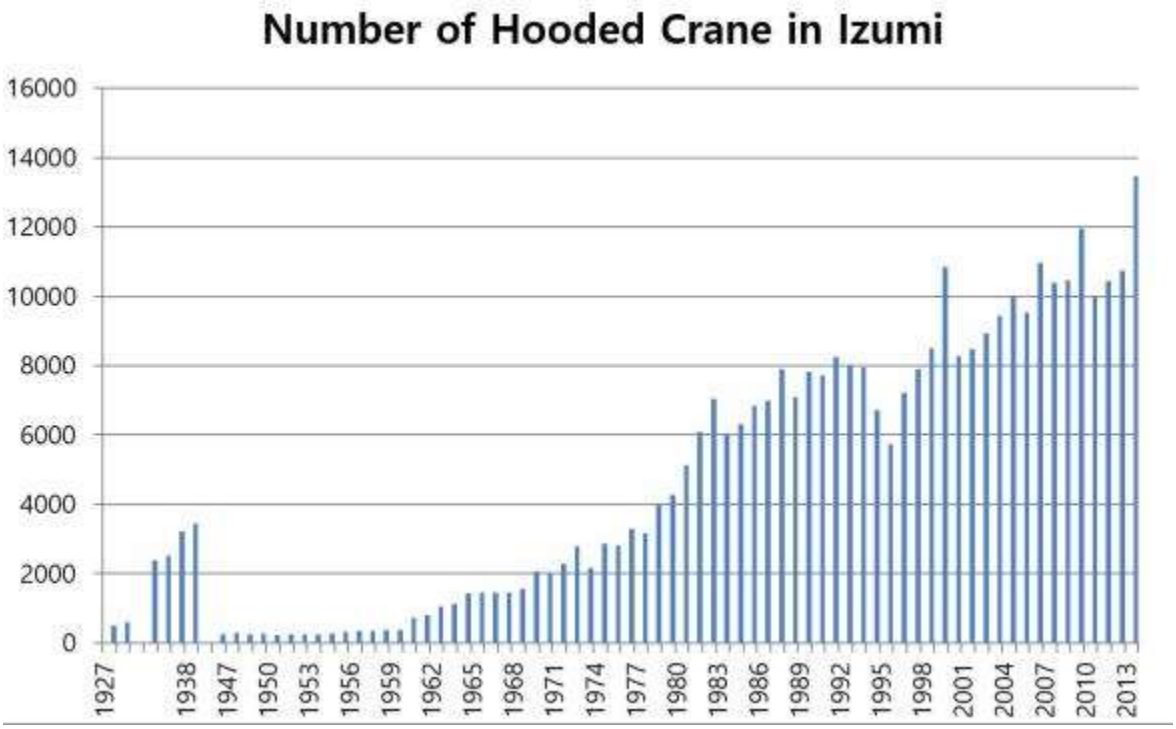
1) Hooded Cranes' Population

a. Numbers of Hooded Crane in the site in 2014-2015

11/8/2014 11,802 cranes 11/15/2014 13,472 cranes

*Field studies were cancelled on Dec. 6, 13, 20 and Jan. 10 due to highly pathogenic bird flu. (Conducted by the Kagoshima Crane Conservancy)

b. Numbers and trends of Hooded Crane in the site from 2003[1] to 2015



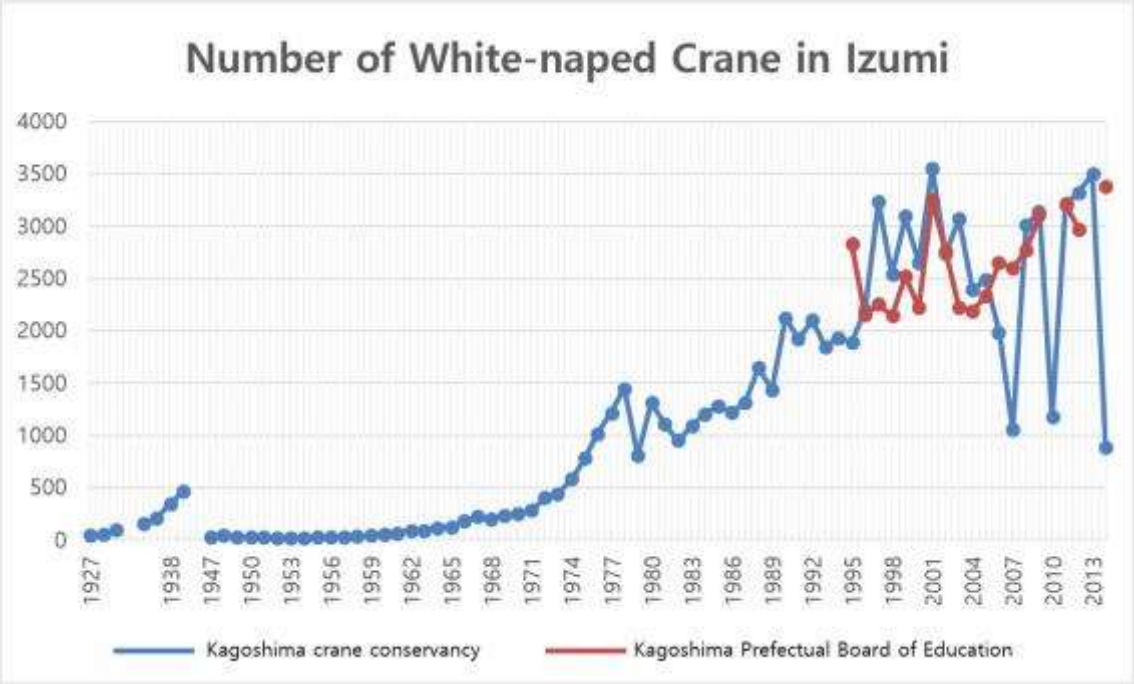
[Figure 87] Changes in the population of Hooded Crane in Izumi

(Plotted based on research data of Kagoshima crane conservancy)

[Table 5] Results of research: Number of Cranes in Izumi (*soruce from the website of Izumi City Crane Museum, Crane Park Izumi)

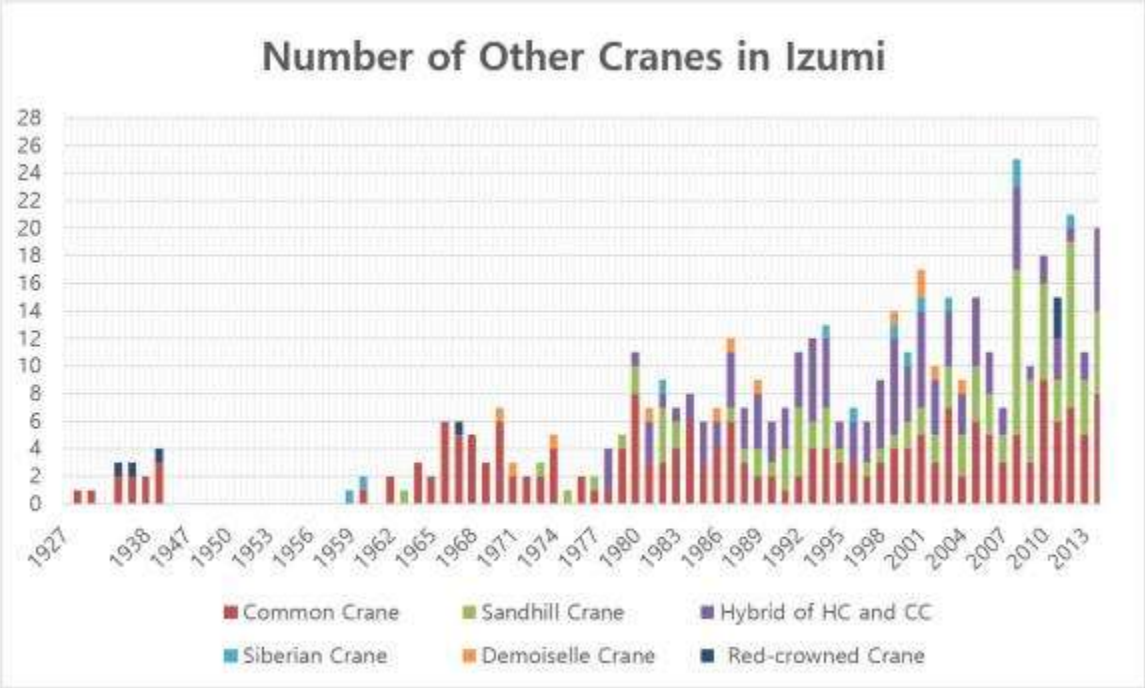
	Hooded Cranes	White-naped crane	Red-crowned Crane	Common Crane	Siberian Crane	Sandhill Crane	Demoiselle Crane	Hybrid HC and CC	Total
1927	400	40							440
1928	500	60		1					561
1929	600	100		1					701
—									
1936	2,381	158	1	2					2,542
1937	2,510	211	1	2					2,724
1938	3,217	347		2					3,566
1939	3,435	469	1	3					3,908
—									
1947	250	25							275
1948	300	50							350
1949	245	30							275
1950	265	28							293
1951	218	23							241
1952	243	20							263
1953	259	20							279
1954	255	22							277
1955	274	25							299
1956	318	27							345
1957	356	31							387
1958	350	34							384
1959	375	45			1				421
1960	376	60		1	1				438
1961	723	71							794
1962	811	96		2					909
1963	1,053	95				1			1,149
1964	1,127	121		3					1,251
1965	1,442	129		2					1,573
1966	1,467	181		6					1,654
1967	1,450	221	1	5					1,677
1968	1,452	203		5					1,660
1969	1,562	233		3					1,798
1970	2,072	257		6			1		2,336
1971	2,023	287		2			1		2,313
1972	2,286	401		2					2,689
1973	2,793	449		2		1			3,245
1974	2,158	582		4			1		2,745
1975	2,867	781				1			3,649
1976	2,813	1,021		2					3,836
1977	3,296	1,220		1		1			4,518
1978	3,179	1,448		1				3	4,631
1979	3,962	808		4		1			4,775
1980	4,273	1,318		8		2		1	5,602
1981	5,127	1,112		3			1	3	6,246
1982	6,096	950		3	1	4		1	7,055
1983	7,036	1,095		4		2		1	8,138
1984	6,029	1,212		6				2	7,249
1985	6,319	1,284		3				4	7,610
1986	6,848	1,225		4			1	2	8,080
1987	6,984	1,316		6		1	1	4	8,312
1988	7,893	1,653		3		1		3	9,553
1989	7,106	1,439		2		2	1	4	8,554
1990	7,833	2,120		2		1		3	9,959
1991	7,728	1,925		1		3		3	9,660
1992	8,259	2,102		2		5		4	10,372
1993	8,026	1,852		4		2		6	9,890
1994	7,951	1,927		4	1	3		5	9,891
1995	6,707	1,891		3		1		2	8,604
1996	5,747	2,201		3	1			3	7,955
1997	7,231	3,232		2		1		3	10,469
1998	7,904	2,535		3		1		5	10,448
1999	8,511	3,093		4	1	1	1	7	11,618
2000	10,855	2,655		4	1	2		4	13,521
2001	8,273	3,555		5	1	2	2	7	11,845
2002	8,490	2,737		3		2	1	4	11,237
2003	8,940	3,069		7	1	3		4	12,024
2004	9,432	2,397	1	2		3	1	3	11,839
2005	10,027	2,486		6		4		5	12,528
2006	9,530	1,991		5		3		3	11,532
2007	10,973	1,059		3		2		2	12,039
2008	10,383	3,010		5	2	12		6	12,028
2009	10,468	3,142		3		6		1	11,637
2010	11953	1176		9		7		2	13147
2011	10,024	3,198	3	6		3		3	13,237
2012	10,441	3,327		7	1	12		1	13,789
2013	10,748	3,500		5		4		2	14,259
2014	13,472	886		8		6		6	14,378

c. Numbers of other associated birds



[Figure 88] Changes in the population of White-naped Cranes in Izumi

(Plotted based on research data of the Kagoshima crane conservancy and Kagoshima Prefectual Board of Education)



[Figure 89] Changes in the population of other cranes in Izumi

(The data were sourced from the website of Izumi City Crane Museum, Crane Park Izumi)

2) Hooded Crane behavior in the site

a. Breeding behavior

Not available in the sites

b. Feeding behavior

In leased lands in Arasaki and in the east reclaimed land, cranes are fed with wheat every morning from 6:30 during the period from November to March, and so most of them forage there in the early morning. After eating the feed, they disperse to the site or farmlands near the site in Euchi, Noda, Shiomi, Imagama, etc. About 90% of Hooded Cranes use the site. Cranes forage in farmlands gleans left after harvest or, rice shoots grown after harvest, plant roots, insects, and small aquatic animals and plants. Just after arriving, they do not strongly depend on artificial feeding. This is probably because there are many food sources such as post-harvest rice shoots on farm lands and their vigilance is particularly high immediately after migration. From February to March, they are also fed with small fish, but do not heavily depend on it. They often stay in family groups in areas other than Arasaki, and the east and west reclaimed lands.

c. Roosting behavior

Roosts are prepared in the east reclaimed land from October and in Arasaki from November; therefore, cranes roost in the east reclaimed land in October, and then in Arasaki and the east reclaimed land after November. After their population increases, they also use, as roosts, paddy fields with natural water.

The area of prepared roosts is 5.5 ha in total, and the average area of roosts per crane is 4.7 ㎡ (in 1997 to 2009); however, since cranes roost close to each other during night time, the actual distances between them are probably smaller than the figures suggest. Formerly they used mudflats at river mouths, etc., but currently no roosts have been observed under natural conditions.

d. Other noteworthy behavior

As the number of overwintering cranes has increased, their migrations have become earlier; the day of the first arrival used to be in mid-October, but currently it is in early October. Also, the day of the first departure used to be in mid-February, but currently it is in late January. Records of observation of banded cranes show the philopatry of Hooded Cranes and Whitenaped Cranes in wintering grounds; in some cases, Hooded Cranes used almost the same paddy fields for 14 years as their territories.

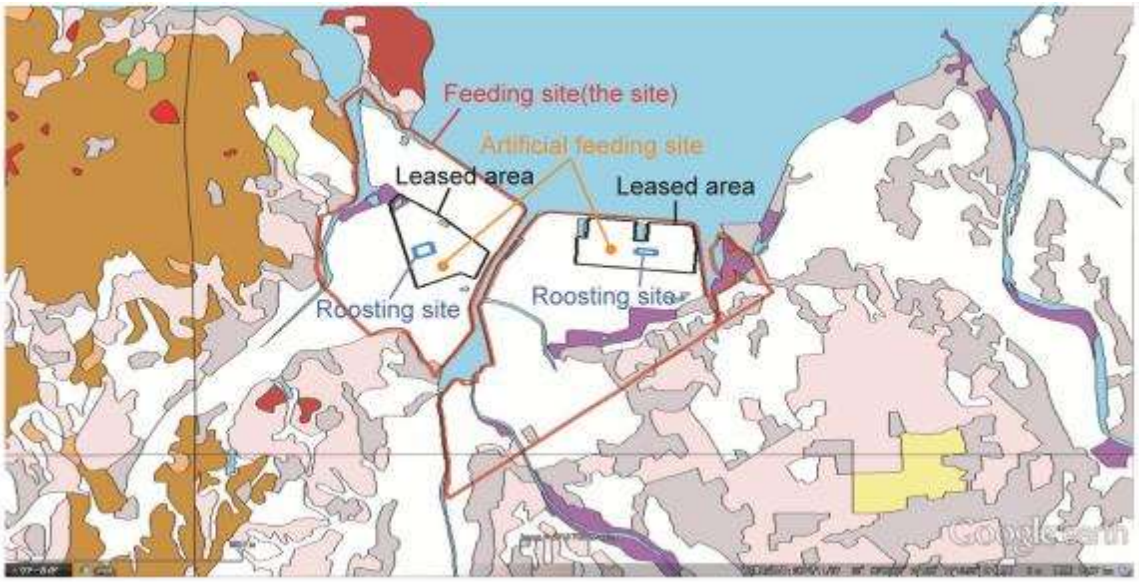
3) Noteworthy fauna and flora

- Black-faced Spoonbill, Platalea minor (the Environment Ministry's red list category: IB; IUCN red list category: EN)

- Eurasian Spoonbill Platalea leucorodia (Environment Ministry: DD; IUCN: LC)
- Common Shelduck, Tadorna tadorna (Environment Ministry: II; IUCN: LC)
- Far Eastern Curlew, Numenius madagascariensis (Environment Ministry: II; IUCN: VU)
- Common Redshank, Tringa totanus (Environment Ministry: II; IUCN: LC)
- Black-winged Stilt, Himantopus himantopus (Environment Ministry: II; IUCN: LC)
- Oriental Pratincole, Glareola maldivarum (Environment Ministry: II; IUCN: LC)
- Eastern Marsh Harrier, Circus spilonotus (Environment Ministry: IB; IUCN: LC)
- Peregrine falcon, Falco peregrinus (Environment Ministry: II; IUCN: LC)
- A rare species of Batillaria multiformis (Batillaria)
- A rare species of Assimineidae
- A rare species of Ellobium chinense
- Chaenogobius uchidai (Environment Ministry: II; IUCN: Not evaluated)
- Fiddler crab, Uca lacteal (Environment Ministry: II; IUCN: Not evaluated)
- Parasesarma plicatum. Southern limit of the range in the Sea of Japan of the species (Environment Ministry: Not ranked; IUCN: Not evaluated)
- Gymnogobius scrobiculatus. Southern limit of the range in the Sea of Japan of the species (Environment Ministry: IB; IUCN: Not evaluated) [3]

2.4.3 Habitat Information

1) Ecological features of the site



[Figure 90] Locations of foraging places and roosts in Izumi

*** [Color coding] White: Rice paddies and weeds; Purple: Reed beds; Right blue: Open waters; Pink: Residential areas**

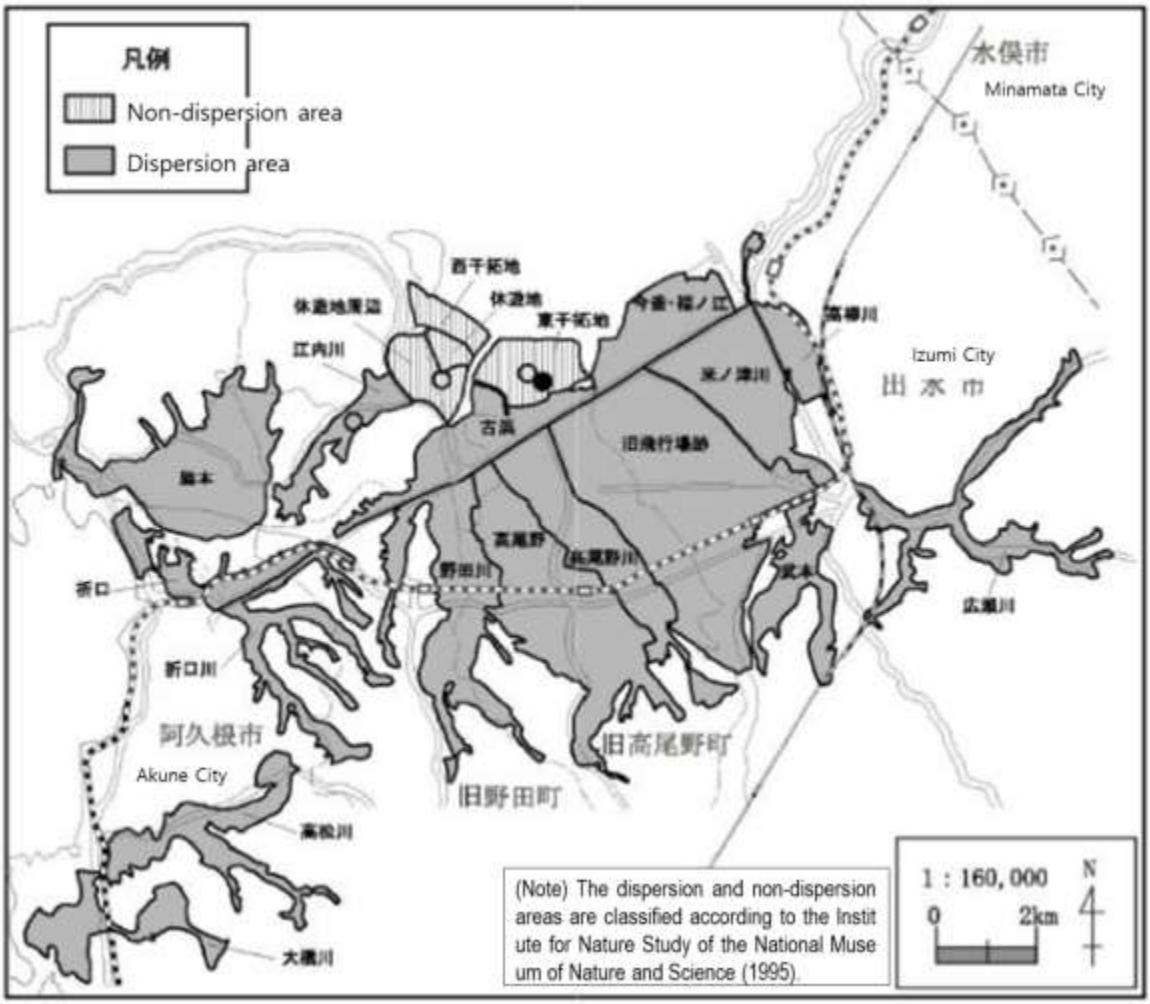
2) Dominant flora communities of the site

- ✓ Foraging zones: Rice, paddy weeds, vegetables (potatoes, broccoli, broad beans, grass, barley, etc.), common reed.
- ✓ Roosting zone: Rice, paddy weeds.

3) (Past and) Present land use of the site

- ✓ Foraging zones: Farmlands. During winter, some of them serve as protected areas for cranes. (Farmlands are leased, and access to them is prohibited.)
- ✓ Roosting zone: Farmlands. During winter, they serve as protected areas for cranes. (Farmlands are leased, and are provided with water during winter. Access to them is prohibited.)

4) Potential areas to be habitat for species



[Figure 91] Areas used by cranes in Izumi (gray zone)

***Excerpt from the Long-term Crane Protection Study in FY 2013 by Izumi City Board of Education**

5) Threats

	Current Threat	Potential Threat
A. Residential and commercial development		
Housing and urban areas	☐	☐
Commercial and industrial areas	☒	☐
Tourism and recreation areas	☒	☐
Others or additional notes: Solar panels are increasing in large numbers in areas not used by cranes. There is a plan for constructing a small hotel in the Shimozuru district.		
B. Agriculture and aquaculture		
Annual and perennial non-timber crops	☒	☐
Wood and pulp plantations	☐	☐
Livestock farming and ranching	☐	☐
Marine and freshwater aquaculture	☒	☐
Others or additional notes: At the site, vegetables are grown during winter, and there is the potential that the winter cropping areas will increase. It is concerned that the amount of rice left after harvest, which serves as food for cranes, will decrease. At the site, during the winters between 2010-2011 and 2014-2015, highly pathogenic avian flu virus was detected in cranes. In Izumi City, chicken farming is common, and so there is friction with poultry producers. Moreover, the artificial feeding attracted many ducks, causing damage to seaweed farming on the coast of the site, and resulting in friction with local fishermen.		
C. Energy production and mining		
Mining and quarrying	☐	☐
Energy-related activities	☒	☐
Others or additional notes: Increase in solar panels		
D. Transportation and service corridors		
Roads and railroads	☒	☐
Utility and service lines	☐	☐
Shipping lanes	☐	☐

	Current Threat	Potential Threat
Flight paths	☐	☐
Others or additional notes: There is a plan for constructing an expressway in areas used by cranes during daytime, although they are outside the conservation area.		
E. Biological resource use		
Hunting and collecting terrestrial animals	☐	☐
Gathering terrestrial plants	☐	☐
Logging and wood harvesting	☐	☐
Fishing and harvesting aquatic resources	☐	☐
Others or additional notes: On the coast of the site, laver seaweeds are farmed, and sweetfish, eels, carps, and Japanese mitten crabs are commercially fished, but these fishery do not affect cranes.		
F. Human intrusions and disturbance		
Recreational activities	☒	☐
War, civil unrest and military exercises	☐	☐
Work and other activities	☒	☐
Others or additional notes: Since most protected areas for cranes are farmlands, there may be disturbance due to access by farmers or sightseers. There may also be disturbance by local peoples walking with dogs		
G. Natural system modifications		
Fire and fire suppression	☒	☐
Dams and water management/use	☒	☐
Landfill and/or Reclamation	☒	☐
Other ecosystem modifications	☒	☐
Others or additional notes: Controlled burning is sometimes conducted in farmlands, forcing cranes to fly away, but they return because of their preference for remaining in the same area. Wetland in the Arasaki district was reclaimed and converted into a woodyard. Farmlands have been turned into dry paddy fields through land improvement projects, resulting in the loss of saline environments.		
H. Invasive and other problematic species and genes		
Invasive non-native/alien species	☒	☐

	Current Threat	Potential Threat
Problematic native species	☐	☐
Introduced genetic material	☐	☐
Others or additional notes: Cranes are sometimes disturbed by several stray cats living at the site. Weasels and foxes also live at the site, but since their numbers are small, they have little effect.		
I. Pollution		
Household sewage and urban waste water	☐	☐
Industrial and military effluents	☐	☐
Agricultural and forestry effluents	☐	☐
Garbage and solid waste	☒	☐
Air-borne pollutants	☒	☐
Excess energy	☐	☐
Others or additional notes: There is a lot of trash on the coast of the site. Abandoned agrichemicals were also found. In recent years, PM 2.5 has been an issue.		
J. Climate change and severe weather		
Habitat shifting and alteration	☐	☐
Droughts	☐	☐
Temperature extremes	☐	☐
Storms and flooding	☐	☐
Others or additional notes:		

2.3.4 Socioeconomic and Stakeholders Information

1) Stakeholders of the site

a. Stakeholders influential to site management

(1) Decision makers: Izumi City, Kagoshima Prefecture, Environment Ministry, Agency for Cultural Affairs, and local residents.

(2) Property owners: Individuals (farmers, residents, etc.), companies, Izumi City, etc.

(3) Developers: Companies and organizations related to the tourism industry, solar power companies, Ministry of Land, Infrastructure, Transport and Tourism, etc.

(4) Community: Land Improvement District office, Kagoshima Izumi Agricultural Cooperative, Marui Agricultural Cooperative (chicken farming), Izumi City Tourism Association, Izumi Chamber of Commerce, etc.

(5) Conservancies: Izumi City Crane Museum, Crane Park Izumi (Izumi City), Kagoshima Crane Conservancy (organization of the governments concerned).

(6) Advisors, etc.: Izumi Crane and Wildlife Research Group, Kagoshima Environmental Research and Service, Kagoshima University, International White-naped and Hooded Crane Network

(7) Others: Elementary and Junior High Schools such as Izumi Municipal Sho Junior High School and Izumi Municipal Takaono Junior High School.

b. Stakeholders impacted by site management

Izumi City, Environment Ministry, Agency for Cultural Affairs, Kagoshima Crane Conservancy, farming households, chicken farming households

2) Socioeconomic significance

a. Relevant cultural/economic values of the site

The site is the world's largest wintering ground for Hooded and White-naped Cranes, at about 90% and 50%, respectively, of their worldwide populations; therefore, the site plays domestically and internationally a very important role in conserving endangered species and biological diversity. The site is designated as a Special Nnational Natural Monument by the Agency for Cultural Affairs and as a Wildlife Protection Area (Special Protection Area) by the Environment Ministry. Although the site is not a wetland designated under the Ramsar Convention, it satisfies criteria 2 and 6 for Hooded Cranes and White-naped Cranes, and criterion 6 for Eurasian Wigeon. It is also selected by the Environment Ministry as one of Japan's 500 important wetlands, an important socio-ecological production landscape (satochi-satoyama) for conservation of biological diversity, and one of Japan's 100 soundscapes to be conserved.

Cranes are a major tourism resource of Izumi City; in the city, there are a crane observation center,

a museum, restaurants, hotels, etc., and there are products and events bearing the name of a crane. Also, cranes are the symbol of the city; for example, the city's emblem has a design of cranes, and the city took the opportunities afforded by cranes to sign friendship agreements with domestic and foreign cities, such as Kushiro City, Hokkaido; Shunan City, Yamaguchi Prefecture; and Suncheon City, ROK.

Local elementary and junior high schools provide education programs and research on cranes, as they serve as a good material for environmental education. For example, the crane clubs of Municipal Sho and Takaono Junior High Schools work as researchers for a study of counting the number of cranes conducted six times in a winter by the Kagoshima Crane Conservancy. The results of the studies are treated as official records of the population of cranes in Izumi. The crane clubs received, for their activities, the Education Minister's Encouragement Prize in a meeting of National Presentation on Protection Activities for Wildlife, Jiji Press' Educational Encouragement Prize, and the Education Minister's prize for contributors at the 50th anniversary of the Act for the Protection of Cultural Properties. There is a system where elementary and junior high school students in the city act as volunteer guides at the crane observation center, creating opportunities for emotional education and social experience.

b. Main economic activities and general income

The gross production of Izumi City is about ¥157 billion (FY 2012), and the primary, secondary and tertiary industries account for 5%, 22.5%, and 71.9%, respectively. The city's key industry is agriculture; the products produced include agricultural products such as rice, broad beans, strawberries, tomatoes, and trees for afforestation, in addition to citruses such as Satsuma mandarin, and animal products such as chicken meat, eggs and beef cows. In particular, the production of chicken meat and eggs is a thriving industry with the second largest production volume in the nation. The main sector of the fishery industry is the small-scale coastal fishery of kuruma-ebi prawns, flatfishes, etc. In the secondary industry, manufacturing and construction are the first and second largest sectors, respectively. Wholesale and retail trade, medical care, and welfare account for half of the tertiary industry. The site is one of the best known reclaimed lands in the prefecture, and is used mainly for agriculture, such as rice and vegetable growing, and chicken farming.

3) Access and tourism

a. Annual visitor numbers and visitors characteristics

The number of tourists to the city per year is about 800,000. Among of them, about 150,000 people visit the site. Many of them come from outside Kagoshima Prefecture, also including foreign tourists coming mainly from ROK, Hong Kong, and Taiwan.

b. Access to the site

Kagoshima Airport — Bus (Nangoku Kotsu: about 1 hr. and 20 min.) — Izumi Station —Taxi, rental car, Izumi crane sightseeing excursion bus (about 20 to 25 min) — Site

http://www.city.izumi.kagoshima.jp/izumi05/01kankoguide/05kotsu.asp#sec06

http://www.kanko-izumi.com/bus.html

http://izumikan.boo.jp/stairu/access.html

c. Visitor facilities and infrastructure

Izumi Crane Observation Center Entrance fee: ¥210 for adults Facilities: Restroom, parking space, restaurant, shops, rooms for exhibition on cranes, telescope, and observatory (rooftop). Guides are available at all times.

http://www.city.izumi.kagoshima.jp/izumi08/04shisetu_19.asp

* Outside the site (about 20 min by car from the site. About 6 km in direct distance.)

- ✓ Izumi City Crane Museum, Crane Park Izumi
- ✓ Entrance fee: ¥320 for adults
- ✓ Facilities: Restroom, parking space, exhibition rooms. Curators are available at all times. Crane watching tours and other events are conducted regularly. http://www.city.izumi.kagoshima.jp/izumi_crane/default.asp

d. Reasons to visit the site

The site is one of the globally rare wintering grounds where many Hooded Cranes and White-naped Cranes, which are rare species, can be easily seen up close. The site is designated as a special natural monument by the Agency for Cultural Affairs and as a Wildlife Protection Area (Special Protection Area) by the Environment Ministry.

e. Income generated from tourism

Unknown because not researched in Izumi City. The revenue of the Crane Observation Center is about ¥8 million.

f. Research and education facilities

- ✓ Izumi City Crane Observation Center: Guides and exhibitions are provided to visitors.
- ✓ Outside the site ・Izumi City Crane Museum, Crane Park Izumi (about 20 min by car from the site. About 6 km in direct distance.)

  (1) Researches: Research on the population of wintering cranes in Izumi, research on the number of White-naped Cranes jointly by Japan and ROK, research on the use of dispersion areas in Japan and China, verification research on banded cranes, research on the number of ducks, birds census, and international exchange of information on cranes.

  (2) Promotional education: Exhibitions, provision of learning and on-demand lectures on cranes and nature for students, acceptance of volunteer staff, and guide for the public.

2.3.5 Planning and Management Information

1) Tenure and Ownership

a. The site

- ✓ Land: Individuals such as farming households and residents, companies, Izumi City, etc. A ((special protection area)) and B (part of the designated special natural area) in figure 82 are leased from farming households as a feeding station for cranes, from October to February and from November to March, respectively.
- ✓ Rivers, river mouths, (Takaono-gawa river, Noda-gawa river, Euchi-gawa river, Jabuchigawa river, Urata-gawa river): Country

b. Surrounding areas

Individuals such as farming households and residents, companies, Izumi City, etc.

2) Status of legal protection/management

a. Current status of legal protection (local, national and international)

- ✓ Areas in yellow lines in [figure 82 (C, F, H)]: Designated as Special Natural Monument areas
- ✓ Areas in red lines other than H in [figure 82]: Nationally designated Izumi/Takaono Wildlife Protection Area (Special Protection Area)

b. Administrative authority in charge of management

- ✓ Areas in yellow lines in [figure 82 (C, F, H)]: Agency for Cultural Affairs, Kagoshima Prefecture, and Izumi City
- ✓ Areas in red lines other than H in [figure 82]: Environment Ministry, Kagoshima Prefecture, and Izumi City

c. Current management measures taken by the authorities

- ✓ Designation of Special Natural Monument and Wildlife Protection Area (Special Protection Area)
- ✓ Leasing of lands from farming households, and prohibition of human access and shading of light by installation of nets along boundaries
- ✓ Provide roosts by filling water to paddies during winter
- ✓ Provide bird prevention materials (nets, string, red-silver tape, poles) to farm fields with winter cropping (*These are provided on request to farming households outside the site in the city)
- ✓ Dispatch of patrols for cranes (Kagoshima Crane Conservancy). During winter migration they patrol every day for early detection of injured, sick, dead, and weakened birds
- ✓ Drive off ducks attracted by provided feed that cause damage to seaweeds farmed nearby
- ✓ Facilities for disinfecting the soles of shoes and cars at doorways of the Crane Observation Center and parking spaces for prevention of highly pathogenic bird flu (If bird flu is

suspected, manned or unmanned disinfection points are set up in multiple parts of reclaimed lands in addition to the above to spray lime hydrate or antiseptic solution onto cars for disinfection or to confirm the death or weakening of birds)
- ✓ Set-up of a crane protection center (housing and protection of sick or injured birds)
- ✓ Feeding of cranes with wheat from November to March. About 1t per day. Feeding of cranes with fish from February to March (Only in Arasaki)
- ✓ Restoration work for farm fields with dikes collapsed by foraging cranes
- ✓ Examination of excrement of cranes once per month, and examination of water at roosts once per week, for prevention of highly pathogenic bird flu, etc.

d. Current scientific research and facilities

- ✓ Research on the population of wintering cranes (Kagoshima Crane Conservancy)
- ✓ Research on distributions (Izumi City) ・Research on the use of dispersion areas during daytime (Izumi City) ・Verification research on banded cranes (Izumi City)
- ✓ Follow-up research on banded cranes (Izumi City)
- ✓ Research on the number of ducks (Izumi City) ・Research on the number of White-naped Cranes jointly by Japan and ROK (Izumi City)
- ✓ Examination of excrement of cranes and water at roosts concerning highly pathogenic bird flu. (National government, Kagoshima Prefecture, and Izumi City. Outsourced to: Kagoshima University)
- ✓ Anatomy of dead cranes
- ✓ Genetic testing of saved/dead cranes concerning highly pathogenic bird flu. Confirmation testing of cranes if testing positive
- ✓ Simple examination of saved cranes concerning highly pathogenic bird flu. (Izumi City) Facility: Crane protection center
- ✓ Monitoring of wild birds by wildlife surveyors (Environment Ministry)

3) Participation and cooperation with local community (Any CEPA (Communication, Education, Participation and Awareness) programme for community)

- ✓ Students from two local junior high schools participate as researchers in annual research on the population of overwintering cranes. Citizen volunteers also participate in annual research on the number of birds
- ✓ In addition, schools provide learning on cranes
- ✓ Tests are carried out by Izumi City for certification of Izumi Crane Expert Guides. Certified persons are working as volunteer guides at the observation center
- ✓ The Izumi City Crane Museum, Crane Park Izumi, provides children, teachers, and other people with lectures or learning on cranes and nature. It accepts volunteer staff, etc.

4) International Cooperation

a. International partners cooperating for site conservation

The site is designated as an important habitat network site for migratory water birds under the East Asian-Australasian Flyway Partnership. Since, also, Izumi is the world's largest wintering ground, its conservation is mentioned in the Crane Working Group of the East Asian-Australasian Flyway Partnership or in the Crane Specialist Group of the IUCN Species Survival Commission.

b. Potential international partners' influential to site conservation

- ✓ International Crane Foundation
- ✓ Bird Life International
- ✓ WWF
- ✓ Wetlands International Japan
- ✓ International White-naped and Hooded Crane Network

2.3.6 Suggestions for Conservation of Hooded Cranes through NEASPEC

1) Suggested strategy for conservation and better management of species and habitat

a. Strategy for management and restoration of scoping survey sites

In Izumi City, the population of Hooded Cranes has dramatically increased due to feeding and roosts provided. Since, however, 90% of Hooded Cranes in the world concentrate in the city, the risk of infectious diseases and agricultural damage in and around protection areas have been prblems. Probably the current number of wintering cranes already exceeds the city's environmental capacity, and so it is necessary to moderate the population. It is necessary to consider methods and periods for feeding, roosts, and how to change leased lands. Moreover, in order to allow cranes to live as independently as possible from humans in the future, it is also necessary to create, in various locations, natural environments where Hooded Cranes can live. Methods for this also need to be considered.

Currently, the Environment Ministry is preparing to draw up a conservation plan for White-naped Cranes and Hooded Cranes. The conservation in Izumi is for the entire species, and so needs to be considered from the international point of view.

b. Strategy for breeding ground (ex. China, DPRK, ROK)

Izumi is not a breeding ground.

c. Joint action to designate more protected areas for BFS in the region

Cranes often use the Euchi district in Takaono-cho, Shiomi-cho, and Imagama-cho, which are around the site. If they are designated as protected areas by law, the development of farm land, etc. is expected to be restricted. Such designation in cooperation with parties concerned in Japan should be couraged.

d. Cooperation for increasing public awareness

Cranes need to coexist with local communities, and so it is necessary to increase opportunities for local residents to think about or participate in conservation. In the past, as part of international efforts, foreign researchers were invited to hold an international symposium in Izumi City. Events, promotional activities, etc. are required to increase the participation of citizens.

2) Priority actions/ areas of work for conservation and rehabilitation of key Hooded Crane sites in the region

Probably Izumi City's environmental capacity has already exceeded, and so it is necessary to moderate the population. Methods and periods for feeding, roosts, and how to change leased lands are raised as issues. Moreover, in order to allow cranes to live as independently as possible from humans in the future, it is also necessary to create, in various locations, natural environments where Hooded Cranes can live.

3) Future cooperative project for Hooded Cranes through NEASPEC framework

Currently, examinations on the population of wintering cranes are visually conducted, and so are affected by weather or the conditions of cranes, and also, the population has increased in recent years; therefore it is becoming difficult to identify it. Thus, new examination methods need to be developed. Cooperation by foreign researchers and financial support may be effective.

In addition, feed for cranes attract many other wild birds. In order to prevent this, it is probably necessary to develop new feeding methods, and carry out various investigations such as label-tracking and satellite-tracking investigations. Joint implementation of these may be an option to consider.

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4) IBA white paper, September 2010, Wild Bird Society of Japan

5) Report on the Assessment of Dispersion of Cranes for FY 2012, March 2013, Environment Ministry

6) Hearing Survey on the Formation of New Overwintering Places for White-naped Cranes and Hooded Cranes in Izumi City for FY 2014, March 2015, Environment Ministry

7) Website of Kagoshima Prefecture, Statistical Chart 2 (Gross Production of Municipal Governments), Estimations for FY 2012

8) Renewal Plan for Nationally Designated Izumi/Takaono Wildlife Sanctuary, November 2007, Environment Ministry

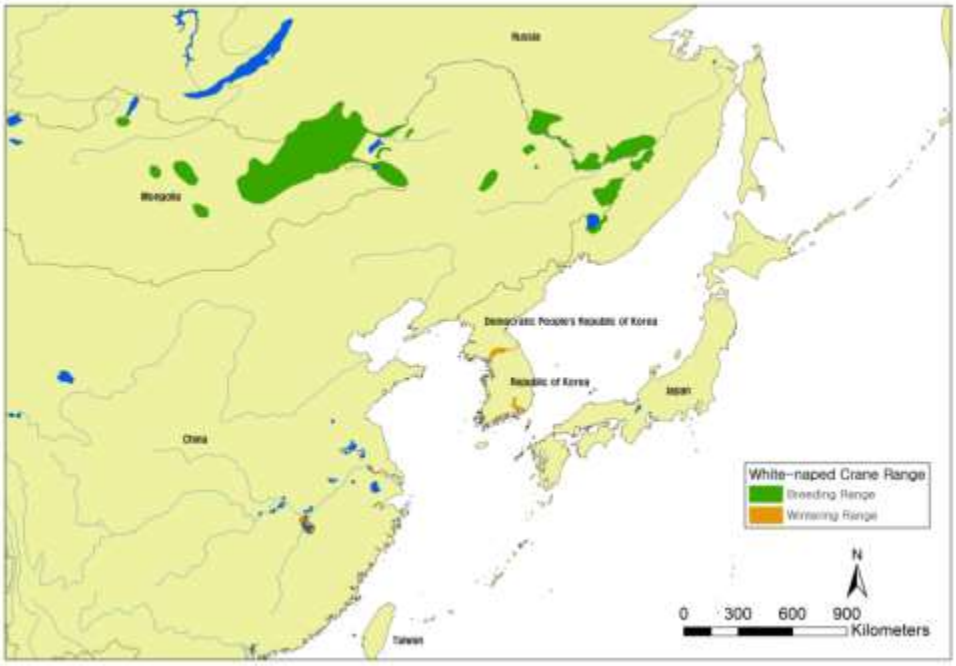
9)"History of Conservation of Cranes and Conservation Activities", 2012, Izumi City Crane Museum, Crane Park Izumi

3. White-naped Crane (*Grus vipio*)

3.1 Current status of the bird

White-naped Cranes *Grus vipio* is listed as a globally vulnerable species because it is thought to be experiencing a rapid and on-going population decline, largely for the loss of wetlands to agriculture and economic development (BirdLife International 2016).

The birds breed in northeastern Mongolia, northeastern China, and adjacent areas of southeastern Russia. It migrates along the Songwen plain and Gulf of Bohai to its wintering grounds in the Yangtze basin, mainly at Poyang Lake and along the Korean peninsula to the Demilitarized Zone on the border area between DPRK and ROK, mainly at Cheorwon and to southern Kyushu in Japan. The total population of White-naped Cranes is estimated at 4,900-6,500. About 3,000 individuals in the western portion of the breeding range migrate south through China, resting at areas on the Yellow River delta, and wintering at wetlands in the middle Yangtze River valley. Approximately 2,000 birds in the eastern portion of the breeding range migrate south through the Korean peninsula (Meine and Archibald eds, 1996).



[Figure 92] Range of White-naped Cranes in East Asia (*Source from ICF)

3.2 Scoping Survey in China: Dalai Lake, Ergun River Basin, and the Huihe River

Site name (Country)	Dalai Lake, Ergun River Basin, and the Huihe River (China)	**Submitted Date**	December, 2016
Complier name	National Bird Banding Centre, China	**Contact Information**	

From August 31 to September 4, 2014, surveyors from the National Bird Banding Center carried out a survey on the White-naped Crane and its habitats at Dalai Lake, Ergun River Basin, and the Huihe River.

3.2.1 Study area

The Inner Mongolia Dalai Lake National Nature Reserve is located in the northeast of the Inner Mongolia Autonomous Region, in the west of Hulun Buir League. It adjoins the Russian Federation in the north, neighbors Mongolia in the south (47°45'50"–49°20'20" N, 116°50'10"–118°10'10" E). The total area of the protection zone is 740,000 ha. In the protection zone, there are 325,300 ha of wetland area composed of rivers, large and small lakes, and the lake river flood plains, accounting for 44% of the total area of the protection zone; there are 408,300 ha of grassland, accounting for 55%; there are 6,400 ha of sand area, accounting for 0.9%.

Dalai Lake National Nature Reserve is a comprehensive nature reserve that mainly protects rare bird species and the lakes, grasslands, and other ecosystems these birds live on. The main objectives are to protect the lake, rivers, wetlands, and typical prairie ecosystems in the protected area and the biodiversity of Dalai Lake, which includes a variety of waterfowl and rare and endangered species that inhabit, breed, and migrate in the protection zone.

Huihe National Nature Reserve is located in southwest Hulunbuir City, in the Inner Mongolia Autonomous Region. The geographic coordinates are 48°09'–49°00' N, 118°46'–119°43' E. Huihe NNR covers an area of 346,848 ha, including 173,000 ha of wetland, 161,048 ha of meadow grassland, and 12,800 ha of *Quercus mongolica* forest. The three core areas, i.e., Gaolinwenduer Wetland, meadow grassland, and *Q. mongolica* forest, cover an area of 106,107 ha, accounting for 30.6% of the total area; the buffer area covers 128,984 ha, accounting for 37.2%; the experimental area covers 111,757 ha, accounting for 32.2%. Huihe NNR is one of 17 key biodiversity conservation areas in China, and it was listed in the Chinese Biosphere Reserves Network (CBRN) in 2007.

The protected Huihe NNR area is a comprehensive nature reserve that highlights the protection of wetland, forests, grasslands, and rare and endangered birds; the local biodiversity is very rich. At present, 316 bird species have been recorded in 56 families, including *Grus japonensis*, *Otis tarda*, and ten other species of national first-class protected birds, whooper swan, Eurasian spoonbill, and 45 other national second-class protected birds. Additionally, there are 31 species of fishes in six families, ten species of amphibious reptiles in eight families, 43 species of beasts in 14 families, and 380 species of plants in 84 families and 84 genera.

Huihe Wetland, Dalai Lake, Zhalong Nature Reserve, Russia, and Mongolia Daur Reserve constitute the Northeast Asian grassland ecosystem. It is an important ecological barrier and migration stopover site for many migratory birds in Northeast Asia and worldwide, and plays an important

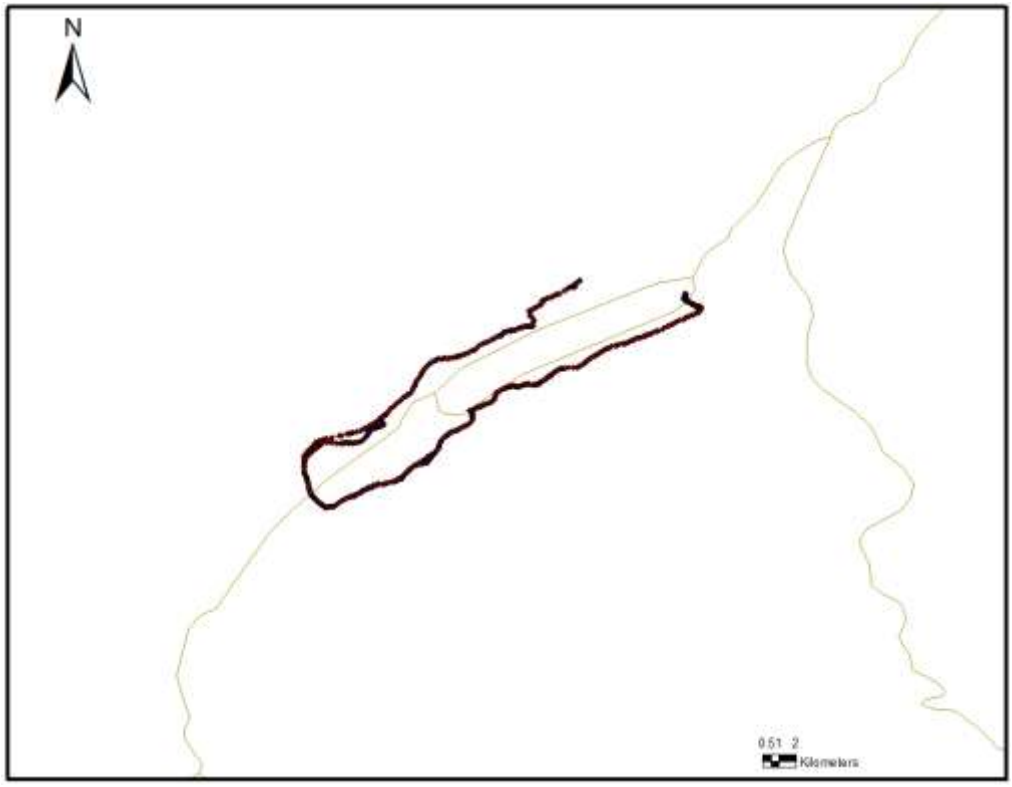
and valuable role in preserving the stability of regional biodiversity.

The Ergun River is located in the south of Ergun City, crossing Suqin Hui Nationality, Sanhe, Labudalin, and Heishantou Towns. The longest west–east distance is 70km, and the widest north–south distance is 42km.Ergun Wetland Nature Reserve is located on the border between China and Russia, overlooking Russia across the Ergun River in the west. Ergun Wetland is a very expansive flood plain where it forms a delta at the junction of the Ergun River and its three tributaries from the forest and high mountain area, i.e., the Genhe, Derbugan, and Hawuer Rivers.

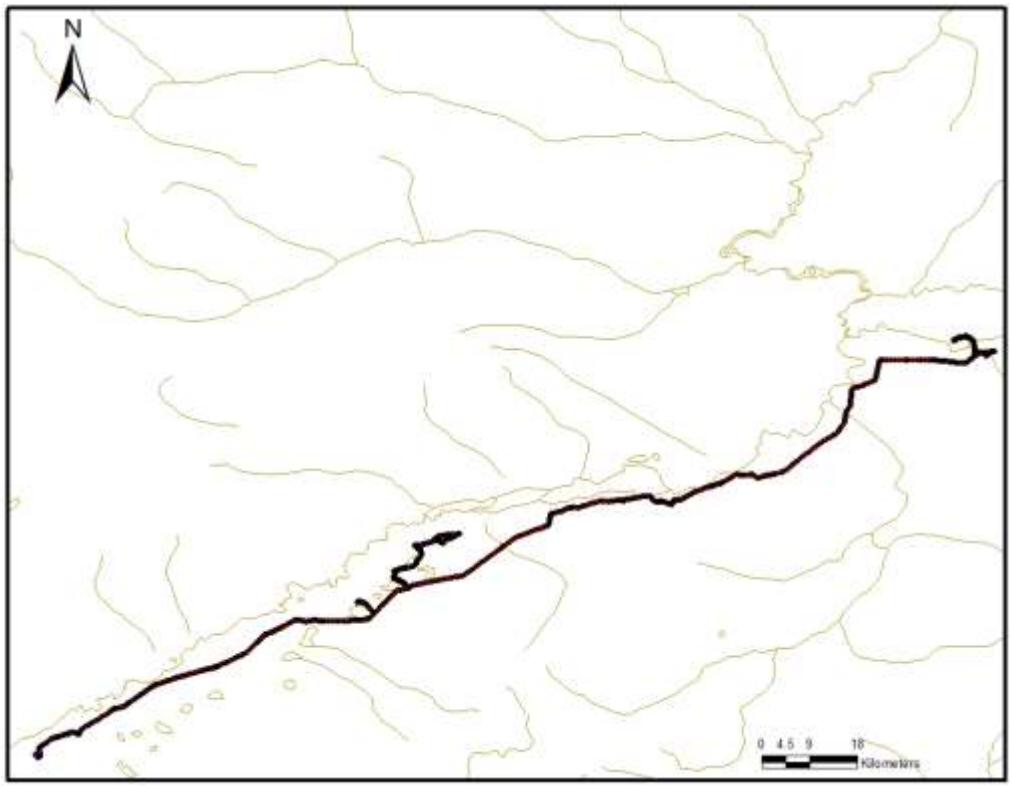
Moreover, it also covers the Genhe, Derbugan, and Hawuer Rivers, as well as the flood plain, Salix shrub, saline alkaline grassland, ponds, and its tributaries on both sides of the rivers. It is known as the most beautiful wetland in Asia, and is the largest, most intact wetland in China at present. Furthermore, the Ergun River Wetland also has two globally important ecoregions: the Daurian steppe ecoregion and the Heilongjiang River Basin ecoregion. The Ergun Wetland ecosystem is composed of the lake, prairie, and forest ecosystems; it is a completely closed ecosystem, and its vulnerability and non-renewable characteristics are very prominent.

3.2.2 Methods

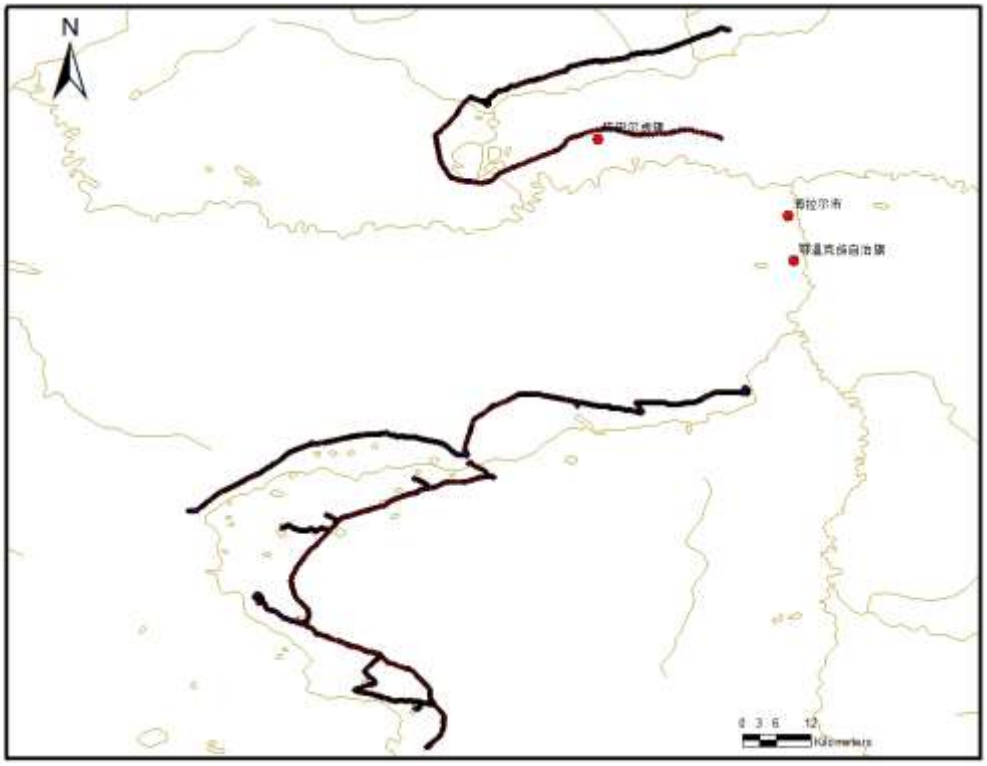
On August 31 and September 4, 2014, 2–4 sample points were selected in Ulam Noel Wetland, Aoka Wetland, Quanhe River, Hulieyetu Wetland, Ergun River Wetland, Huyetuo Lake, Morigelie Wetland, Huihe Xiboqiao, Sifang Mountain, Heying, Hongqidui, Nanhui, Beihui, Chagan Mountain, Luotuo Bozi, Dali Wetland, Haolibao, Erdaogou, Sanpaozi, Modamuji, and other sites separately, by the direct scan and counting method to determine White-naped Crane population numbers.



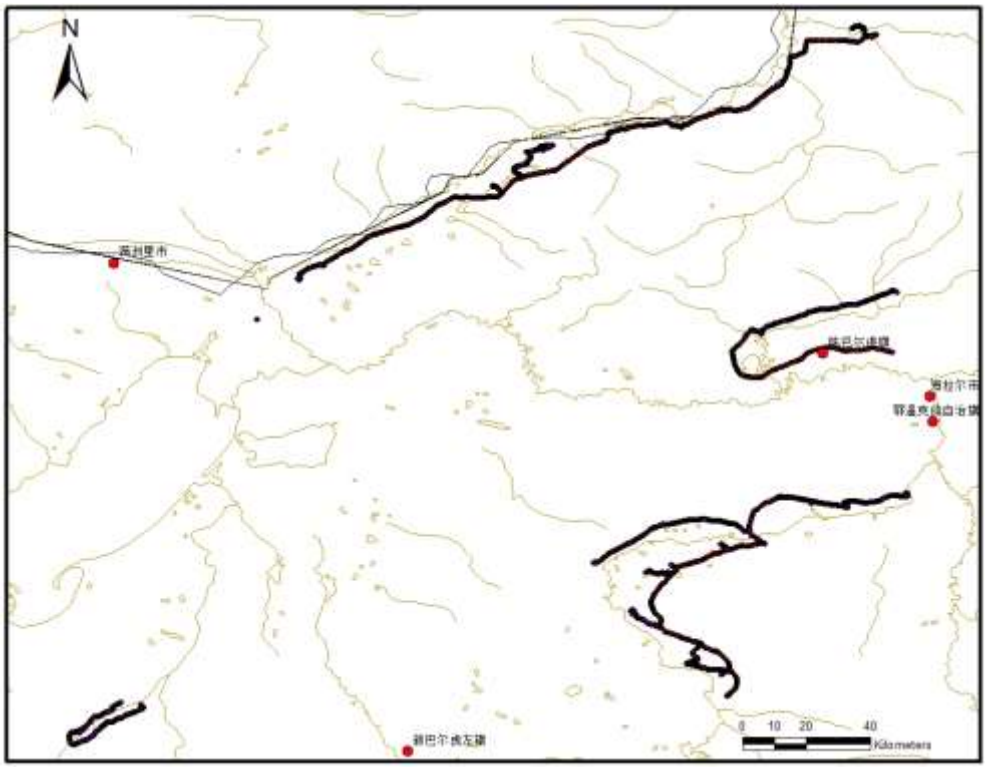
[Figure 93] Dalai Lake Investigation Route



[Figure 94] Ergun River Investigation Route



[Figure 95] Huihe River Investigation Route



[Figure 96] General Investigation Route

3.2.3 Results

Only 36 White-naped Cranes were recorded in the Huihe protected area during the survey, including eight families and ten single individuals; none were observed in either the Dalai lake NNRor the Ergun River.

Besides the White-naped Crane, there was a large number of Hooded Crane *Grus monacha*, common crane *Grus*, and red-crownedcrane *Grus japonensis*, e.g., a total of 72red-crowned cranes, comprising nine families and 40 single individuals, were all found in the Huihe NNR. Twenty-onehooded and 27 common cranes were also recorded during the surveys. In addition to the crane species, at Dalai Lake NNR, Ergun River, and Huihe River, there are whooper swan *Cygnus cygnus*, swan goose *Anser cygnoides*, greylag goose *A.anser*, mallard *Anas platyrhynchos*, common teal*Anas crecca*, gadwall*Anas strepera*, common pochard *Aythya ferina*, northern lapwing *Vanellus vanellus*, black-tailed godwit*limosa limosa*, Far Eastern curlew *Numenius madagascariensis*, Eurasian curlew *N.arquata*, whimbrel *N.phaeopus*, little curlew *N.minutus*, black-winged stilt *Himantopus himantopus*, upland buzzard *Buteo hemilasius*, eastern marsh harrier *Circus spilonotus*, and other birds (see the appendix).

3.2.4 Conservation suggestions

The Dalai Lake Nature Reserve, Ergun River, and Huihe River are breeding sitesfor cranes, great bustard *Otis tarda*, swan goose, and many other waterfowl species; these areas have become the migration route and important stopover sites for migratory birds.

Additionally, a crane survey was carried out on the Huihe River in the 2014 spring migration season by nature reserve staff. In April, there were 22 white-naped, 53 red-crowned, 34 common, 18 Demoiselle (*Grus virgo*), and 21 Hooded Cranes. In May, there were four Hooded Cranes, 29 white-naped, 39 red-crowned, and six common cranes.

The number of cranes is relatively small in Dalai Lake and Ergun River, and it was found during the survey that habitat loss and degradation were the primary factors threatening the cranes. The white-naped, red-crowned, and other cranes occurred at Ulam Noel Wetland and other sites that were surveyed in past 20 years, but since 2000, Dalai Lake and its surrounding area have had serious drought and low precipitation, and the lake area has continued to decrease, which indirectly affects crane habitats.

Furthermore, human disturbance has also had a negative influence on the craneat the Dalai NNR. Oil exploitation directly affects crane habitats. Duringoil transportation, the destruction of grassland and oil leakage caused by heavy trucks will directly affect crane habitats. In the process of oil exploitation, groundwater resources are depleted and the water level of the rivers and lakes falls, which results in the decrease of river and lake watershed areas, thus indirectly affecting crane habitats. Tourism, fishing, road construction, over-grazing, and illegal activities have a negative impact on crane migration and breeding.

To preserve the Ergun Wetland ecosystem, appropriate measures must be taken to reduce the potential interference and destruction caused by human activities to the wetland resources, protect wetland biodiversity, prevent wetland and biodiversity decline, and preserve the native wetland's ecological characteristics and natural scenery as much as possible.

3.2.5 The sites

3.2.6 List of recorded birds

Chinese name	Scientific Name	English Name
凤头䴙䴘	*Podiceps cristatus*	Great Crested Grebe
普通鸬鹚	*Phalacrocorax carbo*	Great Cormorant
苍鹭	*Ardea cinerea*	Grey Heron
草鹭	*Ardea purpurea*	Purple Heron
大白鹭	*Egretta alba*	Great Egret
白鹭	*Egretta garzetta*	Little Egret
白琵鹭	*Platalea leucorodia*	White Spoonbill
疣鼻天鹅	*Cygnus olor*	Mute Swan
小天鹅	*Cygnus columbianus*	Tundra Swan
鸿雁	*Anser cygnoides*	Swan Goose
灰雁	*Anser anser*	Graylag Goose
赤麻鸭	*Tadorna ferruginea*	Ruddy Shelduck
翘鼻麻鸭	*Tadorna tadorna*	Common Shelduck
赤颈鸭	*Anas penelope*	Eurasian Wigeon
赤膀鸭	*Anas strepera*	Gadwall
绿翅鸭	*Anas crecca*	Green-winged Teal
绿头鸭	*Anas platyrhynchos*	Mallard
斑嘴鸭	*Anas poecilorhyncha*	Spot-billed Duck
红头潜鸭	*Aythya ferina*	Common Pochard
黑鸢	*Milvus migrans*	Black Kite
白头鹞	*Circus aeruginosus*	Western Marsh Harrier
白腹鹞	*Circus spilonotus*	Eastern Marsh Harrier
大鵟	*Buteo hemilasius*	Upland Buzzard
猎隼	*Falco cherrug*	Saker Falcon
白枕鹤	*Grus vipio*	White-naped Crane
灰鹤	*Grus grus*	Common Crane
白头鹤	*Grus monacha*	Hooded Crane
丹顶鹤	*Grus japonensis*	Red-crowned Crane
白骨顶	*Fulica atra*	Coot
黑翅长脚鹬	*Himantopus himantopus*	Black-winged Stilt
凤头麦鸡	*Vanellus vanellus*	Northern Lapwing
灰鸻	*Pluvialis squatarola*	Grey Plover
环颈鸻	*Charadrius alexandrinus*	Kentish Plover
针尾沙锥	*Gallinago stenura*	Pintail Snipe
扇尾沙锥	*Gallinago gallinago*	Common Snipe
黑尾塍鹬	*Limosa limosa*	Black-tailed Godwit
小杓鹬	*Numenius minutus*	Little Curlew
中杓鹬	*Numenius phaeopus*	Whimbrel

白腰杓鹬	*Numenius arquata*	Eurasian Curlew
大杓鹬	*Numenius madagascariensis*	Far Eastern Curlew
鹤鹬	*Tringa erythropus*	Spotted Redshank
红脚鹬	*Tringa totanus*	Common Redshank
泽鹬	*Tringa stagnatilis*	Marsh Sandpiper
白腰草鹬	*Tringa ochropus*	Green Sandpiper
林鹬	*Tringa glareola*	Wood Sandpiper
矶鹬	*Actitis hypoleucos*	Common Sandpiper
红腹滨鹬	*Calidris canutus*	Red Knot
红颈滨鹬	*Calidris ruficollis*	Rufous-necked Stint
尖尾滨鹬	*Calidris acuminata*	Sharp-tailed Sandpiper
弯嘴滨鹬	*Calidris ferruginea*	Curlew Sandpiper
普通海鸥	*Larus canus*	Common Gull
银鸥	*Larus argentatus*	Herring Gull
红嘴鸥	*Larus ridibundus*	Black-headed Gull
普通燕鸥	*Sterna hirundo*	Common Tern
须浮鸥	*Chlidonias hybridus*	Whiskered Tern
白翅浮鸥	*Chlidonias leucopterus*	White-winged Black Tern

3.3 Scoping Survey in Mongolia: Khuiten River Valleys and Eastern Mongolia

Site name (Country)	Khuiten River Valleys and Eastern Mongolia (Mongolia)	**Submitted Date**	July 2016
Complier name	Wildlife Science and Conservation Center of Mongolia	**Contact Information**	

3.3.1 Background information

NEASPEC member countries adopted the NEASPEC Nature Conservation Strategy in 2007. In order to implement the strategy, the member countries selected six target species, amur tiger, amur leopard, snow leopard, Hooded Crane, White-naped Crane and Black-faced Spoonbill, as flagship species of North East Asia, and set specific objectives to contribute the conservation of target species; and to promote transboundary and intergovernmental cooperation and enhance coordinated mechanism for their conservation. Under these objectives, scoping surveys and joint studies are carried out on the three NEASPEC flagship migratory bird species by national focal points of the Project. In 2014, the Wildlife Science and Conservation Centre of Mongolia (WSCC) was nominated by the Ministry of Environment and Green Development of Mongolia as national focal point to implement the NEASPEC's "Conservation and Rehabilitation of Habitats for Key Migratory Birds in North-East Asia" project components in Mongolia.

The NEASPEC Project is expected to: (i) improve the conservation status and promote international cooperation for key wetland habitats of White-naped Cranes, Hooded Cranes, and Black-faced Spoonbills in North-East Asia; (ii) strengthen bilateral and multilateral, and multi-level cooperation for migratory birds conservation in North-East Asia; and (iii) Contribute to achieving the goals of the NEASPEC Nature Conservation Strategy, and the Aichi Biodiversity Targets (5, 11, 12, 14 and 19) of the Convention of Biological Diversity (CBD) and contribute to sustainable development in the region. Thus, the Project will involve joint activities amongst North-East Asian countries including scoping survey, joint studies and capacity building activities. Furthermore, the Project is an opportunity to facilitate the exchange of views in field practice and also on subregional cooperation and cross-border cooperation on habitat conservation.

The expected results from the project activities included:

A. Scoping surveys and joint study be conducted, better and more up-to-date knowledge is generated about the identified habitats and shared within and beyond the Project participants

B. Capacity of key local stakeholders including researchers and habitat managers is enhanced on generating knowledge and linking it with the planning, implementation and evaluation of habitat management

C. Awareness of migratory birds and habitat conservation has been promoted in the local community and authorities

D. Increased subregional dialogue and cooperation for joint actions and future opportunities

The White-naped Crane *Grus vipio* is a threatened species (VU) with about 6,000 individuals remaining in the wild. They are only found in East Asia, and primarily nest in wetlands of the grassland steppe and forest steppe zones in northeast Mongolia, southeastern Russia, and northeast China. The cranes in the western part of the range migrate to Poyang Lake in the Yangtze Basin of southern China (the only wintering area for the species in China) (Li et al. 2012), while the birds from eastern part of the range migrate to a few locations along border area in the

De-militarized Zone between DPRK and ROK, and to Izumi in southern Japan (Higuchi et al. 1996). The western population of WNCs is experiencing a rapid and on-going population decline, from about 3,000 individuals 15 years ago to 1,000-1,500 today. Causes of decline relate to human activities and natural causes. The loss of wetlands and habitat degradation to agricultural land expansion, changes in land use practice, and impacts from hydroelectric dams both at wintering and breeding grounds are the most significant threats. Because of their migratory behavior and unique locations of their breeding and wintering grounds, they are extremely vulnerable to various threats throughout their flyways, which lie along one of the most rapidly changing human developed regions on Earth–East China.

Between 2014 and 2015, various activities have been carried out in eastern Mongolia, southern Russia, and southern China in collaboration with the Ministry of Environment, Green Development, and Tourism of Mongolia, the State Protected Areas Administration of Mongolia, the Institute of Biology at Mongolian Academy of Sciences, and the Onon-Balj National Park in Mongolia, the Daursky Nature Reserve in Russia, the Beijing Forestry University and the Poyang Lake National Nature Reserve (PLNNR) in China, the United States Forest Service (USFS) and the International Crane Foundation in USA. USFS and the International Crane Foundation made additional financial contribution to the project.

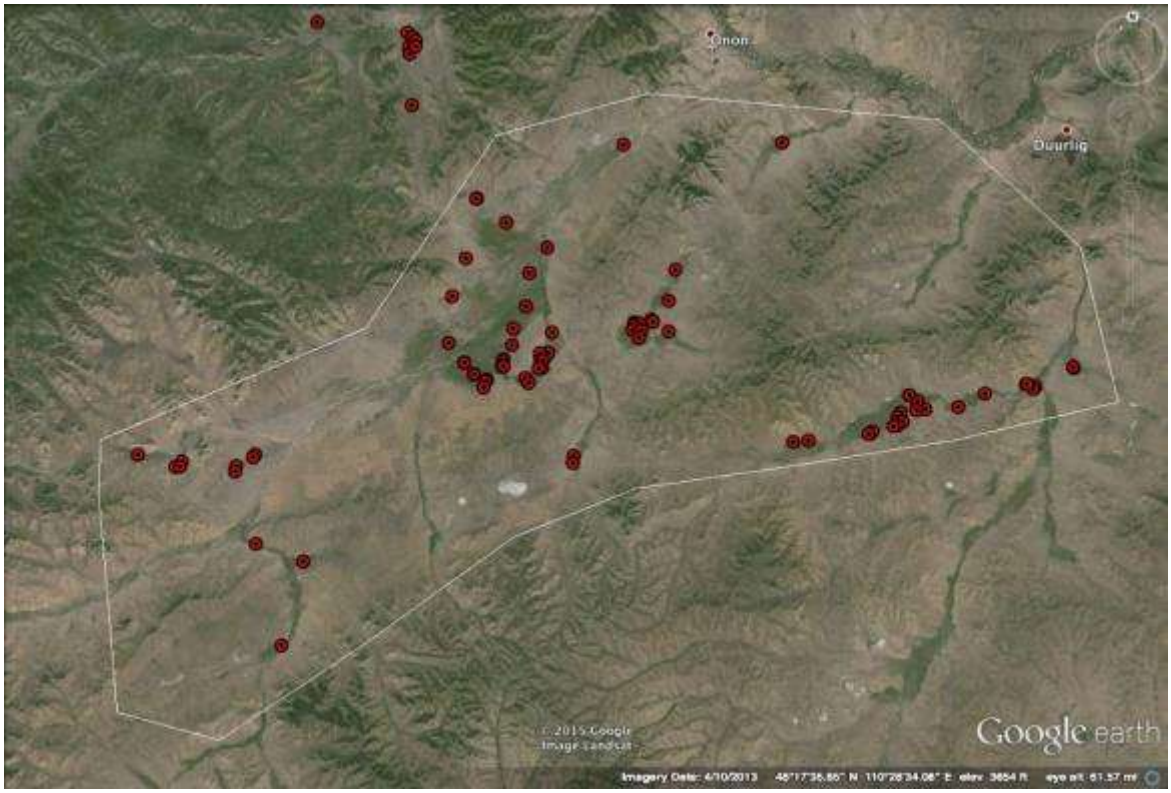
3.3.2 Results

1) Scoping Surveys and Joint Studies

Under the project supported by NEASPEC, the works on White-naped Cranes (WNC) in Mongolia were enabled at local and subregional levels, and transboundary areas between Mongolia and Russia, and the major wintering site in China.

At the local level, WSCC has successfully continued its White-naped Crane population monitoring at the Khurkh-Khuiten River Valleys (Figure 97). The Mongolian White-naped Crane project started in 2012 with the collaboration and financial support from the ICF and USFS. The site was selected for its global importance for White-naped Crane populations in East Asia. Especially the western part of the breeding range of this species is highly dependent on this site. It has been identified that this site not only supports a large number of nesting pairs, also provides critical staging and molting grounds for the species.

Researchers from the WSCC and IoB conducted nest monitoring throughout the breeding season at Khurkh and Khuiten River Valleys. In 2014, recordings were made for 80 pairs of WNCs (Figure 97), 12 pairs of Eurasian Cranes, and 82 pairs of Demoiselle Cranes nesting in Khurkh and Khuiten Valleys. Most pairs successfully raised their chicks, with many raising two chicks. Nesting pairs were highly dependent on wetlands and lakes in riparian habitats. Nest sites were abundant with tall grass providing cover for incubating cranes and inaccessibility to ground predators. Therefore, it seems important to maintain adequate water balance in the nesting areas to support the growth of tall grass.



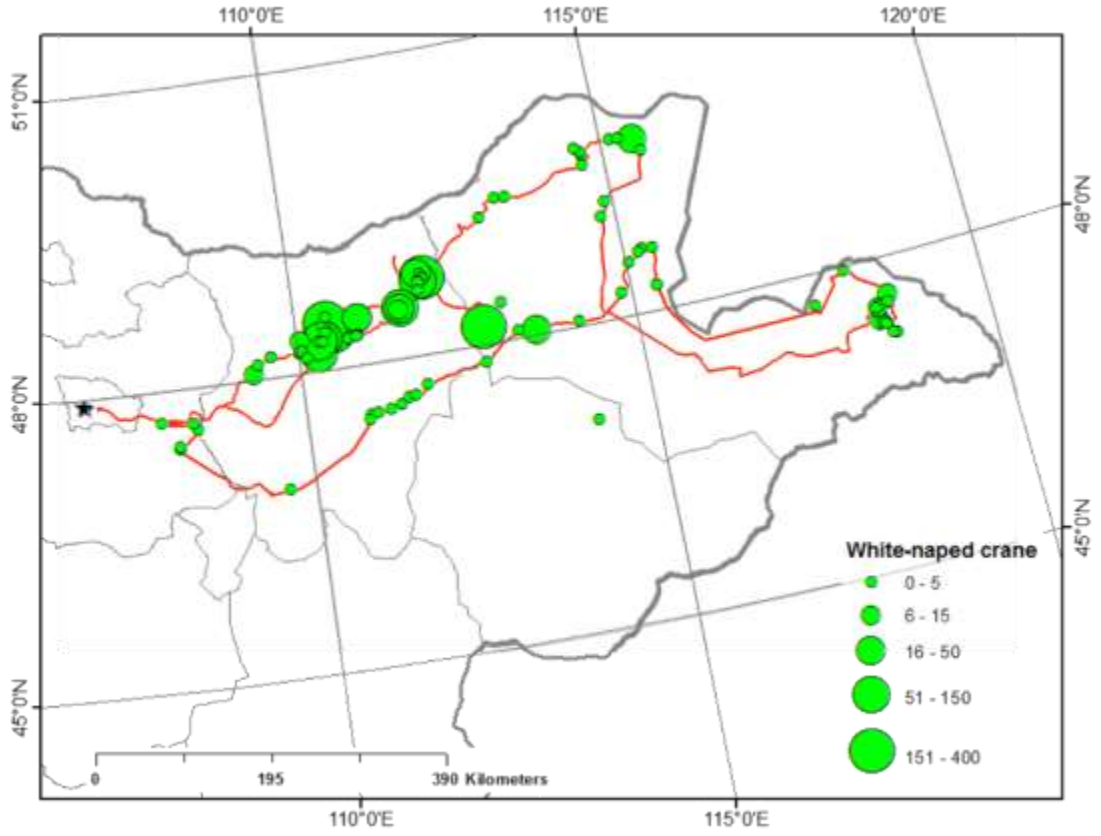
[Figure 97] Locations of WNC nests in the Khurkh and Khuiten River Valleys

[Figure 98] White-naped Crane

WSCC discussed with the Ministry of Environment, Green Development, and Tourism (MEGDT) of Mongolia and WWF Mongolia a proposal to designate Khurkh-Khuiten River Valleys as a local or state sponsored Special Protected Area (SPA). WWF Mongolia successfully lobbied three county administrations surrounding the two valleys to designate their respective county territories as local protected areas. The administrations of Omnodelger, Binder, and Bayanadraga counties have formally announced the establishment of local protected areas to date.

At the subregional level, WSCC carried out the scoping survey to identify critical sites for pre-migration congregation of White-naped Cranes in entire eastern Mongolia. The survey was conducted from 13th September to 7th October 2014 in eastern Mongolia. Two teams were deployed to count and document crane species at pre-migration congregation sites following two major routes for two weeks. The survey effectively covered approximately over 80% of potential crane habitats in eastern Mongolia. A survey in autumn in such big scale was never before conducted in Mongolia. As a result of this scoping survey, several critical sites were identified where four species of cranes, the White-naped Crane, the Eurasian Crane, the Hooded Crane, and the Demoiselle Crane, congregate in large numbers before their autumn migration. In addition, a new breeding site of Red-crowned Crane in Mongolia has been located. This species is a very rare in Mongolia and there was only one record of breeding in the country prior to this discovery.

During the survey, a total of 1,790 WNCs were recorded at 41 sites, also 6,964 Eurasian Cranes at 28 sites and 104 Hooded Cranes at 12 sites were counted. Relatively few Demoiselle Cranes were recorded, which is 202 Demoiselle Cranes at 6 sites, during the survey because this survey started when most of them migrated to south.



[Figure 99] Locations of White-naped Crane records during the survey in eastern Mongolia

The number of WNCs recorded during the study was more than current population estimate for the western flyway with 1500 individuals (Figure 99) (Wetland International 2016). It is an indication that the survey was important to estimate current population size based on counts at breeding locations and major staging sites in autumn. The scouting survey also revealed that some WNCs do not move to staging areas to join other flocks instead they stay at the breeding ground for extended period probably until they start migrating to south.

[Figure 100] White-naped and Eurasian Cranes at crop fields in Norovlin

Three locations in Mongolia were identified as important congregation sites during autumn migration for the White-naped Cranes. The first site is the Khurkh River Valley where 272 WNCs were recorded on September 18, 2014. That is 18% of the regional population based on a population estimate of 1,500 individuals (upper limit) for the western population of WNCs. The second site is the Norovlin Crop Field where 292 (19.5%) and 505 (33.7%) WNCs were counted on September 20thand October 2nd respectively. Third site is the Sainsariin Lake. 123 (8.2%) WNCs were counted on September 29th. All three sites were located within the Onon River basin situated in Khentii Province. Totally these three sites supported approximately 46-60% of the regional population of WNCs indicating the importance of the region for conservation of this species. Furthermore, these counts were made only during one day and total number of cranes stopping at those sites over several weeks should be higher when cranes from Russian breeding grounds arrive later. There was no major pre-migration congregation site in Dornod Province in northeastern Mongolia. It is believed that lack of convenient roosting sites and crop fields in northeast Mongolia might be critical factor for selecting staging sites.

[Figure 101] Researchers scouting lake shores and wetland and counting cranes and other waterbirds at Tashgain Tavan Lake, Eastern Mongolia

2) Capacity Building

Over the last two years, the Mongolian White-naped Crane project trained about 20 young biologists, recent graduates, and undergraduate students in field survey techniques and basic data analysis and enabled them to participate in survey works and to obtain hands-on experiences in environmental issues and research methods (Figure 102). The training is planned to expand and increase the number of participants with the aim of developing future generation of conservationists in Mongolia.

A workshop entitled, "Endangered cranes and satellite imagery analysis: a workshop to build local knowledge and capacity in wildlife conservation and research in Mongolia" was organized in August 2015 in Ulaanbaatar and utilized the Khurkh and Khuiten Valleys as field training site. Participants learned various methods in Geographic Information System and Remote Sensing methods and tools. The workshop was intended to train specialists in protected areas in eastern Mongolia where WNCs and key wetland habitats are found and improve their skills and knowledge to better study and understand how endangered cranes use the habitats located within the Khurkh River Valley, and more broadly across Eastern Mongolia.

Two members of Mongolian project team, Nyambayar Batbayar and Sarangerel Ichinkhorloo,

participated in the 'Korean DMZ Joint Study' and 'Northeast Asia Young Conservation Leadership Programme" in January and May 2015, respectively. Through these activities, the project staffswere able to expand their professional network in East Asia and learn from experiences related to environmental issues at key WNC wintering habitats in ROK.

[Figure 102] Mongolian crane biologist is training a student from the Mongolian State Agricultural University

3) Public Awareness

Locally, the project team raises public awareness on threatened crane species, their key habitats, and wetland conservation through public talks, presentations, meetings, publishing various articles, and radio and TV interviews as well. Between 2014 and 2015, WSCC staff gave six presentations at six local schools and two EcoClubs on crane ecology and some results of the project. Also, ICF's George Archibald gave a talk on cranes and wetland conservation for Mongolian Birdwatching Club; Iderbat Damba gave an interview on cranes and wetland issues to Mongolian National Television; Tseveenmyadag Natsagdorj gave a public talk on rare birds and cranes on Mongolian Central Radio in 2015.

In June 2014 and 2015, WSCC and ICF together with partners in Mongolia successfully organized the Mongolian crane festivals (Figure 103). During the Crane Festival public awareness activities were conducted on topics including: a) status of crane species in Mongolia and conservation issues, b) sustainable wetland and water use, c) wildlife poaching and illegal hunting, and d) environmental law and regulation. It was estimated that 300-400 people attended in the Festival.

The local administration expressed their strong interest in continuing the festival as an annual event. The Third Crane Festival had been planned on June 13, 2016.

A brochure about WNCs has been produced in the local language and distributed to herders and the local community in the Khurkh and Khuiten Rivers Valleys and residents of towns in the region in spring and summer of 2015.

In August 2014, a team from the Jiangxi Province TV Station in China visited the Khurkh and Khuiten River Valley and filmed project activities and documented the WNC situation in Mongolia which a NEASPEC project staff, Ms. Gabby Chan, featured in the documentary. In December 2015, with the support from ICF and PLNNR, a Mongolian TV program production crew was arranged to film wintering cranes at Poyang Lake. They have produced one TV program for Mongolian audiences. The main theme of these documentary programs was to compare situations of the crane's breeding habitat in Mongolia to wintering habitat in China and highlight environmental issues and threats to cranes. These television programs are serving as excellent public education tools on crane conservation issues in both countries.

Internationally, Mongolian WNC project communicates through WI/IUCN Crane Specialist Group Global Crane News (http://www.savingcranes.org/whats-new/category/global-crane-news/), the EAAFP website (http://www.eaaflyway.net/category/news/news-partnership/), ICF-hosted Discussion Group, and several birdwatching list servers to disseminate information related to the project activities and key findings.

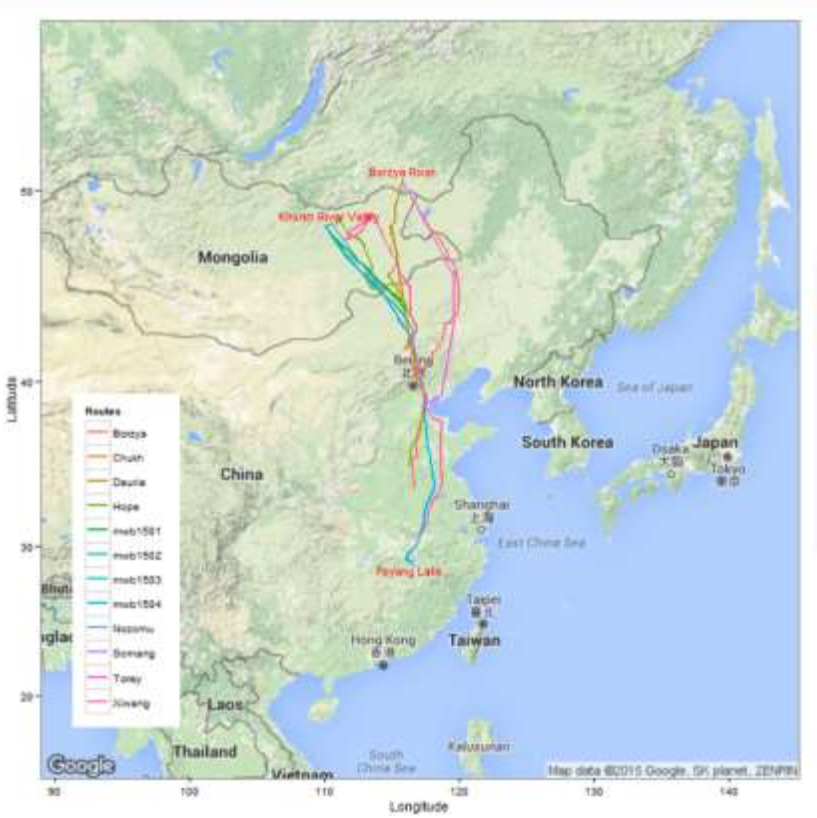
[Figure 103] School kids dancing with crane costumes during the Crane Festival

4) Subregional cooperation

As part of the joint study at Dauria International Protected Areas, efforts were coordinatedwith colleagues at Daursky State Nature Reserve (DSNR) in Russia and executed several activities in collaboration with coordinating body Dr. Oleg Goroshko. Information exchanges with Russian colleagues have greatly increased and Mongolian researchers conducted a fieldwork in the DSNR in August 2015.

At DIPA, drought condition was observed everywhere and agricultural activities on Mongolian side is slightly increasing but decreasing on Russian side due to various factors from financial support from governments to climate change impacts. Prospects of agricultural activities are not well understood. Livestock herding communities are suffering a lot due to lack of water and many people moving to distant place seeking for better forage grounds. Baruun Torey Lake was dry and water in Zuun Torey Lake was very low due to many years of the dry condition in the area. Ulz River was fragmented and stopped reaching Khokh Lake in Mongol Daguur. Cranes were only recorded at shallow water wetland near a town Kulusutay and at several locations along Borzya River.

The joint team captured three juvenile White-naped Cranes during four days of work and documented habitat characteristic of the area. One more crane was captured and fitted with the transmitter on Mongolian side as well. Currently, three devices, which were deployed in Russia, are providing a large amount of migration and local movement data at PLNNR. It is hoped that throughout next spring and summer, these birds will provide very useful information on transboundary area use by WNCs. In additional, four more WNCs marked at Khurkh and Khuiten River Valleys providing a large amount of exciting movement data and information via satellite and cellular networks (Figure 104).



[Figure 104] Migration routes of White-naped Cranes from the Khurkh and Khuiten River Valleys and the Dauria International Protected Area

Tseveen and Nyamba participated in the 4th Meeting of the Crane Working Group of Eurasia, which was held in Daursky State Nature Reserve in southern Russia from 1-4 September. Two presentations, about Siberian Crane records in Mongolia and the White-naped Crane project activities, were presented by Mongolian biologists. Also, WSCC met representatives of a local school community and teachers during the conference. WSCC has prepared three boxes of books and reading materials in Russian and English languages to be sent to these local schools in Russia which are located in DIPA. The books and reading materials include new and used books on conservation and environmental subjects. Some of these books were published during the Soviet era, but they still have much significant conservation value, so it will be very useful for school kids.

In 2014 and 2015, WSCC captured and color marked 38 WNCs including chicks and few adults. Seven adults and seven chicks were marked with satellite and cellular telemetry units for last two years. Tracking data from this telemetry system is shared among key White-naped Crane experts in Mongolia, China, and ICF helping to understand threats along migration flyway and winter sites. Several key stopover sites were identified in China. For example, major staging sites such as Duolin in Inner Mongolia, Miyuan Reservoir in the Beijing area, wetlands in Beidagang, and rice fields near Bohai Bay in Hebei Province proved to be critical for WNCs because all cranes regularly used these sites during both spring and autumn migration (Figure 104).

On August 8, 2014, an international workshop was convened at the Ministry of Environment and Green Development of Mongolia. A total of 16 people participated including 1 from WSCC, 1 from ICF, 2 from Mongolian Academy of Sciences, 2 from USFS, 1 from NEASPEC, 1 from Jiangxi TV Station, and 8 from MEGD. There were 4 presentations delivered by project staff from WSCC, ICF, MAS, and USFS. Project partners presented the main activities and results of the WNC project,

work conducted by the USFS service specialists in 2013, results from the satellite tracking study, and the wintering status of cranes in Poyang Lake in China.

Collaborations with Chinese partner organizations greatly strengthened including Beijing Forest University (BFU), PLNNR, and Beijing Brooks Education Center. Chinese partners are carrying out monthly studies during the winter and ground-check marked birds and satellite tracking locations to better understand habitat use of WNCs in winter.

Two Mongolian team members, Nyambayar Batbayar of WSCC and Iderbat Damba of Mongolian Academy of Sciences, visited Poyang Lake at the end of November 2014. They presented results of the project in Mongolia and visited several sites where satellite marked cranes were spending several weeks after their arrival. This is the second site visit by Mongolian partners to the wintering site. Chinese partners from the Poyang Lake Nature Reserve visited Khurkh and Khuiten River Valleys in August 2015 for the first time (Figure 105). It was the first time that Chinese partners officially visited the project site and learned about WSCC's work. WSCC planned to host the White-naped Crane Network Meeting in August 2016 which will bring together White-naped Crane experts from six countries in East Asia and two experts from the USA. There will be one full day meeting in Ulaanbaatar to discuss the current status and strategic planning and the meeting will continue at the research camp in Khurkh River Valley.

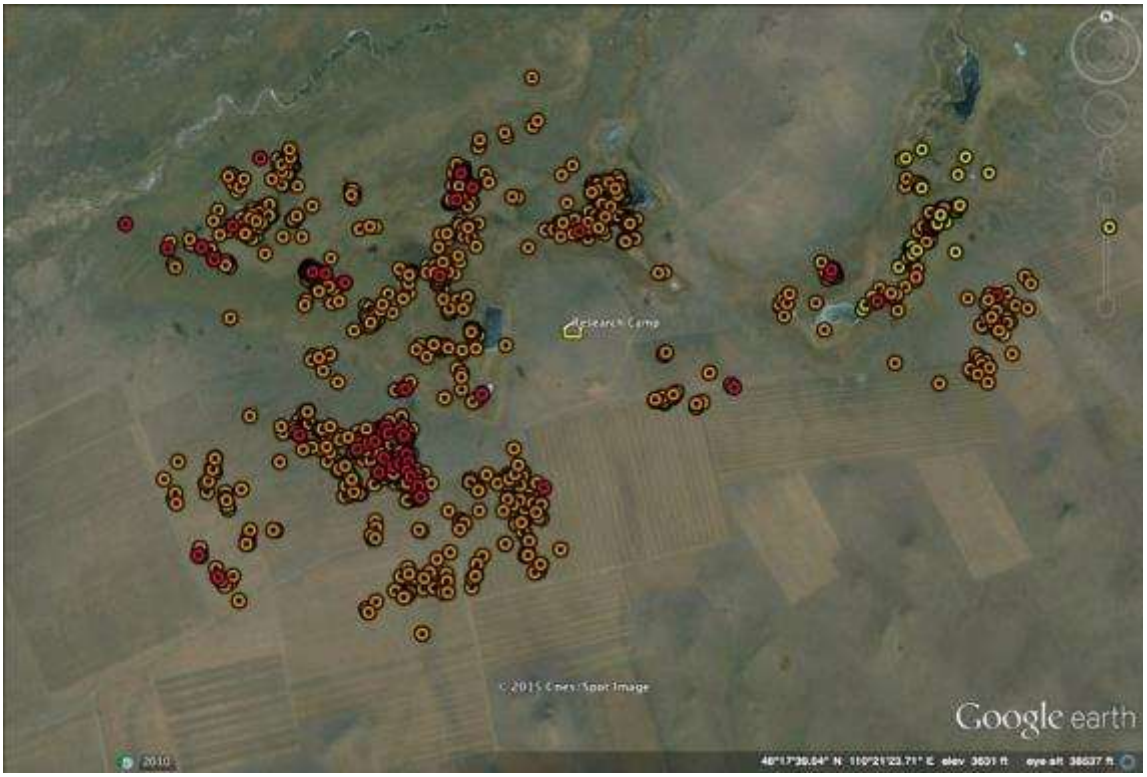
[Figure 105] Staff members from the Poyang Lake Nature Reserve visited Khurkh and Khuiten valley to boost international cooperation on White-naped Crane conservation, July 2015

3.3.3 Preliminary conclusions

Ministry of Environment, Green Development, and Tourism of Mongolia was very pleased with the project achievements and advised WSCC to work more on engaging local herders at the project sites since they live very close to key crane nesting habitats and share the same wetland and water resources with cranes. Ms. Onon Yondon mentioned that the crane conservation project could learn from the existing examples of community groups which have been established to protect and use forest resources in the area.

The project team was very concerned about the extensive use of agricultural areas by WNCs and other crane species and worried that it might bring the conflict to agricultural companies. It is learnt that at present there is no major conflict between cranes and agricultural companies. It is believed the Mongolian traditional belief not to harm birds, especially cranes, may have an important role in keeping conflict at a low level. However, the number of cranes attracted to crop fields is increasing during autumn migration, and crop damage by cranes may increase in the future. Another concern related to agricultural companies is pesticide use in eastern Mongolia. Pesticide use is not documented and coordinated among agricultural companies operating in the area. Therefore, no data about the names and quantities of chemicals used in the area was available in the government office. WSCC has expressed concern about the uncontrolled use of chemicals and need for better coordination among government offices and businesses.

Significant steps forward have been made to strengthen collaboration with the protected areas administrations of Khan Khentii Strictly Protected Area and Onon-Balj National Park, and WWF Mongolia on crane conservation and biodiversity protection. A common consensus has been reached on crane conservation, training protected area staff on wildlife monitoring, and carrying out joint public education activities on wetland conservation and sustainable use of water resources. It was agreed that the OBNP wildlife specialist would be participating in the spring surveys annually starting in 2015. The best example of joint collaboration with the SPA administrations was activities jointly organized during the Mongolian Crane Festival. WSCC jointly organized public educational activities on environmental laws and regulations, issues related to wildlife poaching and illegal hunting, children's art exhibition, and a documentary film demonstrating sustainable water use in Mongolia.



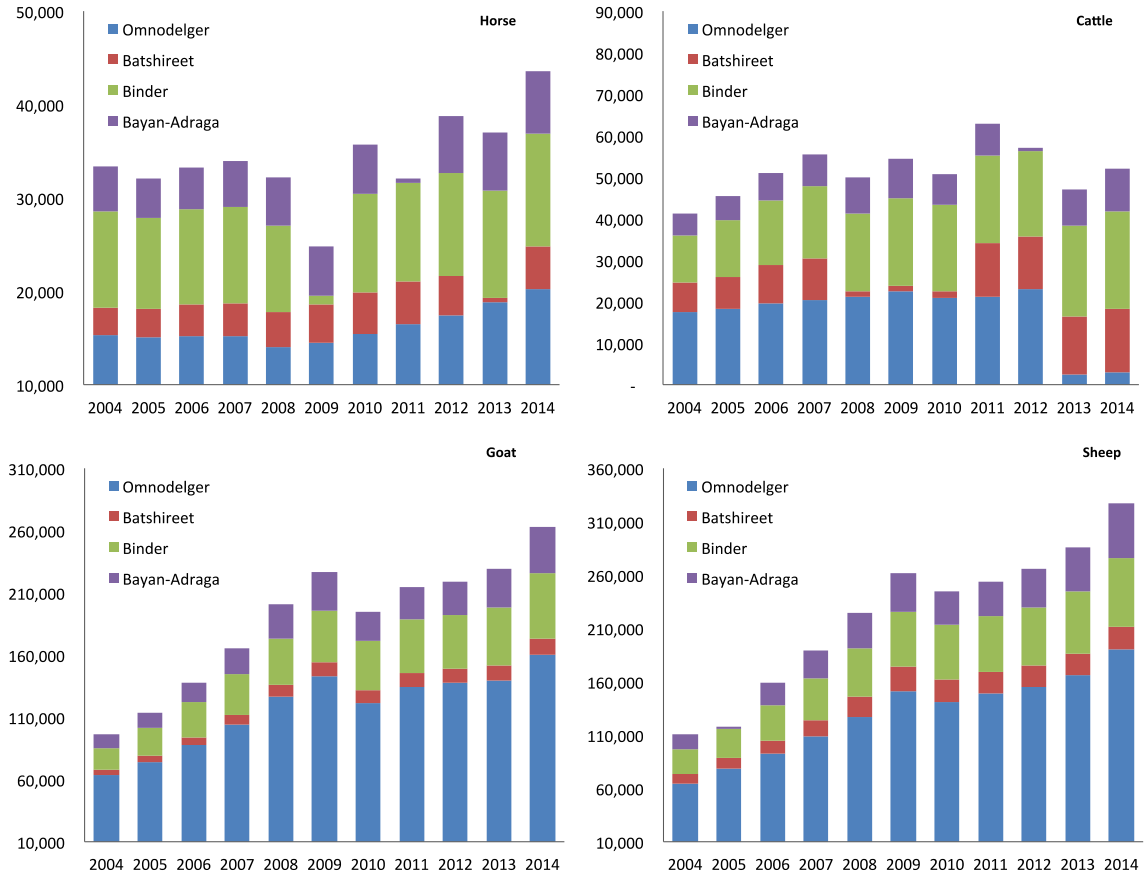
[Figure 106] Crane usage over crop fields in Khurkh Valley between September 1 and October 15. Each color represents a different bird

WSCC planned to provide professional support to strengthen the management and biodiversity protection of the KKSPA and OBNP. The Mongolian team met with the protected areas administrations five times in 2014-2015 and discussed opportunities for more cooperation on crane conservation issues, clarified awareness of crane conservation issues in the past and present, and identified needs from the KKSPA and OBNP. It was determined that both parks are in need of better staff training in wildlife monitoring, proper equipment, and coordination with other national parks and local administrations regarding activities on cranes conservation and research. Currently, there is no wildlife monitoring scheme in place due to lack of funding and resources. Wildlife inventories and monitoring activities are carried out opportunistically as they arise during other activities. Only rare mammal species or game animal censuses are conducted, and they are seldom done subject to available funds from the central government. OBNP is making good progress in recent years because WWF Mongolia is implementing a project on a community based conservation initiative and management scheme using a river basin concept. During this project, they were able to form community-based forest warden groups. The project team members met several forest wardens and managers of these community groups and learned about their experiences. In summer 2015, the Mongolian WNC project provided crane and wetland habitat related information package to the KKSPA and OBNP. They will use this information to develop educational programs, brochures and pamphlets, and train their volunteers and eco-club members.

The WSCC team is pursuing a greater level of protection status for the Khurkh and Khuiten River Valleys. In Mongolia, the protection and management of local protected areas are responsibilities of local county governors. But with no spare money to spend on newly established protected area, it is hard to imagine that any meaningful management actions can be taken by the local administrations at present. A better approach is to increase the protection status from local to a national level Special Protected Area (SPA). In Mongolia, the management and protection measures at state level SPAs are administrated and funded by the central government. The

Mongolian team is working with WWF Mongolia to find ways to improve the current protection status for Khurkh and Khuiten River Valleys. At the moment, the site is shortlisted on the list of potential areas to become a state level SPA in future. The joint team from WWF Mongolia, WSCC, and MAS are preparing a proposal to establish "Khurkh and Khuiten River Valley Nature Reserve" to be submitted later to the MEGD.

The last 10 years' livestock population census data has been obtained for Omnodelger, Batshireet, Binder, and Bayan-Adraga counties (Figure 107). These counties surround the Khurkh and Khuiten Rivers Valleys and their territories overlap making the land use and management in the area more complex. Livestock data shows that the goat and sheep population in the region has increased almost 3 fold over the last decade. The sole reason behind this large increase is the high price of cashmere and sheep meat in Mongolia. Also, Omnodelger county has more livestock compared to other counties. It is known that a large number of goat and sheep could mean more grazing on grassland and could lead to alteration of the sustainable balance between plant regeneration and grazing regime. However, the percentages of these animals are unknown.



[Figure 107] Four main livestock types and their population size in the study region

3.3.4 Recommendations

Based on this WNC project in Mongolia, it is recommended that the following list of actions to be implemented in near future in Mongolia and DIPA as part of NEASPEC's program for Conservation and Rehabilitation of Habitats for Key Migratory Birds in Northeast Asia

1) It is very clear that the Khurkh and Khuiten River Valleys support a significant proportion of the regional population of WNCs in East Asia. Therefore it is crucial to ensure key habitats in this area are protected and necessary conservation and management measures are secured in place. WSCC highly engage to engage local livestock herding communities in crane population monitoring and protection in Mongolia and Russia. One possible and effective way is to form community groups to help cranes and protect key habitats. It is estimated that at least 6 community groups, based on herders' proximity to each other, need to be established for Khurkh and Khuiten River Valleys. Through these groups, WSCC promoted wetland habitat conservation, concepts of sustainable livelihood, and identify alternative income sources to reduce livestock pressure on wetland habitats.

2) It is important to continue monitoring agricultural companies and their pesticide use. Key WNC habitats and cranes are protected by tradition at the moment. But the changing climate and land use practices might force human behaviour to change and become hostile towards cranes and waterfowls to protect their crop yields. WSCC suggests organizing Mongolian farmers and herders representatives visit ROK and learn environmental issues and discuss possible solutions with farmers protecting cranes in DMZ. It is possible that improving technologies used in Mongolia and Russia might benefit both agricultural companies and crane habitats in return to secure their promise not to expand the size of existing croplands and controlled use of agricultural chemicals.

3) WSCC strongly believes that it is very important to increase the number of people working in crane and critical habitat conservation issues in northeast Asia. A number of people who are actively engaged in crane conservation in the region are very few or aging. It is very important to carry out an aggressive program to train young biologists and conservationists in crane and wetland conservation, and wildlife and land use policy issues in the region. Student exchanges and summer camps are a possible and good start and the existing research camps and protection stations at Khurkh Valley, Daursky NR, and Poyang Lake NR could provide a basis to train the young generation of conservationists.

4) The present environmental situation in DIPA is believed to be mostly climate driven. Lack of precipitation and many years of dry conditions have caused the once famous Torey Lake wetland complex and the Ulz River to suffer from low water levels and consequently caused many cranes to breed further north along the Borzya River or move to the further west. Although it is thought to be a natural cycle; it is important to understand how such long-term drought conditions impact threatened crane and waterbird species and if it is restorable. It is suggested establishing a network of small-scale meteorological stations at selected sites in DIPA and Khurkh Valley to monitor loss of wetland habitat and collect fine-scale data to build predictive models for the future condition of wetlands in DIPA.

5) Carefully planned population monitoring is the key to assessing the impacts of any conservation and management activities. WSCC has established a good population monitoring program for Khurkh and Khuiten River Valleys and a base research camp to operate necessary activities. Data and results from these research activities will give a good indication of population status. Autumn crane survey was critical to assess and capture a reliable population estimate for the western flyway. It is suggested that additional supports be given to the research group on three-year circle basis to ensure their work is not interrupted and continue on until 2020.

6) It is recommended that NEASPEC Program should build on experience from the Mongolian White-naped Crane project and introduce concerted approaches where appropriate; especially targeting a network of key crane habitats and addressing water shortage issues.

Acknowledgments

WSCC is grateful for all students and volunteers participated in the field work and surveys in eastern Mongolia. We appreciate the NEASPEC for providing supports needed to organize scoping surveys and take part in the joint study at Daursky Nature Reserve in Russia. The Ministry of Environment, Green Development, and Tourism of Mongolia provided support to implement the project. We are thankful for Natsagdorj Tseveenmyadag, Amarkhuu Gungaa, and Baatarkhuu Batmunkh, Iderbat Damba, and two drivers. Claire Mirande provided critical support and advices during the implementation of the project. The Mongolian White-naped Crane Project is run in cooperation and funding supports from the International Crane Foundation and US Forest Service.

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III. Joint Study on the Transboundary Areas in North-East Asia

1. Korean DMZ area

Site name (Country)	Korean DMZ area (ROK)	**Submitted Date**	December, 2016
Complier name	KSEE and ERF Korea	**Contact Information**	

1.1 Overview: Global and regional importance of Korean DMZ area as crane habitat

The Korean Demilitarized Zone Area including the Demilitarized Zone (DMZ) and the Civilian Controlled Zone (CCZ) which 250 km (160 miles) long and approximately 4 ~ 20 km wide running across the Korean peninsula is known for their unique biodiversity and ecosystems. The middle and western parts of the Area are an important wintering habitat for many migratory waterbirds, especially for around two thousand birds of endangered White-nape Crane (*Grus vipio*) and several hundred birds of Red-crowned Crane (*Grus japonensis*) in Northeast Asia.

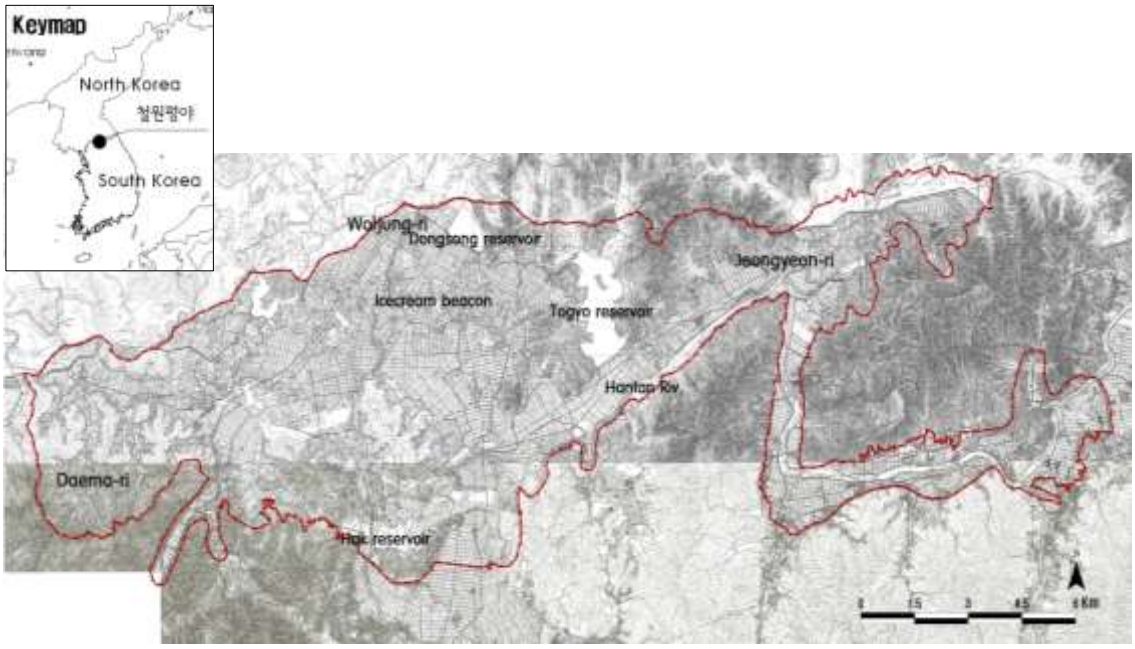
[Figure 108] Location of Crane's habitats in Korean DMZ area

1.2 Important Crane habitat in Korean DMZ area

1.2.1 Cheorwon

1) Location and overview

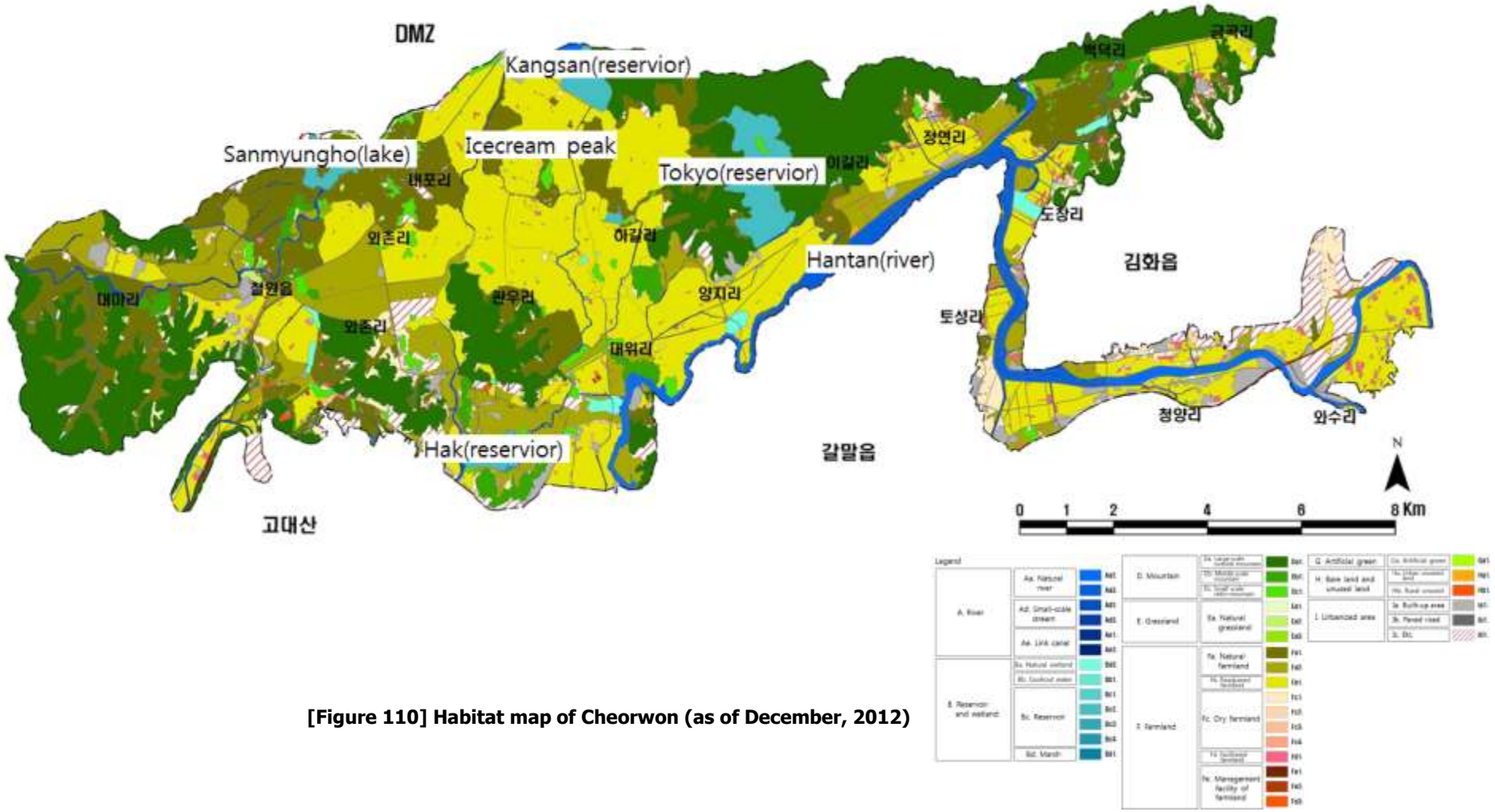
Cheorwon (38°15'N 127°13'E), located at the middle part of Korean DMZ area, is one of the northernmost counties in the Republic of Korea. The administrative district belongs to Gangwon Province. Rice paddies, Hantan River valley and riverine wetlands are main habitat types of cranes in Cheorwon. The total size of rice-paddies in Cheorwon is about 4,332 ha. Altitude is between 190 ~ 300 m.



[Figure 109] Location of Cheorwon in Korea (Inside of red line is survey area)

2) Habitat Composition in Cheorwon

The cranes' habitat in Cheorwon is mainly composed of rice paddies, riverine wetlands, mountains, and residential area. Among of them, Cranes use mostly rice paddies, riverine wetlands and valleys.



[Figure 110] Habitat map of Cheorwon (as of December, 2012)

[Table 6] Composition and ratio of each habitat in Cheorwon

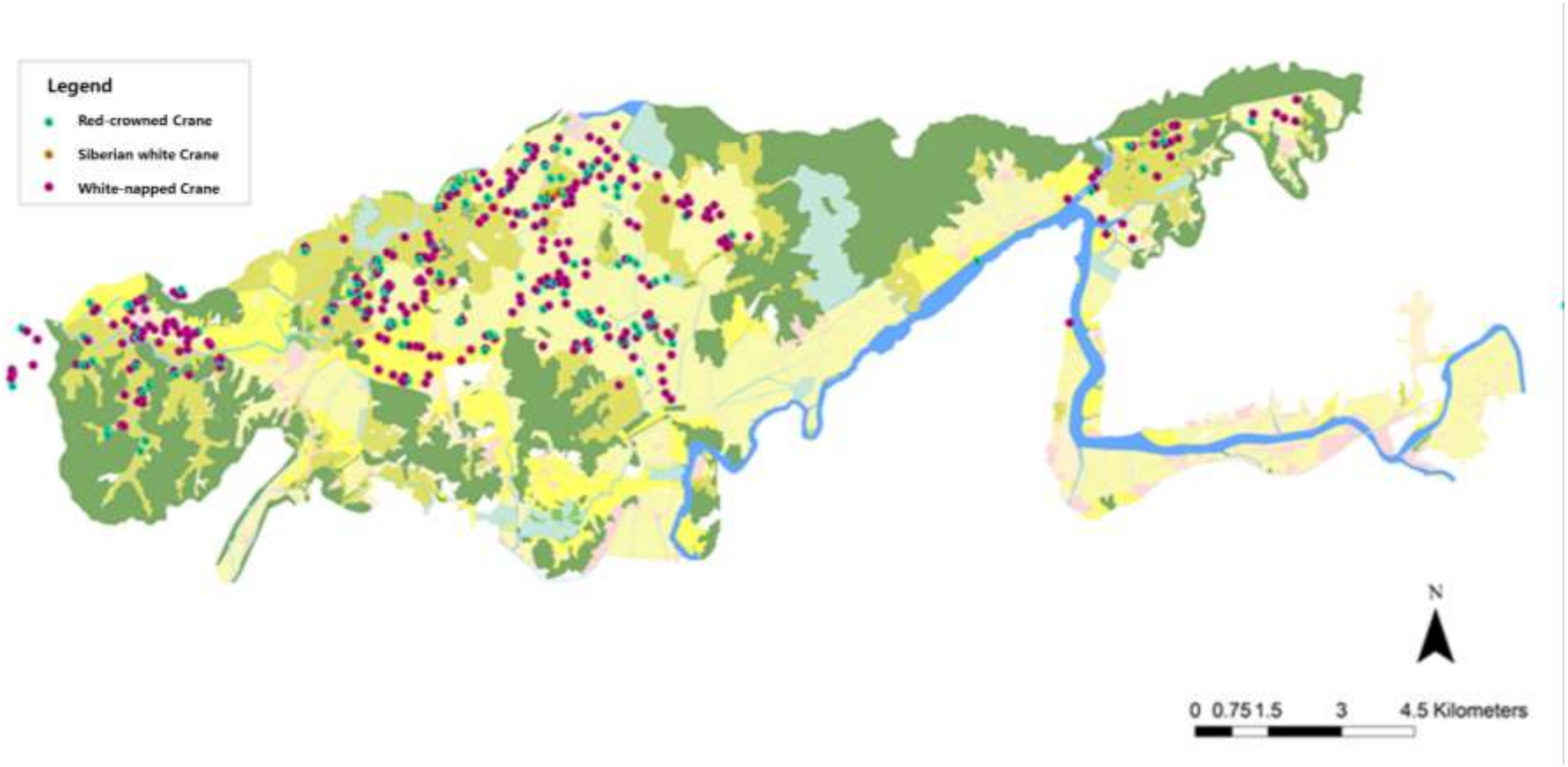
Habitat class	Habitat group	Area (㎡)	Ratio (%)
A. River	Aa. Naturalriver	6,547,247	4.2
	Ad. Small-scalestream	1,765,098	1.1
	Ae. Link canal	779,154	0.5
B. Reservoir and Wetland	Ba. Natural wetland	1,188,239	0.8
	Bb. Gushout water	146,006	0.1
	Bc. Reservoir	4,963,922	3.2
	Bd. Marsh	154,388	0.1
D. Mountain	Da. Large scale outside mountain	36,171,411	23.4
	Db. Middle scale mountain	2,676,657	1.7
	Dc. Small scale relict mountain	2,231,872	1.4
E. Grassland	Ea. Natural grassland	521,112	0.3
F. Farmland	Fa. Natural farmland	36,877,677	23.8
	Fb. Readjusted farmland	43,027,373	27.8
	Fc. Dry farmland	4,755,315	3.1
	Fd. Facilitated farmland	1,603,424	1.0
	Fe. Management facility of farmland	725,037	0.5
G. Artificial green	Ga. Artificial green	4,507	0.0
H. Bare land and unused land	Ha. Urban unused land	103,197	0.1
	Hb. Rural unused	82,636	0.1
I. Urbanized Area	Ia. Built-up area	3,969,814	2.6
	Ib. Paved road	1,076,525	0.7
	Id. etc.	5,266,504	3.4
Total		**154,637,113**	**100.0**

3) Distribution of White-naped Cranes in accordance with habitat type in Cheorwon

From December 2011 to December 2014, 6 species of Cranes were recorded wintering in Cheorwon in total: Red-crowned Crane, White-naped Crane, Hooded Crane, Eurasian Crane, Sandhill Crane, and Siberian Crane. The number of White-naped Cranes observed was 2,816 in December 2014.

[Table 7] Record of Cranes wintering in Cheorwon between Dec. 2011 and 2014

Date	Red-crowned Crane	White-naped Crane	Hooded Crane	Eurasian Crane	Sandhill Crane	Siberian Crane	In total
DEC. 2011	607	1,108	1	3	2		5 species 1,721 Birds
FEB. 2012	670	2,716	3		2		4 species 3,391 birds
DEC. 2012	540	1,351				1	2 species 1,892 Birds
FEB. 2013	428	1,821					2 species 2,249 Birds
FEB. 2014	36	255					2 species 291 Birds
MAR. 2014	345	2,393	3				3 species 2,741 Birds
DEC. 2014	**476**	**2,816**		**1**		**3**	**4 species 3,296 birds**

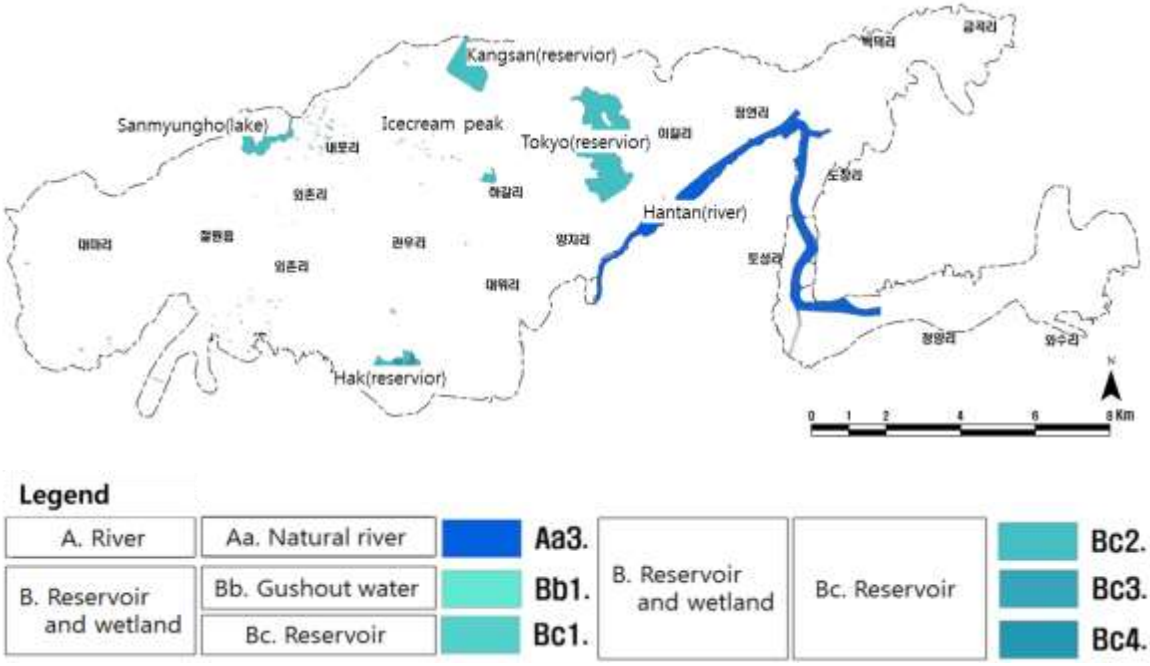


[Figure 111] Distribution of Cranes in accordance with habitat type in Cheorwon (as of DEC. 2014)

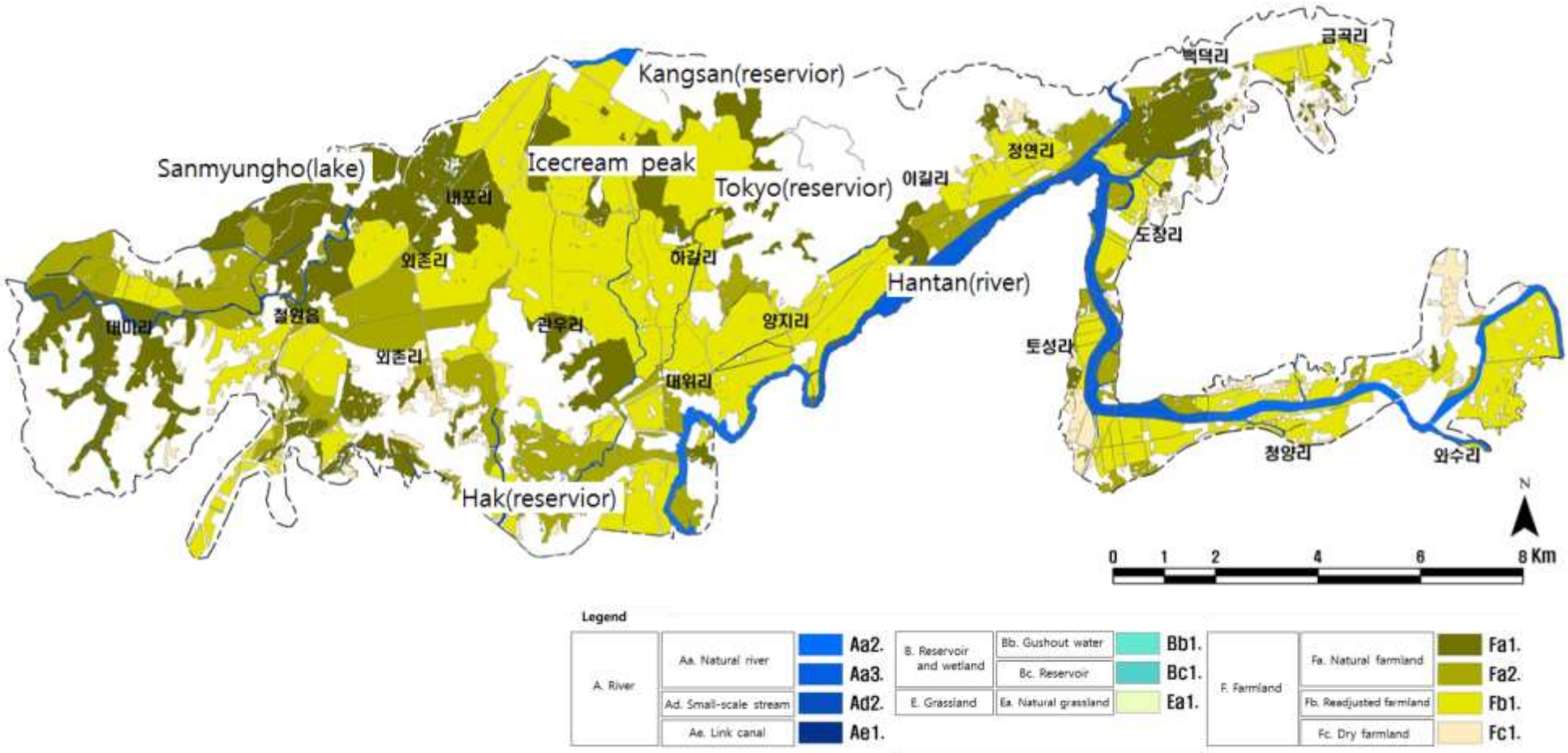
4) Roosting and foraging sties of White-naped Cranes in Cheorwon

White-naped Cranes wintering in Cheorwon use riverine wetlands and shallow water of Hantan River and nearby reservoirs as roosting sites and they also roost on the ice of reservoir when the temperature is dropped enough to freeze.

Main feeding sites of White-naped Cranes are rice paddies: family groups prefer natural rice terraces as their own territory while nonbreeding flocks usually use more open space–adjusted and flattened rice paddies. A large number of White-naped Cranes also use the open area during migration seasons to north and south.



[Figure 112] Distribution of roosting sites of White-naped Cranes in Cheorwon



[Figure 113] Distribution of foraging sites of White-naped Cranes in Cheorwon

5) Numbers and trends of Cranes in Cheorwon (1999-2014)

Beyond White-naped Cranes, Cheorwon is unique place can observe 7 species of Asian Cranes together. Since Korean Ministry of Environment inaugurated the regular monitoring on the number of Cranes in Cheorwon in 1999, the species, numbers and trends of Cranes are as below:

[Table 8] Numbers and trends of Cranes wintering in Cheorwon from 1999 to 2014

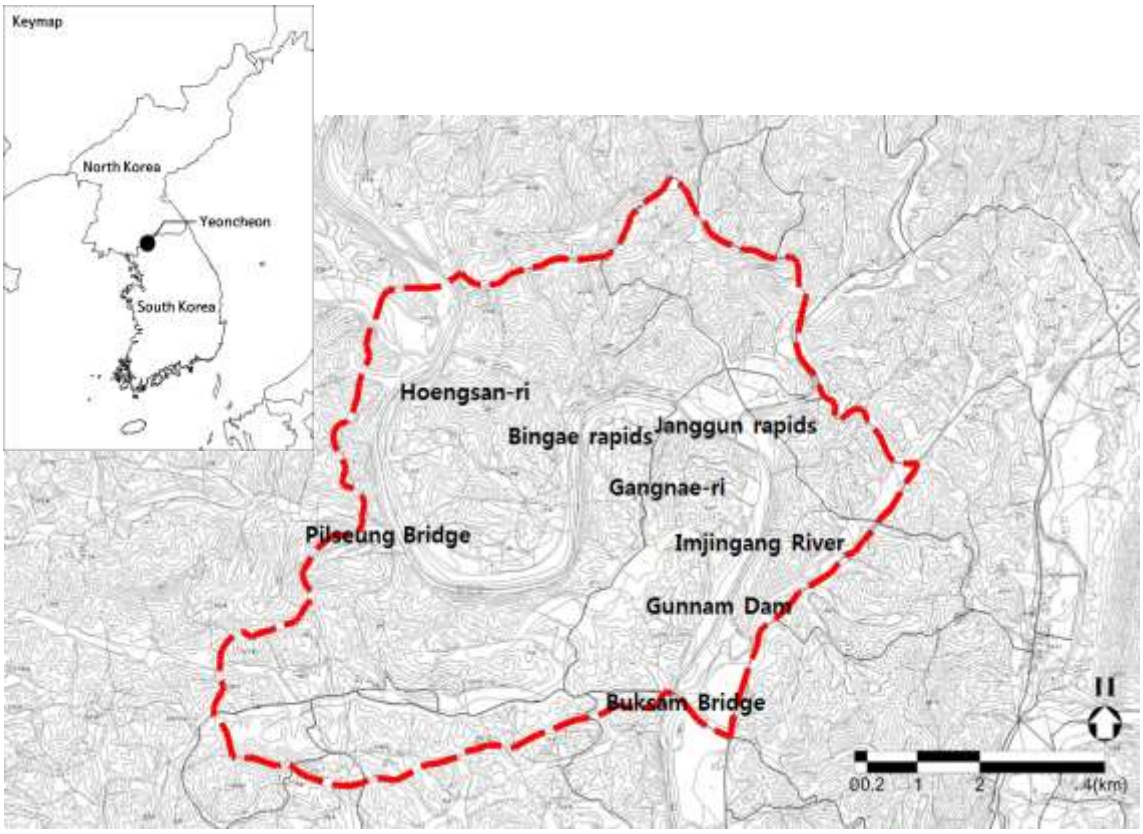
Year	Red -crowned crane	White -naped crane	Hooded Crane	Common crane	Sandhill crane	Siberian crane	Total
1999	372	474	1	1	-	-	4 species 848 individuals
2000	332	358		1	-	1	4 Species 692 individuals
2001	398	377	1	1	-	-	4 Species 777 individuals
2002	535	421	-	-	-	-	2 Species 956 individuals
2003	384	440	-	-	-	-	2 Species 824 individuals
2004	581	488	-	-	-	-	2 Species 1,069 individuals
2005	386	765	1	-	-	-	3 Species 1,152 individuals
2006	489	1,034	1	-	-	-	3 Species 1,524 individuals
2007	567	1,064	5	-	1	-	4 Species 1,637 individuals
2008	601	1,177	3	-	-	-	3 Species 1,781 individuals
2009	828	1,464	-	-	-	-	2 Species 2,292 individuals
2010	882	862	1	-	-	-	3 Species 1,745 individuals
2011	694	1,360	-	1	-	-	3 Species 2,055 individuals
2012	603	1,115	-	-	1	-	3 Species 1,719 individuals
2013	663	1,029	-	2	-	1	4 Species 1,695 individuals
2014	715	2,085	-	1	-	-	3 Species 2,801 individuals

* source from: Wintering Nationwide Birds' Census (Korean Ministry of Environment, 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014)

1.2.2 Yeoncheon

1) Location and overview

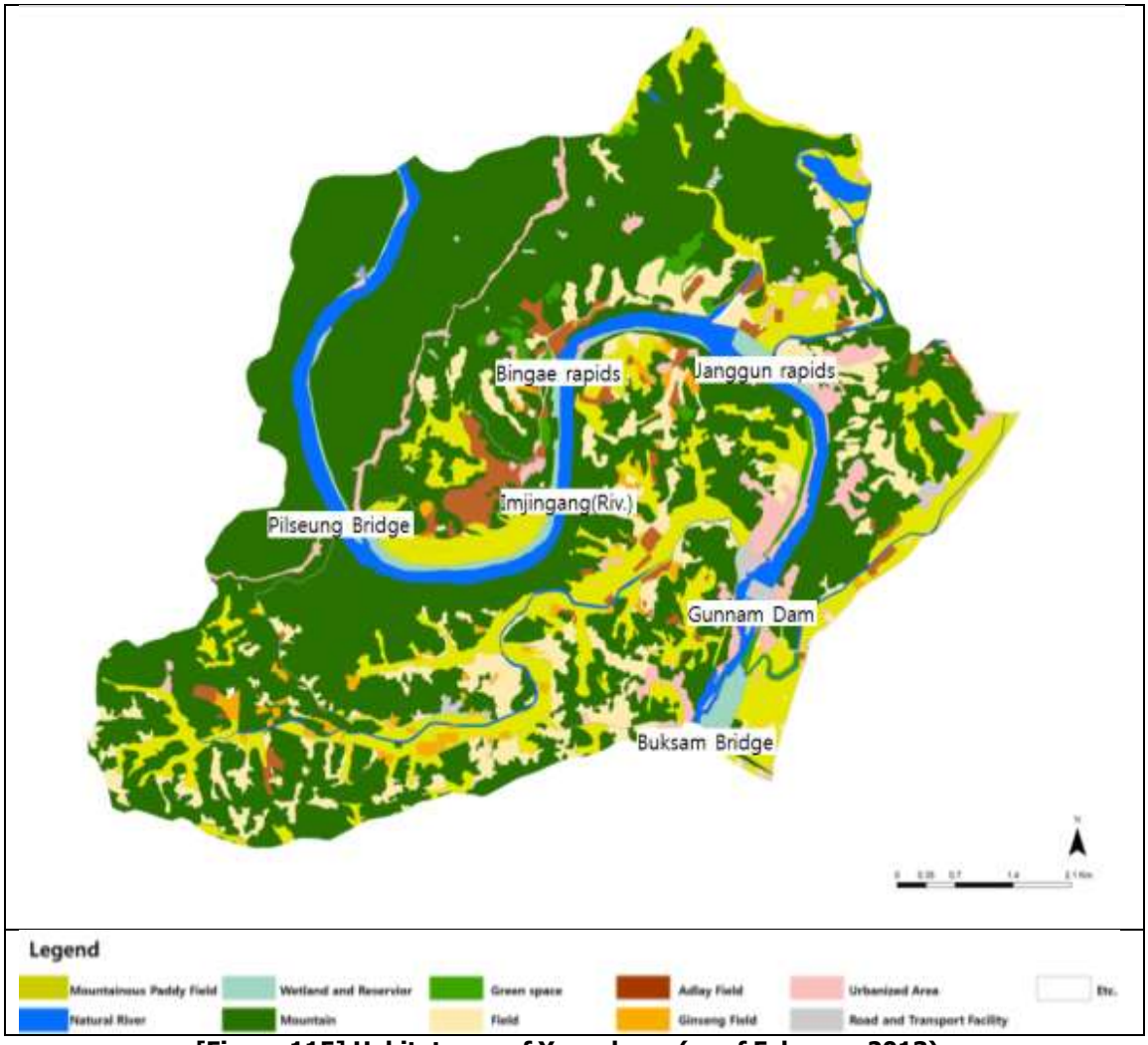
Yeoncheon (38°15′N 127°09′E) is adjacent to Cheorwon to the west. The administrative district belongs to Gyunggi Province. Total habitat size of Yeoncheon is about 40 ha, it is relatively small compared with Cheorwon. Imjin River and riverine wetlands and valleys are main habitat types of cranes in Yeoncheon. Altitude is between 85 ~ 90 m.



[Figure 114] Location of Yeoncheon in Korea (Inside of red line is survey area)

2) Habitat Composition in Yeoncheon

The cranes' habitat in Yeoncheon is mainly composed of the mountain, mountainous rice paddies, stream, riverine wetlands, and reservoir. Among of them, mountainous rice paddies and stream are important habitat types of White-naped Cranes for foraging and roosting sites respectively.



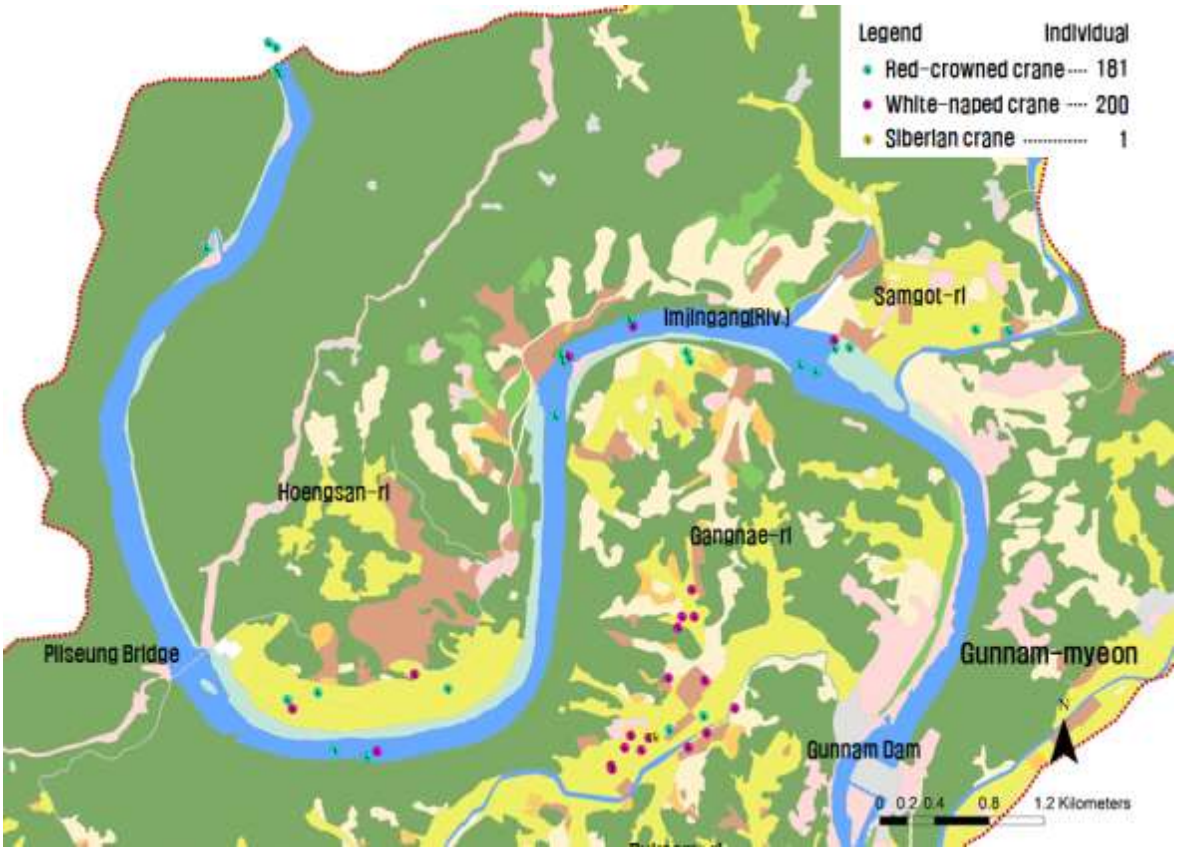
[Figure 115] Habitat map of Yeoncheon (as of February 2013)

[Table 9] Composition and ratio of each habitat in Yeoncheon

Habitat type	Area (㎡)	Ratio (%)
Mountainous paddy field	8,949,798	15.1
Natural river	3,474,242	5.9
Wetland and reservoir	988,848	1.7
Mountain	34,323,570	58.1
Green space	607,881	1.0
Field	5,905,653	10.0
Ginseng field	674,945	1.1
Adlay (Coix mayuen Roman) field	1,486,762	2.5
Urbanized area	2,158,629	3.7
Road and transport facility	511,917	0.9
Etc.	44,725	0.1
Total	**59,126,970**	**100.0**

3) Distribution of White-naped Cranes in accordance with habitat type in Yeoncheon

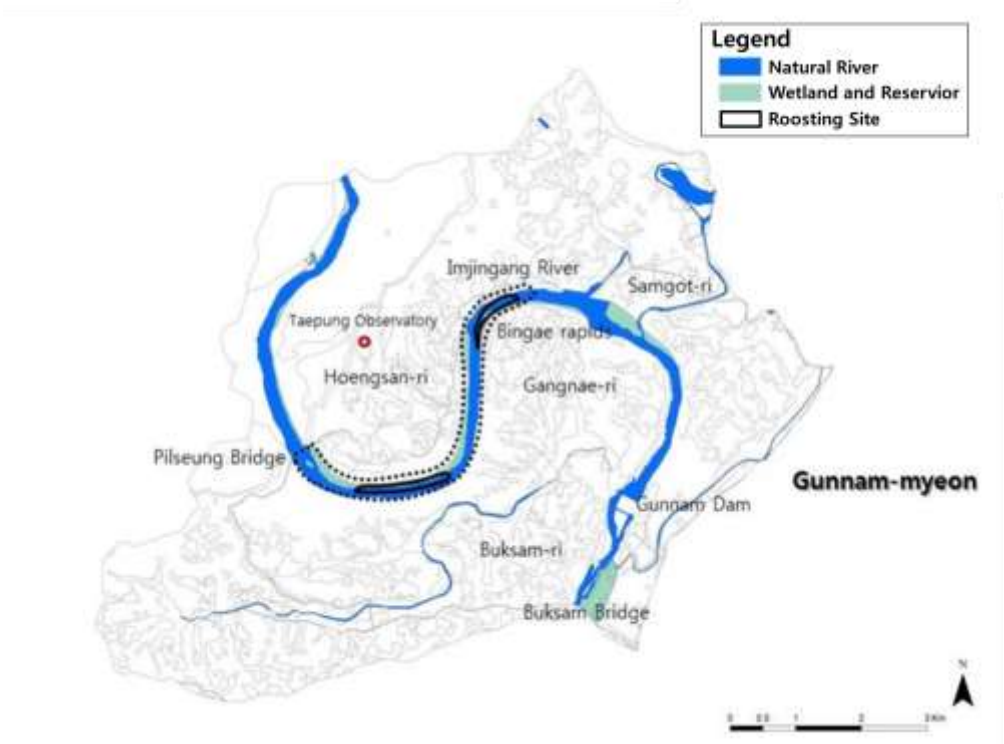
There were 200 individuals of White-naped Cranes, 181 individuals of Red-crowned cranes and 1 individual of Siberian cranes observed in January 2015.



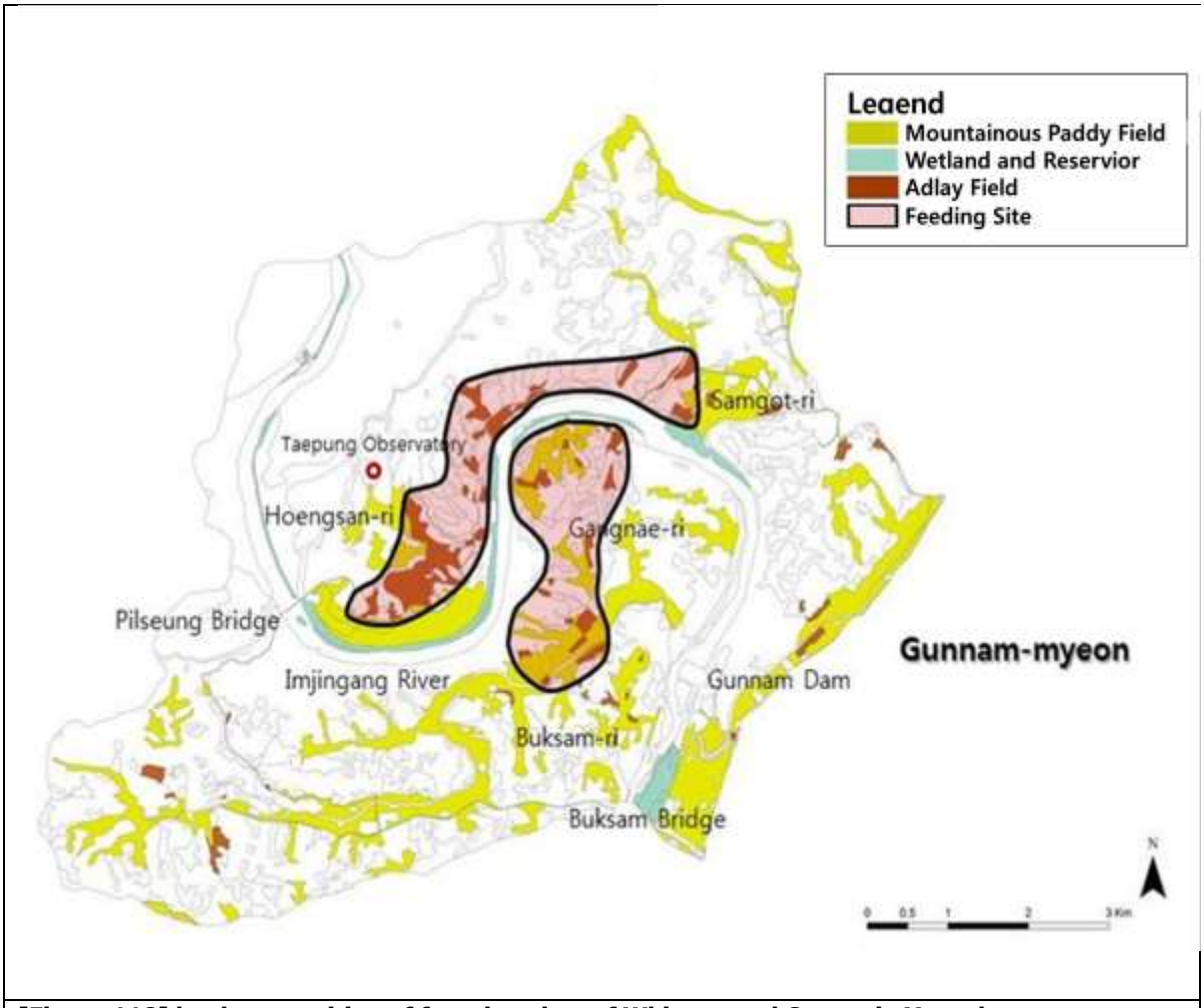
[Figure 116] Distribution of White-naped Cranes in accordance with habitat type in Yeoncheon (as of Jan. 2015)

4) Roosting and foraging sties of White-naped Cranes in Yeoncheon

White-naped Cranes wintering in Yeoncheon usually use shallow water or rapids of Imjin River as roosting and foraging sites. The birds mainly take dropped grains in mountainous rice paddies.



[Figure 117] Location of roosting sites of White-naped Cranes in Yeoncheon



[Figure 118] land composition of foraging sites of White-naped Cranes in Yeoncheon

5) Numbers and trends of Cranes in Yeoncheon from 2005 to 2014

[Table 10] Numbers and trends of Cranes wintering in Cheorwon from 2005 to 2014

Year	Red -crowned crane	White -naped crane	Hooded Crane	Common crane	Sandhill crane	Siberian crane	Total
2005	97	76	-	-	-	-	2 Species 173 individuals
2006	141	86	-	-	-	-	2 Species 227 individuals
2007	121	41	1	-	-	-	3 Species 163 individuals
2008	170	57	1	-	-	-	3 Species 228 individuals
2009	183	98	1	-	-	-	3 Species 282 individuals

2010	144	178	1	-	-	-	3 Species 323 individuals
2011	122	127	2	-	-	-	3 Species 251 individuals
2012	169	144	-	-	-	-	2 Species 313 individuals
2013	228	191	2	-	-	-	3 Species 421 individuals
2014	227	196	-	-	-	2	3 Species 425 individuals

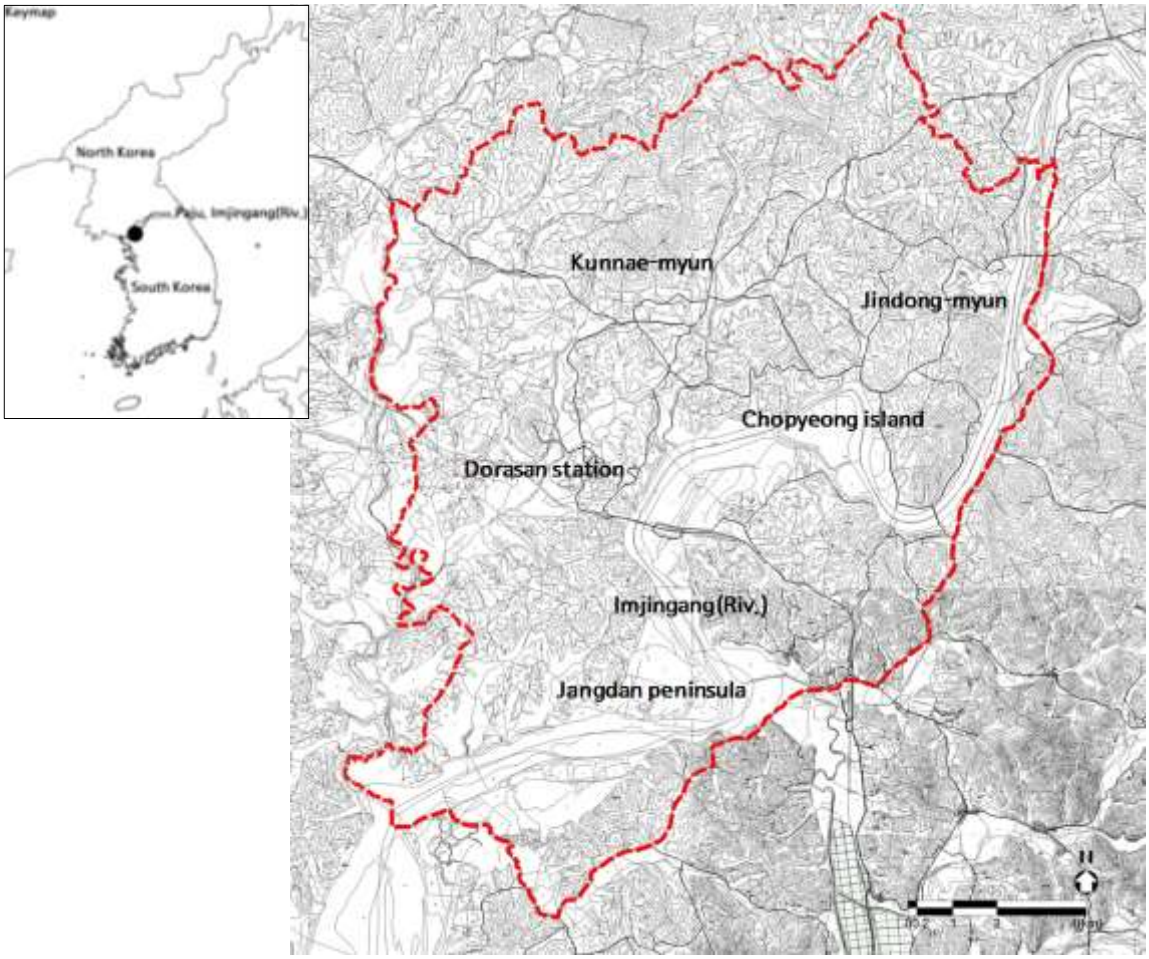
* Before 2005, no survey took place in Yeoncheon.

** source from 'Wintering Nationwide Birds' Census' (Korean Ministry of Environment, 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014)

1.2.3 Paju and Imjin River

1) Location and overview

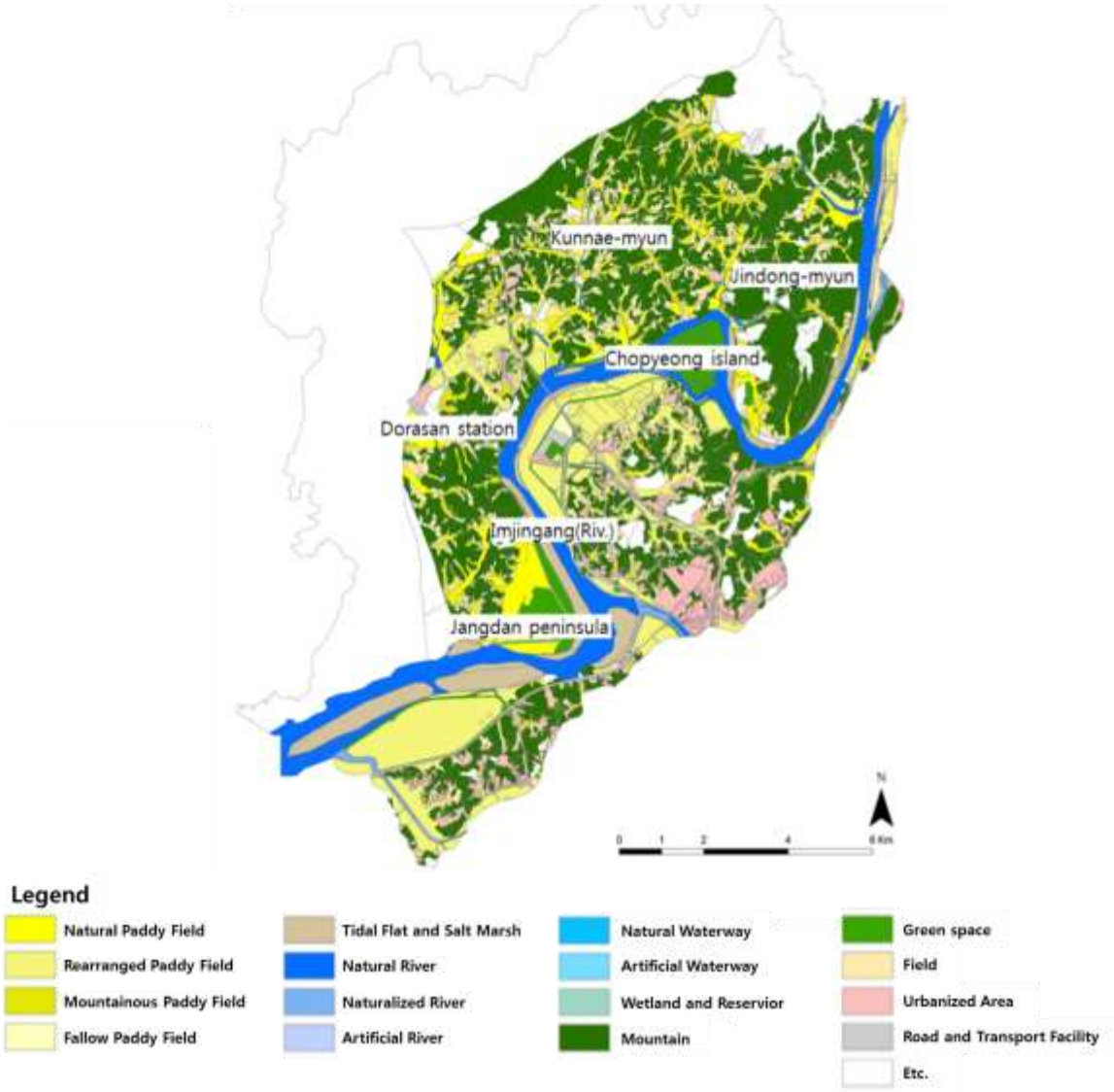
Paju and Imjingang River (37°57′N 126°41′E) is located in the west part of Korean DMZ area and Imjingang River flowing down from Yeoncheon meets Han River here in Paju and goes through to the Yellow Sea. The administrative district belongs to Gyunggi Province. Total habitat size of Paju and Imjingang River is about 1,700 ha. Imjingang River, riverine wetlands, rice paddies are main habitat types of Cranes in Paju. Altitude is between 10 ~ 32 m.



[Figure 119] Location of Paju and Imjin River (Inside of red line is survey area)

2) Habitat Composition in Paju and Imjingang River

The White-naped Cranes' habitat around Imjin River is mainly composed of mountain, river, rice paddies, residential area etc. The birds usually use riverine wetlands and rice paddies as the main habitat.



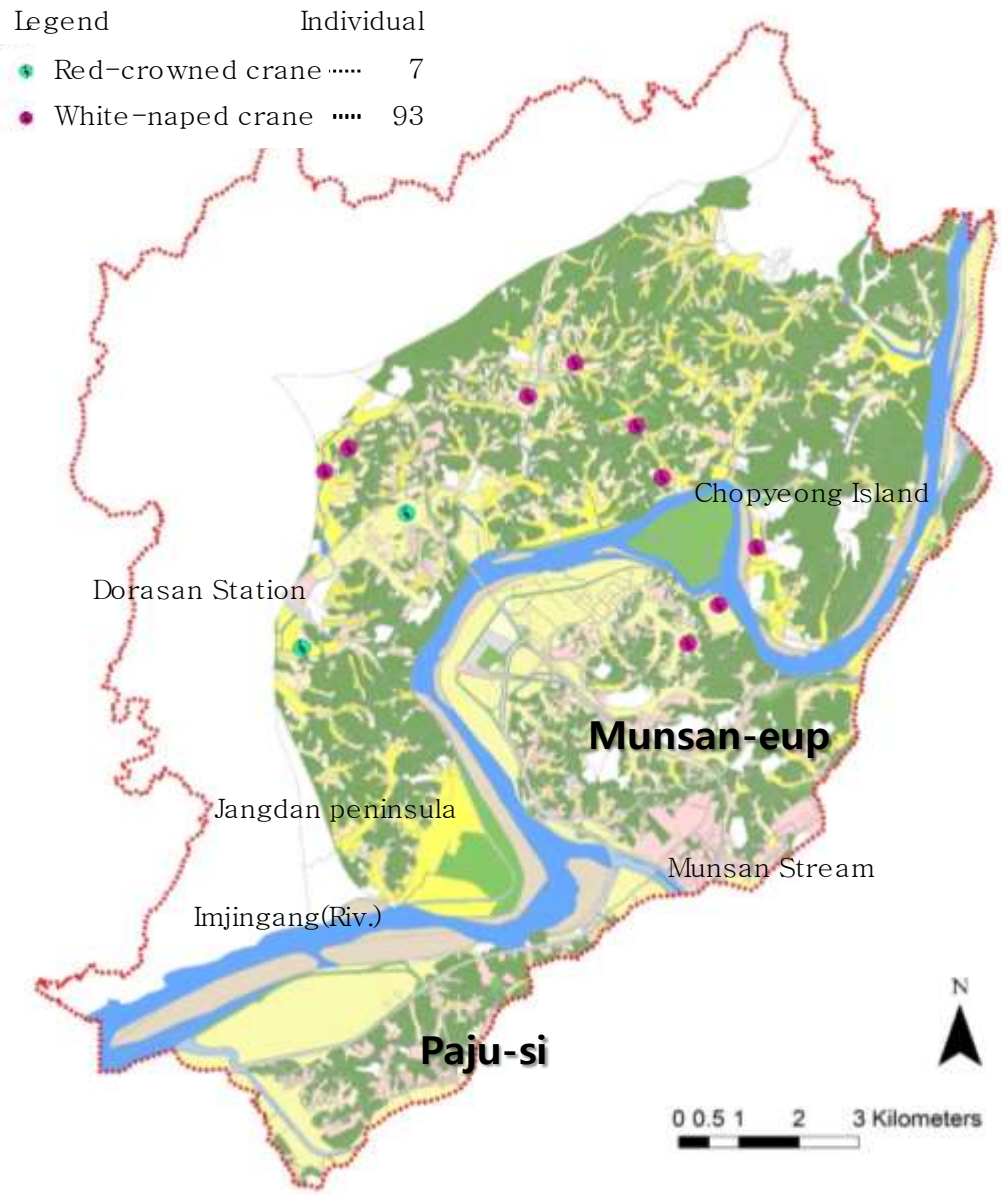
[Figure 120] Habitat map of Paju and Imjin River

[Table 11] Composition and ratio of each habitat in Paju and Imjin River

Legend	Area(㎡)	Ratio(%)
Natural paddy field	9,149,012	4.7
Rearranged paddy field	14,695,479	7.6
Mountainous paddy field	2,590,601	1.3
Fallow paddy field	339,753	0.2
Tidal flat and salt marsh	6,759,384	3.5
Natural river	13,489,688	7.0
Naturalized river	953,172	0.5
Artificial river	222,238	0.1
Natural waterway	209,199	0.1
Artificial waterway	44,748	0.0
Wetland and reservoir	80,084	0.0
Mountain	45,040,665	23.3
Green space	5,936,254	3.1
Field	14,441,654	7.5
Urbanized area	6,144,795	3.2
Road and transport facility	3,015,045	1.6
Etc.	70,556,885	36.4
Total	193,668,655	100.0

3) Distribution of White-naped Cranes in accordance with habitat type in Paju and Imjin River

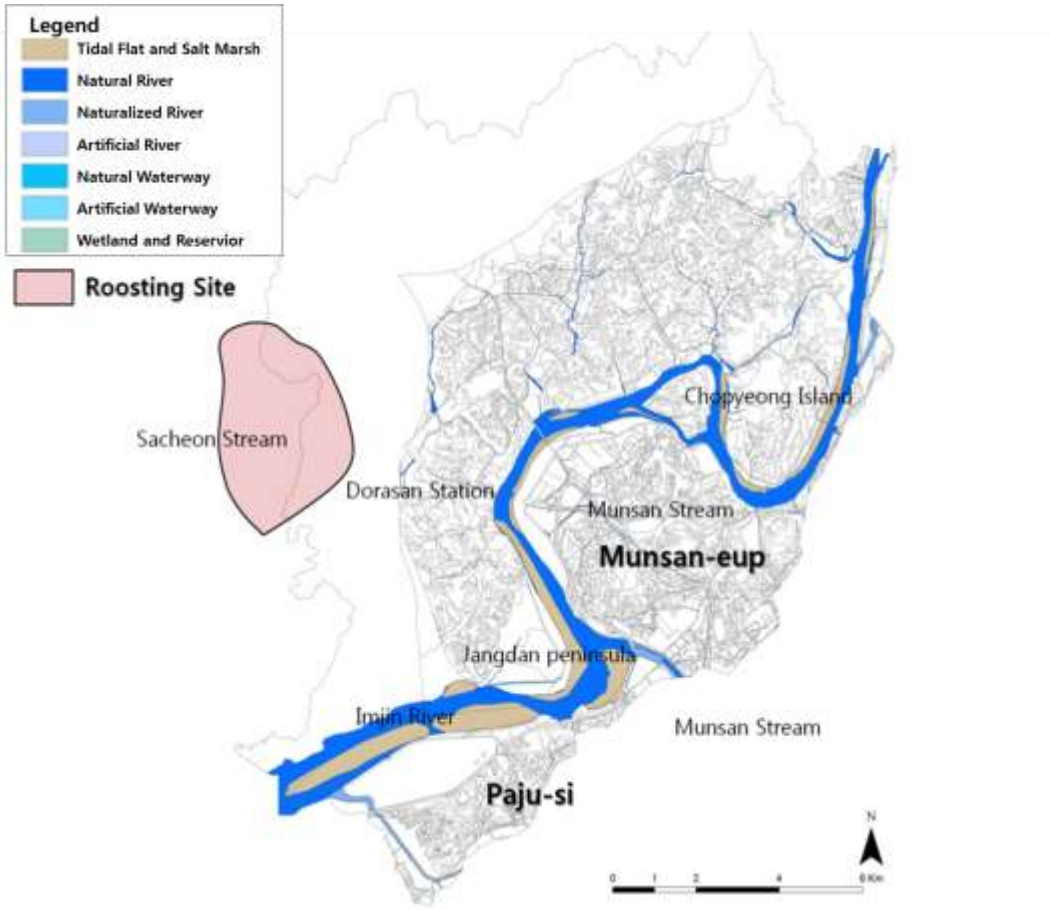
93 White-naped Cranes and 7 Red-crowned cranes were observed during the survey in January2015.



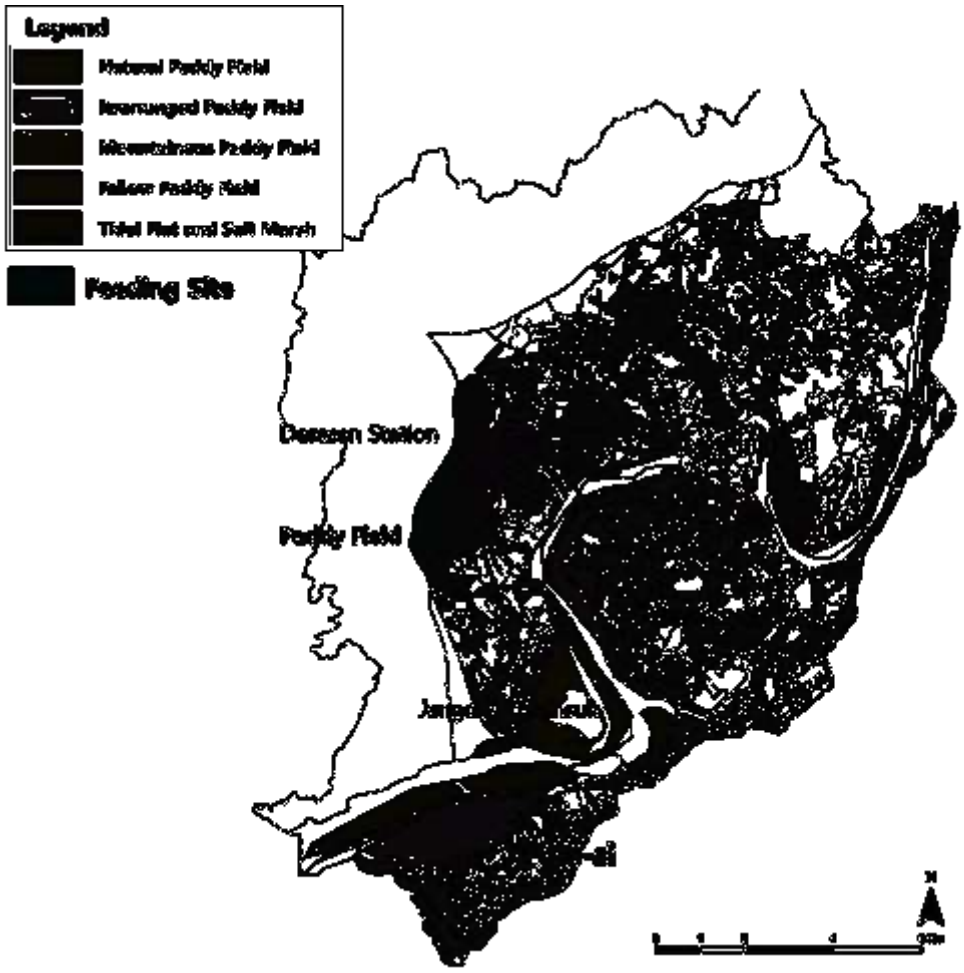
[Figure 121] Distribution of White-naped Cranes and Red-crowned cranes in Paju (as of January, 2015)

4) Roosting and foraging sties of White-naped Cranes in Paju and Imjin River

White-naped Cranes wintering around Imjin River use shallow water and wetlands in the DMZ as roosting site. Rice paddies and shallow riverine wetlands of Imjin River were identified as foraging sites of the birds.



[Figure 122] Location of roosting sites of White-naped Cranes in Paju and Imjin River



[Figure 123] Location of foraging sites of White-naped Cranes in Paju and Imjin River

5) Numbers and trends of Cranes in Paju and Imjin River (1999-2014)

Numbers of Cranes in Paju and Imjin River from 1999 which the national survey was started to 2014 is as follows;

[Table 12] Numbers and trends of Cranes wintering in Paju and Imjin River from 1999 to 2014

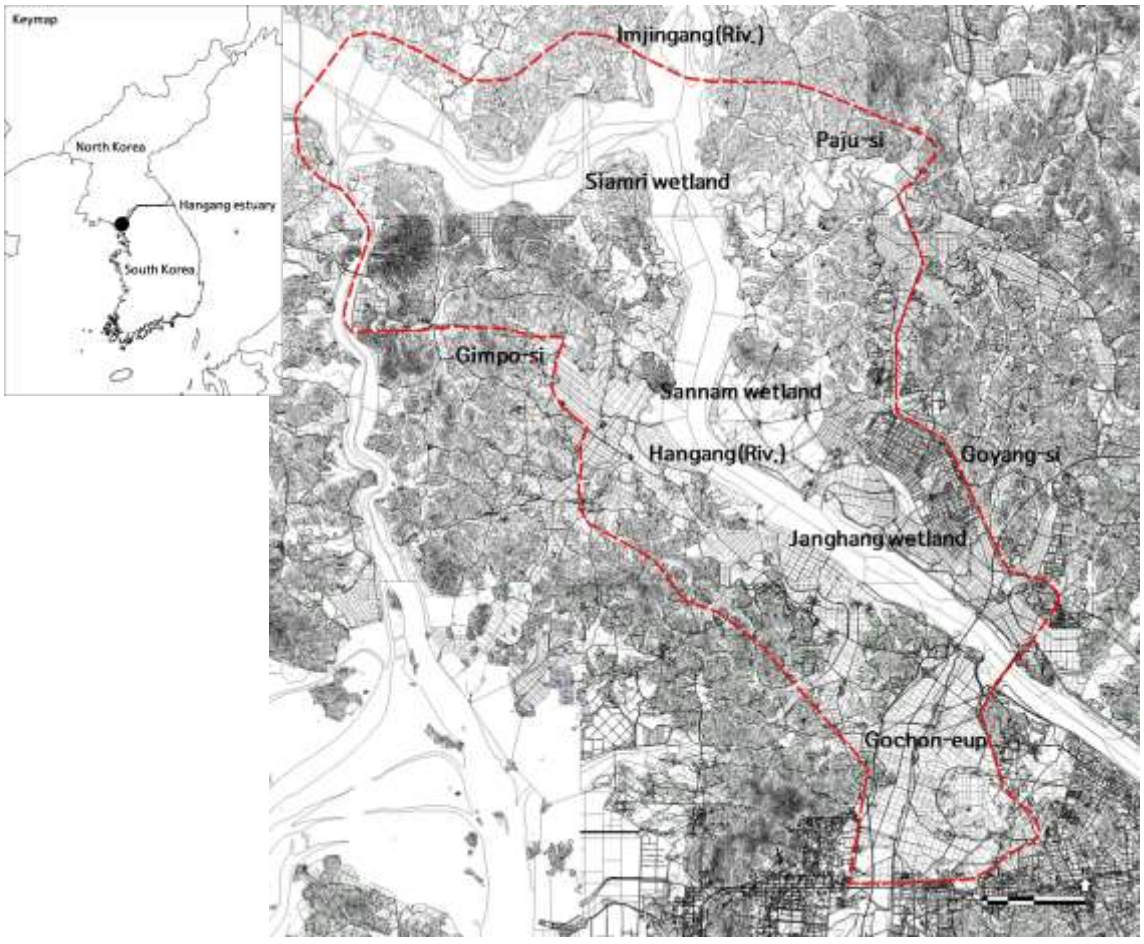
Year	Red -crowned crane	White -naped crane	Hooded Crane	Common crane	Sandhill crane	Siberian crane	Total
1999	-	24	-	-	-	-	1 species 24 individuals
2000	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-
2005	3	79	-	-	-	-	2 Species 82 individuals
2006	-	8	-	-	-	-	1 Species 8 individuals
2007	9	59	-	-	-	-	2 Species 68 individuals
2008	4	86	-	-	1	-	3 Species 91 individuals
2009	10	67	-	-	-	-	2 Species 77 individuals
2010	11	40	-	-	-	-	2 Species 51 individuals
2011	24	34	2	-	-	-	3 Species 60 individuals
2012	11	54	-	-		1	3 Species 66 individuals
2013	1	2	-	-	-	-	4 Species 3 individuals
2014	2	151	-	-	-	-	3 Species 153 individuals

※ Reference: Wintering Nationwide Birds' Census (Korean Ministry of Environment, 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014)

1.2.4 Han Estuary

1) Location and overview

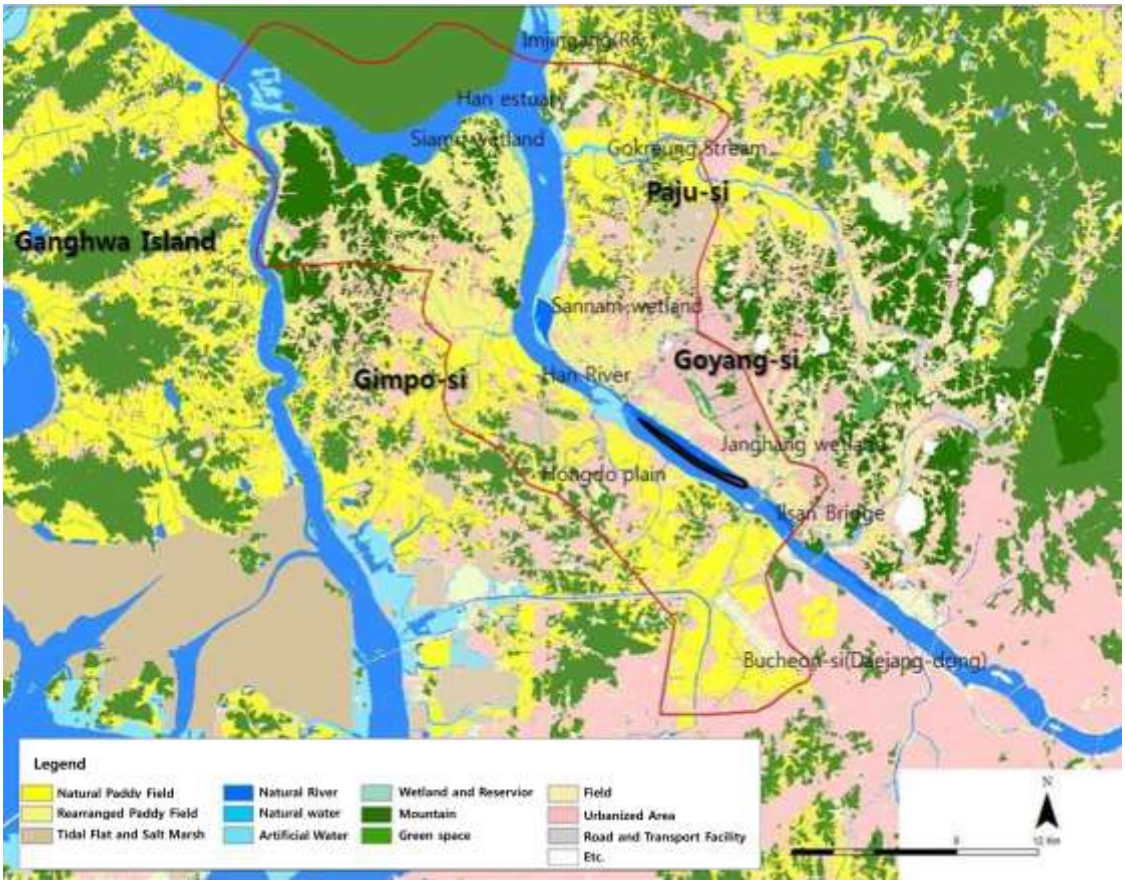
Han Estuary (37°42'N 126°40'E), which is still keeps natural river-mouth ecosystem in Korea, creates border area between DPRK and ROK. The administrative district belongs to Gyunggi Province. Total habitat size of Han Estuary is about 2,620 ha. Riverine wetlands and tidal-flat are main habitat type of Han Estuary. As brackish water affected by strong tides of Yellow Sea, the biodiversity of migratory waterbirds in Han Estuary is very high. Altitude is between 10 ~ 32 m.



[Figure 124] Location of Han Estuary in Korea (inside of red line is survey area)

2) Habitat Composition in Han Estuary

Mountain forest and urbanized area are mainland usages in Han Estuary, the habitat of White-naped Cranes. Adjusted and flattened rice paddies and streams are classified as main habitat type of White-naped Cranes.



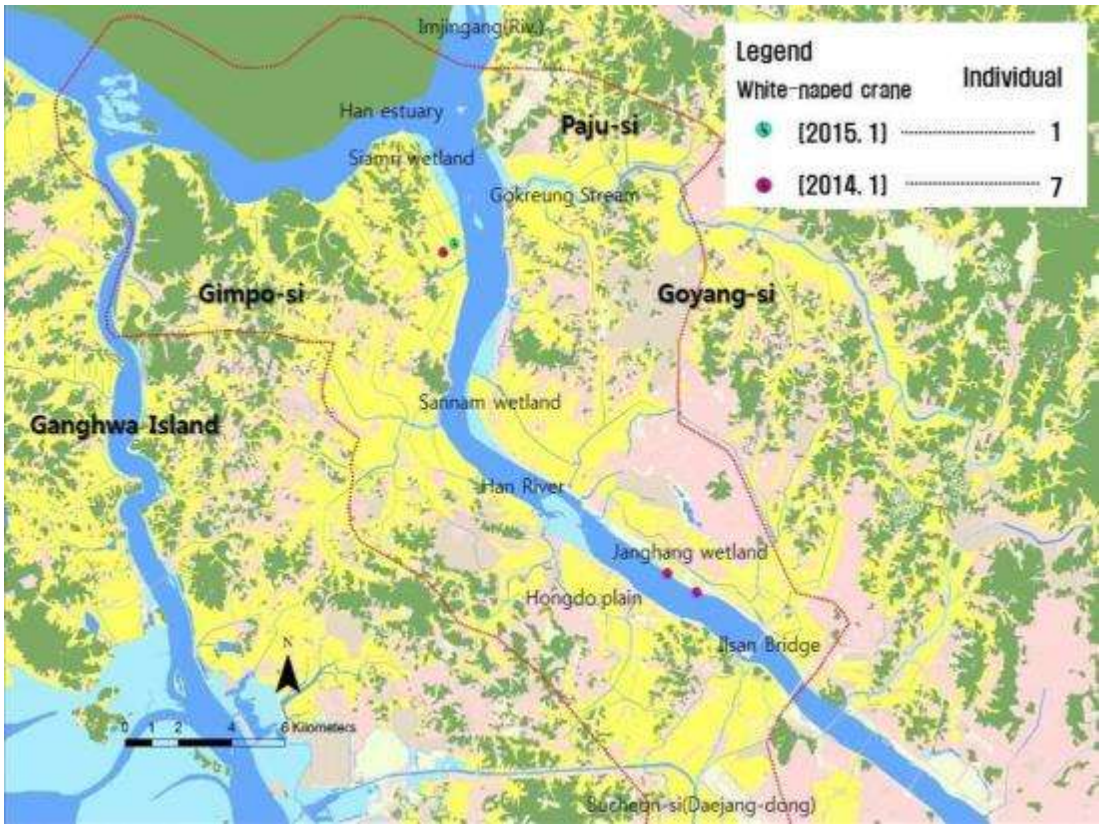
[Figure 125] Habitat map of Han Estuary

[Table 13] Composition and ratio of each habitat in Han Estuary

Legend	Area(㎡)	Ratio (%)
Natural Paddy Field	23,280,429	3.4
Rearranged Paddy Field	64,707,487	9.5
Mountainous Paddy Field	6,394,407	0.9
Fallow Paddy Field	1,346,526	0.2
Natural River	30,171,078	4.4
Naturalized River	10,066,593	1.5
Artificial River	2,467,912	0.4
Natural Waterway	1,025,083	0.2
Artificial Waterway	498,590	0.1
Wetland and Reservior	1,796,646	0.3
Mountain	260,266,511	38.1
Green space	24,672,491	3.6
Field	65,453,596	9.6
Urbanized Area	73,004,481	10.7
Road and Transport Facility	12,511,146	1.8
Etc.	105,196,125	15.4
Total	682,859,104	100.0

3) Distribution of White-naped Cranes in accordance with habitat type in Han Estuary

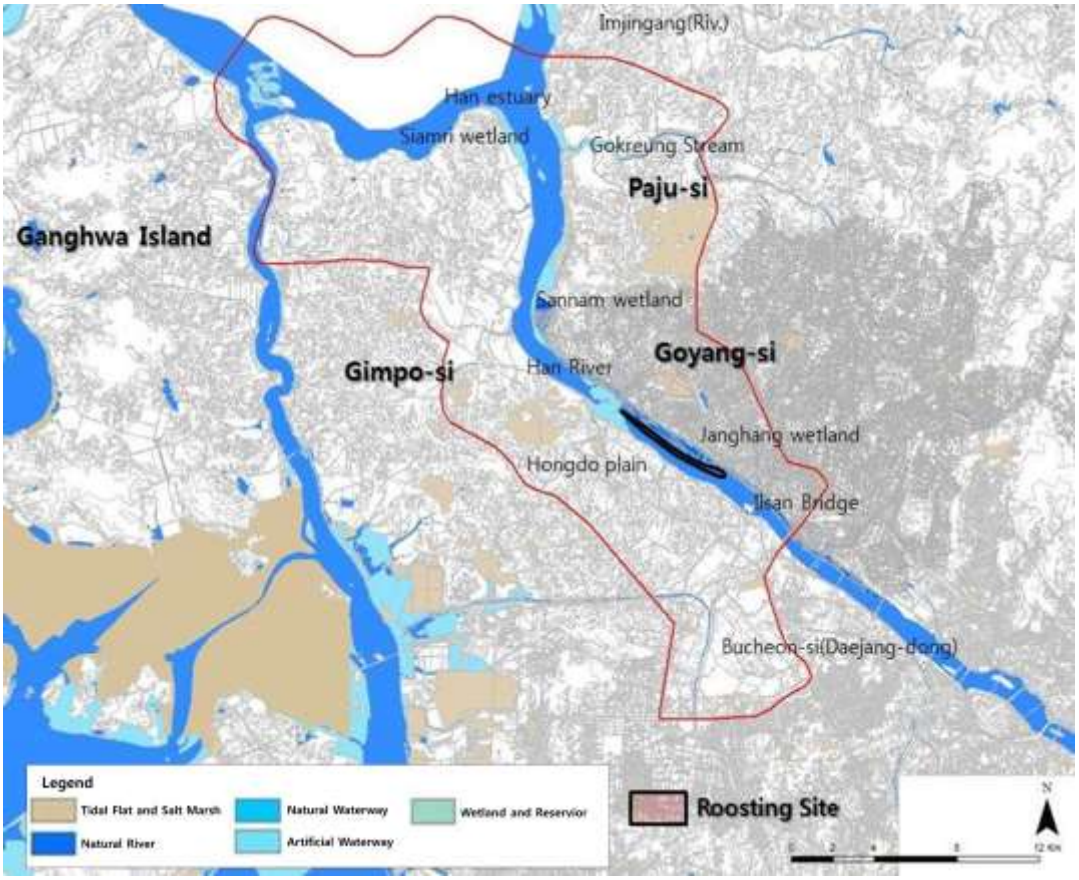
Only 1 White-naped Crane was observed during the survey in January 2015. There was record of 7 White-naped Cranes observed in Han Estuary in 2014. During the past ten years, most rice paddies in Han Estuary, the habitats of cranes, were lost to urbanization.



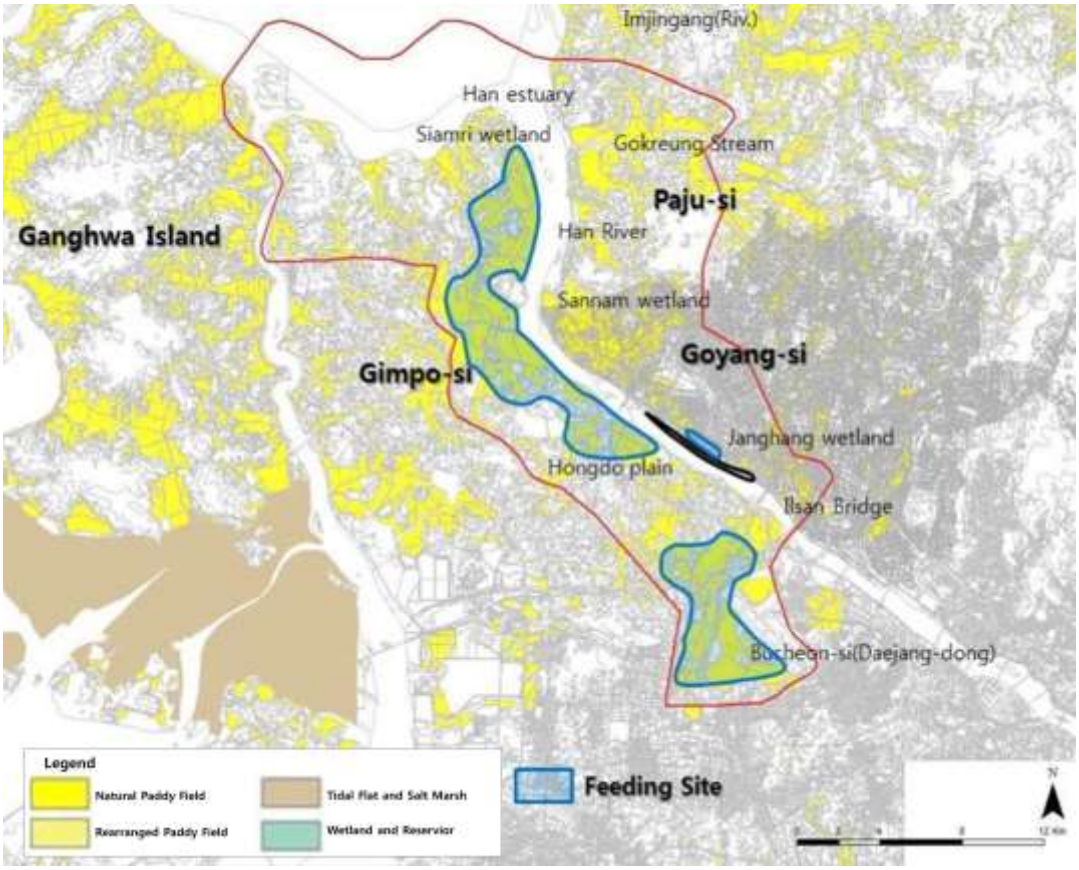
[Figure 126] Appearance of White-naped Cranes in Han Estuary in 2014 and 2015

4) Roosting and foraging sties of White-naped Cranes in Han Estuary

Main foraging sites of White-naped Cranes in Han Estuary are rice paddies and tidal-flat in low tide. It was observed that the birds took dropped grains in rice paddies and bentic organisms like lugworm in tidal-flat. They use shallow water of riverside as roosting sites.



[Figure 127] Location of White-naped Cranes' roosting site in Han Estuary (black line)



[Figure 128] Location of feeding sites of White-naped Cranes in Han Estuary

5) Numbers and trends of Cranes in Han Estuary (1999-2014)

[Table 14] Numbers and trends of cranes in Han Estuary from 1999 to 2014

Year	Red -crowned crane	White -naped crane	Hooded Crane	Common crane	Sandhill crane	Siberian crane	Total
1999	-	68	-	-	-	-	1 species 68 individuals
2000	-	7	-	-	-	-	1 species 7 individuals
2001	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-
2004	-	56	-	-	-	-	1 species 56 individuals
2005	-	85	-	-	-	-	1 species 85 individuals
2006	-	129	-	1	-	-	2 species 130 individuals
2007	-	129	-	-	-	-	1 species 129 individuals
2008	-	56	-	-	-	-	1 species 56 individuals
2009	-	61	-	-	-	-	1 species 61 individuals
2010	-	17	-	-	-	-	1 species 17 individuals
2011	-	-	-	-	-	-	-
2012	-	6	-	-	-	-	1 species 6 individuals
2013	1	-	-	-	-	-	1 species 1 individuals
2014	-	3	-	-	-	-	1 species 3 individuals

※Reference: Wintering Nationwide Birds' Census (Korean Ministry of Environment, 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014)

1.3 Threats to the Korean DMZ area

The biggest threatening factor on crane's habitats in Korean DMZ area is intensified habitat fragmentation by rapid urbanization and ongoing development projects. Urbanization and ongoing development projects including new building construction, extension of roads, increasing agricultural facilities etc. have changed the landscape of cranes' habitats very much, especially in the areas in which have not been designated as any legal protected area yet.

Especially, the habitat loss and fragmentation of Cheorwon has been severe for construction of greenhouses, concreted water-channels and new railway for Kyungwon line (which means Seoul to Wonsan in DPRK) and the landscape has been badly damaged as a result. In addition, ginseng farming, agricultural facilities for liquid fertilizer and small scaled constructions for flattening rice fields have been increased with no appropriate planning and they also have affected to the habitat fragmentation.

Looking back that riverside of Nakdong River which used to be Hooded Cranes' habitat, it was lost for increasing greenhouses and Gimpo plain used to be White-naped Cranes' habitat was lost to urbanization, it is obvious that all ongoing development projects affect cranes' habitat in the DMZ area.

1.3.1 Ongoing development plans

Without any comprehensive and long-term plan for conservation and sustainable development of the DMZ area, all development projects have been taking place along the DMZ area. Though it is hardly possible to realize large-scaled construction projects for the geographical condition of boarder area between DPRK and ROK, consensus to designate protected area over the DMZ area has been blocked for potential development.

During last several decades, Korean central and local governments have marketed various development projects over the DMZ area and all those development projects still remain as potential plan. Moreover, small-scaled development projects have over-issued to relieve any desire of local communities from development. Urban expansion, road construction, dam construction, creation of large-scaled adjusted and flattened rice paddies for machinery farming have been taking place without any guideline for comprehensive conservation plan over the DMZ area.

1.3.2 Change of water regime

Meanwhile, lots of spring waters (*samtong* in Korean) were lost for construction projects flattening rice paddies, roosting sites and foraging sites, especially for providing animal food, for cranes were also lost. In addition, the loss of spring waters is estimated to have affected the ground-water level and then shallow tributaries and hydro ecological system of Hantan River have been also affected.

Especially, greenhouses causing disconnected landscape overuse groundwater to keep the buildings for a constant degree of temperature urgent actions are needed to prevent the exhaustion of ground-water.

For the construction of Gunnam dam in Yeoncheon, the roosting sites of Hantan River used to be shallow water were lost. As the water level became deeper and water flow was delayed, those

sites covered by ice are no longer roosting sites for cranes. Compared with Cheorwon that cranes roost on the ice of reservoir, cranes wintering in Yeoncheon do not use those places as rooting sites because they are not safe from predators for narrow width of the river.

1.3.3 Human disturbance

Ironically, crane's habitats in the DMZ area are becoming increasingly disconnected but more people want to see cranes are visiting. On one hand, local governments and communities are generous to visitors because they expect visitors to contribute to increased local income. However, tourists who are not adequately educated in the absence of proper guidelines are becoming a real threat to the cranes.

Birdwatching and photography in the DMZ area where the systematic management is not done are threatening stable wintering of cranes or hindering their choice to habitat due to the competition of people for observing or photographing.

In addition, stable crane habitat in the Civilian Controlled Zone (CCZ), which has been maintained for decades, are exposed to human disturbance and threat for the reduction of CCZ and the gradual relaxation of visitors' accesses. The selfish behavior of observing more cranes and taking better pictures closer together is threatening the habitat faster than the activity to conserve the cranes and its habitat.

1.4 Recommendations for Korean DMZ area as an important crane habitat

An accurate habitat map should be produced in the status of the cranes in the DMZ area. These maps should map the emergence and behavior of cranes and their preferred areas in detail. Based on these maps, it is necessary to determine the areas that need to be conserved first and reflect them in the relevant policy. If it is difficult to conserve the entire area at once, it is necessary to find the ways to distribute and diversify habitats for small group of cranes. In the long run, these core areas need to be connected to a larger scale of ecological network.

Measures should be taken against the possibility of grouping cranes due to current habitat fragmentation. In addition, the provision of artificial feeding should be stopped to attract tourists. Artificial feeding and resulting collectivization of cranes are to avoid as much as possible because it is highly likely to undermine the system of the DMZ crane population which is highly dependent on nature. An artificial food supply should be chosen in cases of severe cold or natural disasters.

Above all, consensus on wise land use between governments, local residents and farmers should be drawn. Cranes wintering in the DMZ area are used natural habitats in the DMZ area, rice paddies and rivers in the CCZ area as a major habitat. The planning of wise land use should be urgently discussed and agreed with stakeholders, including local residents, farmers and landowners. Without such agreement, it is difficult to designate the crane habitats in the DMZ area as any protected area, but at the same time there is a danger that the wintering sites will disappear at some point.

It is also necessary to develop an ecotourism programme and to operate visitor centres to educate and guide visitors and tourists. Visitors are forming a public opinion for the conservation of cranes and the real beneficiaries of local residents. Sustainable crane tourism can lead to stakeholder

participation for the conservation of cranes. However, awareness-raising programme must be preceded for stakeholders making wise choices. In line with that, it is necessary to plan and practice the operation and management of visitor centres, which can enhance stakeholder awareness and serve as a focal point for visitors.

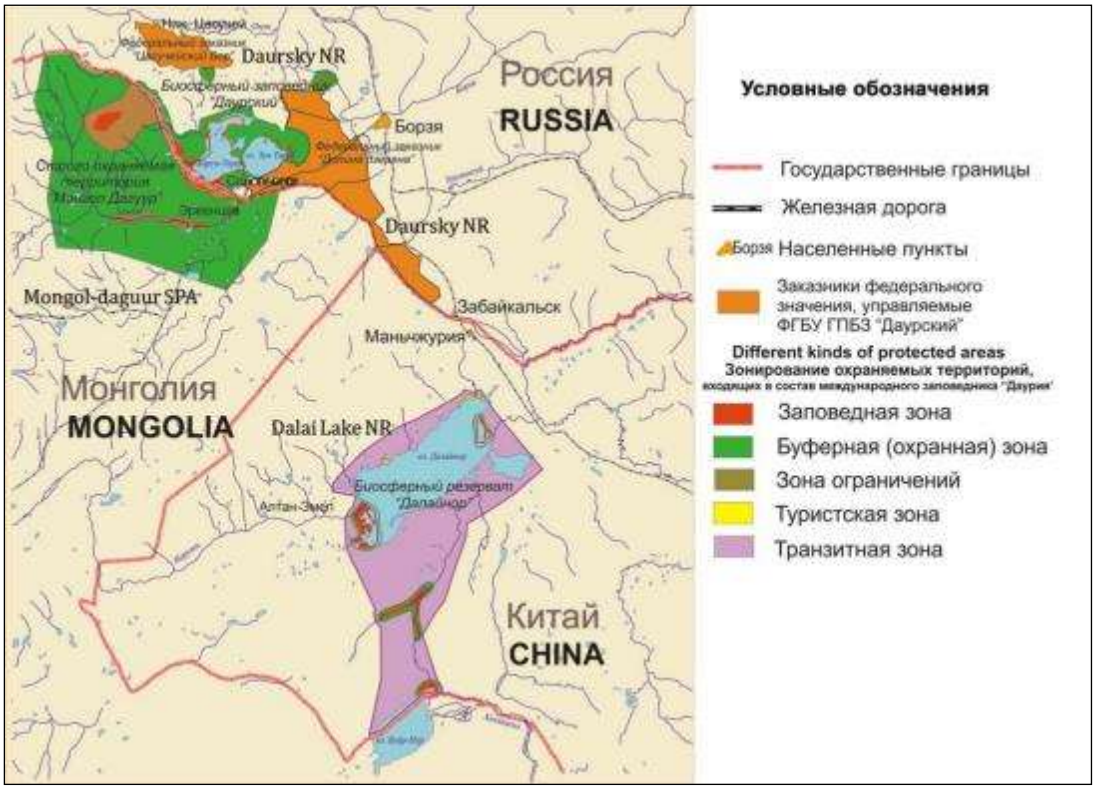
In order to conserve and wisely use the crane habitats of the DMZ area, it is necessary to cooperate closely with the countries in the North-east Asia. In particular, a conservation strategy linked to wintering sites in DPRK, which share the wintering sites of cranes in the DMZ area, is essential. International experts, local residents, NGOs and governments should establish and agree on a comprehensive plan and follow-up actions for the conservation and wise use of the DMZ area. It is time to establish regional action plans based on international strategies for the conservation of the DMZ area, especially for cranes. Habitat and species conservation programme of NEASPEC can contribute to this conservation strategy and can be an important stepping stone for international cooperation.

2. Dauria International Protected Area (DIPA)

Site name (Country)	Dauria International Protected Area (DIPA)	**Submitted Date**	December, 2016
Complier name	Oleg Goroshko(Dr.), State Nature Biosphere Reserve "Daursky" (Zabaikalsky Kray, Russia)	**Contact Information**	

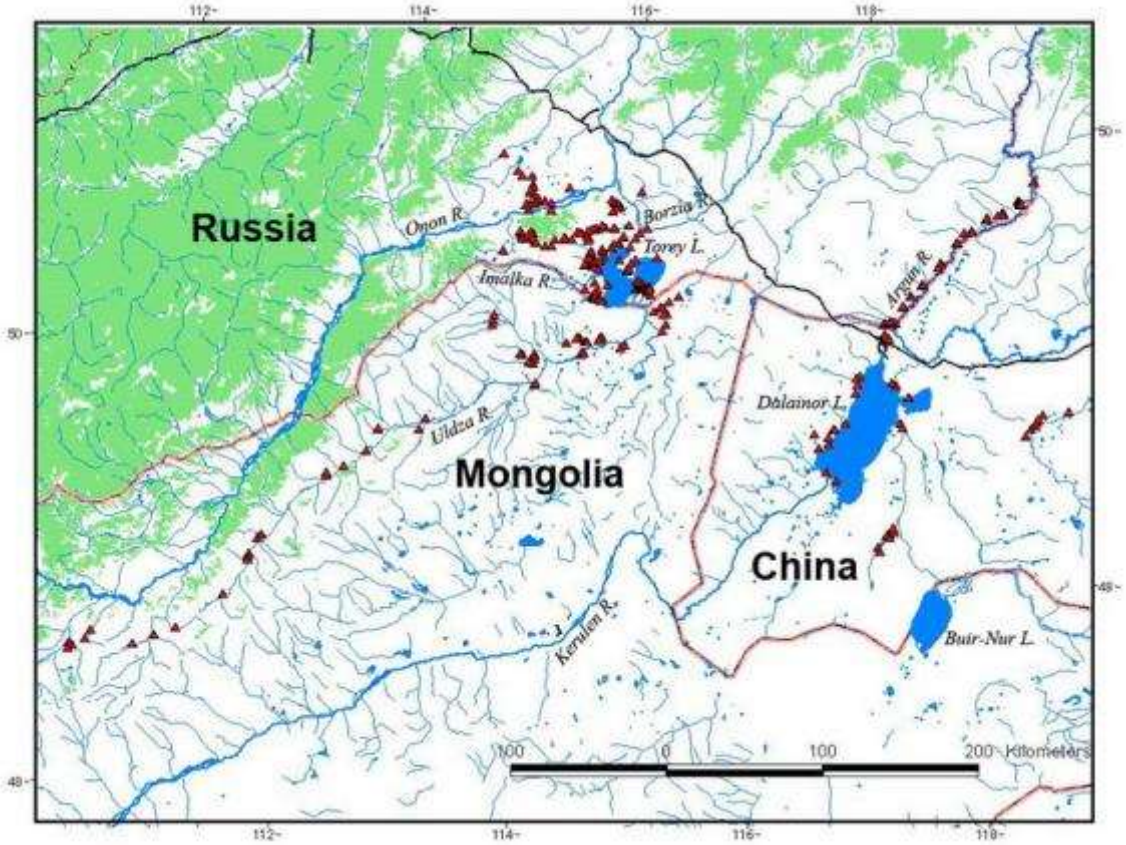
2.1 Overview of the NEASPEC project in Dauria

Dauria International Protected Area (DIPA) was established in 1994. It is located in the center of Transboundary Daurian Steppe Ecological Region. It is one of the 200 global ecological regions in the world selected by WWF in 2000. DIPA includes three national nature reserves: 1) State Nature Biosphere Reserve "Daursky" (Daursky NR) located in Zabaikalsky Kray (Zabaikalsky Region), Russia, 2) Mongol-daguur Strictly Protected Area (Mongol-daguur SPA) located in Darnod Aimag (Darnod Region), Mongolia, 3) National Nature Biosphere Reserve "Dalai Lake" (Dalai Lake NR) located in Inner Mongolia Autonomous Region, China (fig. 129). The total area of DIPA is more than 19,000 km². It includes big wetlands, waste steppes, rocks and forest. The DIPA has a big importance for conservation of waterbirds (especially cranes) in Asia. In particular, DIPA and neighbouring areas are a very important habitat of WNC. All three nature reserves were nominated as Ramsar Sites (Internationally Important Wetlands), as an Internationally Important Bird Areas (IBAs), and as Key Sites for Cranes in the North East Asia (EAAFP).



[Figure 129] Dauria International Protected Area

Considerable attention is needed to monitor waterbird (including WNC) populations and wetlands, and study the influence of climate change and anthropogenic activity to them. Within this line the Dauria transboundary monitoring network (DTMN) are being conducted and formed in 2010. DTMN includes more 250 monitoring plots within a spacious area of the transboundary Dauria Ecoregion including more 150 plots in DIPA and adjacent territories (Fig.130). Lakes and river wetlands are the main part of the monitoring plots. All monitoring plots are classified into three main classes of the frequency of monitoring. The DTMN is a spacious Russian-Mongolian net of special monitoring plots for long-term monitoring of the waterbirds and wetlands in the transboundary Daurian ecoregion. DTMN is a unique type of international cooperation unparalleled in North-East Asia. The final aim of DTMN is prognosis of changes in ecosystems and elaboration of proposals for their long-term preservation, as well as the rational and sustainable use of natural resources in the course of those changes both on the territory of each country and in the transboundary region as a whole.



[Figure 130] The Dauria transboundary monitoring network (DTMN)

2.1.1 The project time: 2014 - 2016.

2.1.2 The project area: the work for study, monitoring and conservation of WNC population and WNC habitats was done:

1) In Russia;

- on local Russian level (in the Daursky NR and adjacent territories)

- on regional Russian level (within whole WNC area in Transbaikal Region (South-Eastern Siberia) in Russia)

2) In Mongolia:

- in DIPA in Dauria Transboundary Ecological Region (in the Mongol-daguur SPA and adjacent territories of Mongolia);

3) At international level (increasing of conservation of WNC in Russia, Mongolia, and China, and increasing of international Russian-Mongolian and Russian-Chinese cooperation for conservation of WNC and its habitats):

- the intergovernmental commission "Joint Russian-Mongolian Commission for the Environment",
- the intergovernmental Working Group on Transboundary Protected Areas and Biodiversity Conservation in the Commission for the Preparation of Regular Meetings of Heads of Governments of Russia and China.

2.1.3 The project team and partners, and collaborating organisations: the Project activities have been carried out in collaboration with:

1) In Russia:

- Ministry of Natural Resources and Ecology of the Russian Federation,
- Ministry of Nature Resources and Industrial Policy of Zabaikalsky Kray,
- the State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray,
- the State Institution "Directorate of Protected Areas of Zabaikalsky Kray",
- the Institute of Nature Resources, Ecology and Cryology of Russian academy of sciences,
- the Transbaikal Museum of Local Nature and History,
- the Ministry of Education of Zabaikalsky Kray,
- the Transbaikal State University,
- 15 secondary schools of Zabaikalsky Kray within breeding area of WNC,
- Radio "Radio of Russia",
- the Red Book Commission of the Russian Federation,
- the Red Book Commission of Zabaikalsky Kray, and,
- Crane Working Group of Eurasia.

2) In Mongolia:

- Eastern Mongolian Protected Areas Administration,
- Mongol-daguur Strictly Protected Area (Mongol-daguur SPA),
- Wildlife Science and Conservation Center of Mongolia (Mongolia WSCC) and,
- Institute of Biology at Mongolian Academy of Sciences.

3) In China:

- National Nature Biosphere Reserve "Dalai Lake" (Dalai Lake NR) and,
- Beijing Forestry University.

4) At international level:

- The intergovernmental commission "Joint Russian-Mongolian Commission for the Environment" and,
- The intergovernmental Working Group on Transboundary Protected Areas and Biodiversity Conservation in the Commission for the Preparation of Regular Meetings of Heads of Governments of Russia and China.

5) Key collaborating persons for field joint studies in Russia:

- Liu Sontao and Dou Huashan (staff of the Dalai Lake NR, China),
- Tseveenmyadag Natsagdorjiin and Nyambayar Batbayar (Mongolia WSCC and Institute of Biology at Mongolian Academy of Sciences, Mongolia) and,
- Guo Yumin (Beijing Forestry University, China).

6) Key collaborating persons for field joint studies in Mongolia:

- Chimit Tseren and Batkhuu Batbayar (staff of the Mongol-daguur SPA).

7) Additional financial contributors to the project:

- State Nature Biosphere Reserve "Daursky" (Daursky NR),
- World Wildlife Fund - Russia,
- UNDP/GEF/Ministry of Natural Resources and Ecology of the Russian Federation (Project "Improving the coverage and management efficiency of protected areas in the steppe biome of Russia") and,
- Government of Zabaikalsky Kray.

Because the first transfer of the NEASPEC project money was on 28 June 2016, the main part of the NEASPEC project works in Dauria was done using money from other different sources on credit. These expenditures were covered using NEASPEC project money after receiving the first transfer.

2.2 Scoping surveys and Joint Studies

2.2.1 Objectives of Scoping Surveys and Joint Studies

This project research work included three main directions as following,

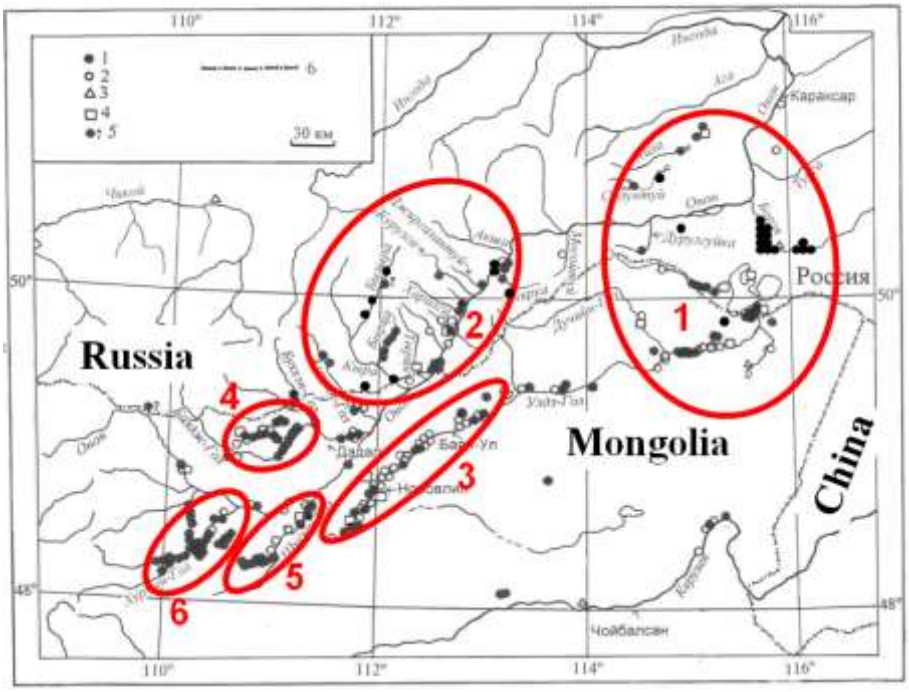
- Analysis of population status, population dynamics and threats during the Progect time (2014-2016);
- long-term analysis of population status, population dynamics, and threats (during the all period of the study 1990-2016)[4] and,
- preparation of recommendations for conservation of WNC and its habitats.

2.2.2 Key areas of Scoping Surveys and Joint Studies

Works for studying, monitoring, and consering WNC has been carried out in Dauria during 1990-2016 on the six important breeding areas of WNC (fig. 131). During the NEASPEC Project period 2014-2016, the following activities have been conducted,

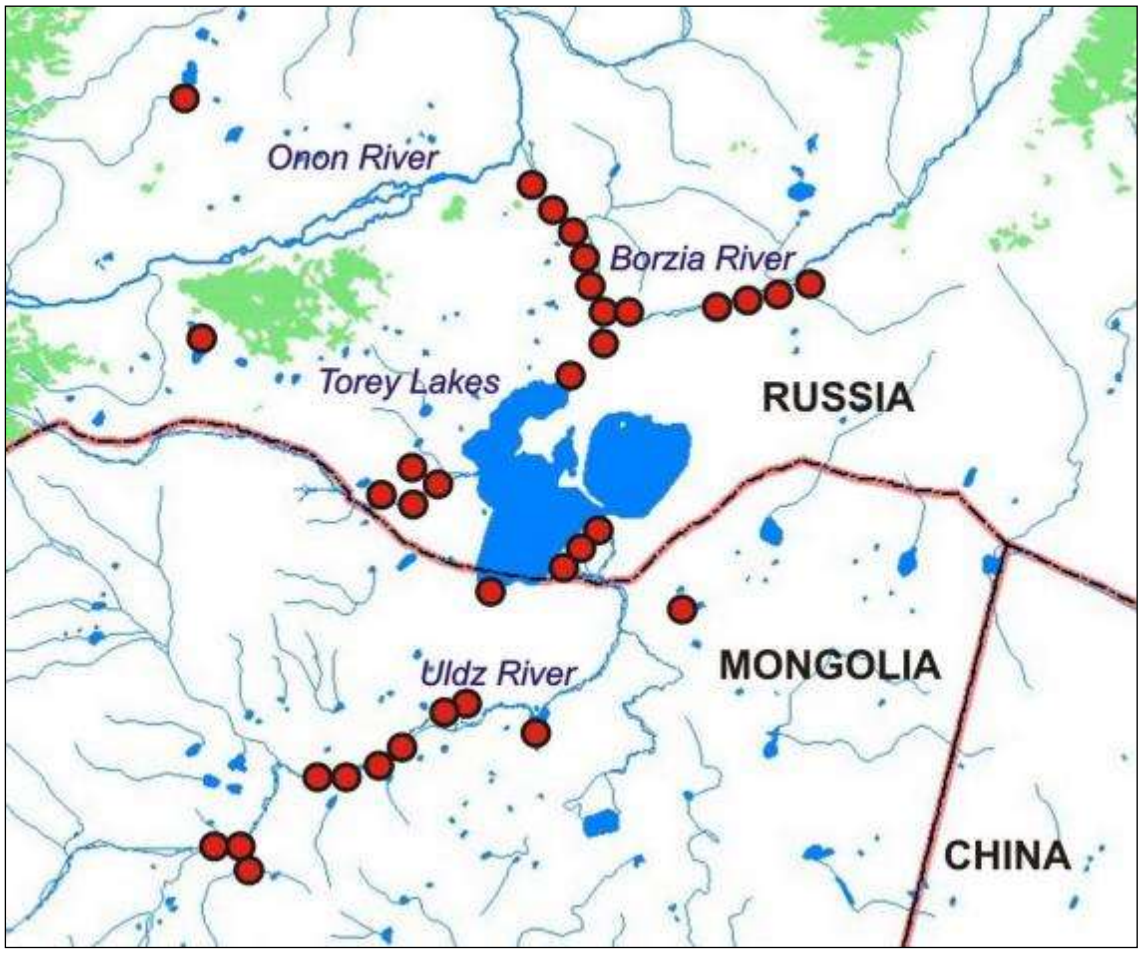
1) Study and monitoring on details of the area number 1 (the Daurian Steppe Area; fig.134) within the area about 18,700 km²;

2) Making a whole census and analysis of WNC population status in Russian Dauria. It is an area about 35,000 km². It is the whole breeding area of western population of WNC in Russia. The site number 2 (the Onon River Area; fig.131) and site number 1 (the Daurian Steppe Area) were key sites for this work. The census of the cranes on the Onon River has extremely high importance for the understanding of the long-term dynamic and conservation of the WNC in the whole Dauria Region.



[Figure 131] Six important breeding areas of WNC in Dauria studied by DIPA staff

For study population status and population dynamics, special attention has been paid to study and monitoring of WNC within DTMN. Plots important for monitoring of the WNC within DIPA and adjacent territories are showed on figure 132. These plots were monitored 2-8 times per each year during 2014-2016 (frequency of monitoring depends on the importance of plot for WNC).

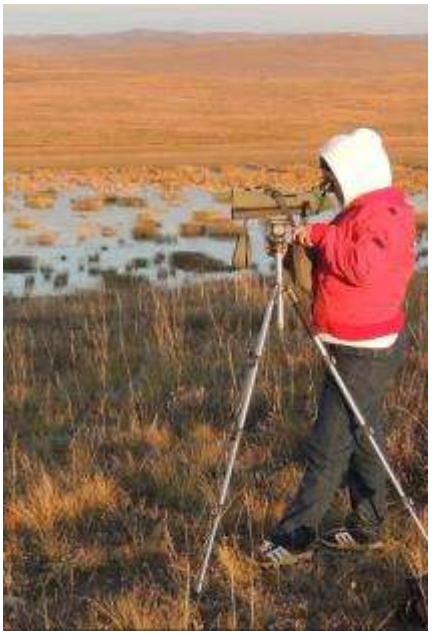


[Figure 132] The DTMN plots important for monitoring of the WNC within DIPA and adjacent territories (Russian-Mongolian part only)

2.2.3 Field works schedule.

During the Project period 2014-2016, 55 field trips were made using a car in Russia and 15 field trips in Mongolia for ground monitoring WNC population and WNC habitats, and study biology of WNC and threats (Table 15; fig.133, 134). Moreover, during June-July 2016, a whole census of WNC population in Russian Dauria was carried out using the car and small helicopter (fig. 135, 136). A car was used for visit wetlands in the Daurian Steppes (the main part of these wetlands is easy of approach), and a helicopter was utilized for observation wetlands on the Onon River. The Onon wetlands are very difficult of approach for a car and can be observed only with using aircraft. The census on the Onon River wetlands was made during 28-29, July 2016.

[Figure 133] Ground study and monitoring of WNC and wetlands



[Figure 134] Ground study and monitoring of WNC and wetlands

[Figure 135] The avia-census on the Onon River wetlands (28-29.July.2016)

[Figure 136] The avia-census on the Onon River wetlands (28-29, July, 2016)

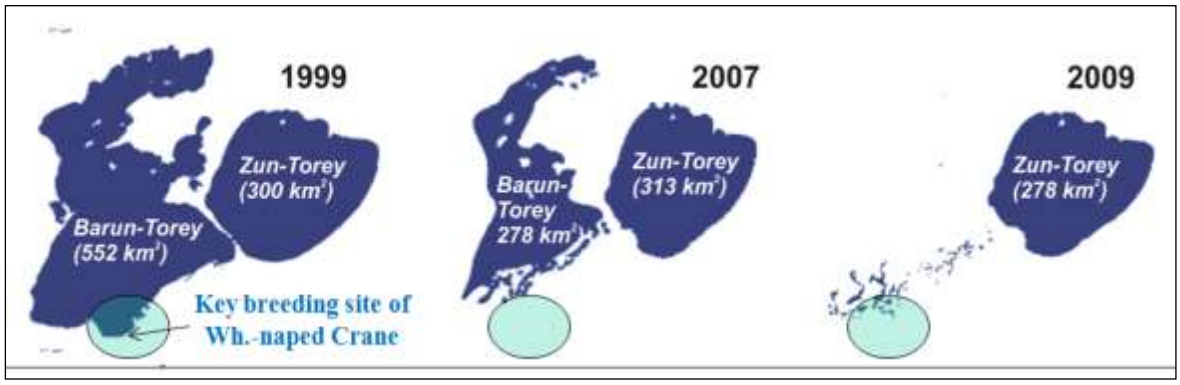
[Figure 137] The avia-census on the Onon River wetlands (28-29, July, 2016)

[Table 15] Field works for monitoring WNC and its habitats and study biology of WNC and threats on the DTMN plots including the Borzia River in Russia and the Uldz R. in Mongolia (Daurian Steppe area)

Time	Area	Team
02.04.2014	Russia	Russian
14-17.04.2014	Mongolia	Russian-Mongolian
18.04.2014	Russia	Russian
26-28.04.2014	Russia	Russian
6-18.05.2014	Russia	Russian
22-24.05.2014	Mongolia	Russian-Mongolian
24-27.05.2014	Russia	Russian
2-3.06.2014	Russia	Russian
05.06.2014	Russia	Russian
10-11.06.2014	Russia	Russian
18-26.06.2014	Russia	Russian
11-19.07.2014	Russia	Russian
19-21.07.2014	Mongolia	Russian
29.07.2014	Russia	Russian
8-20.08.2014	Russia	Russian
29-31.08.-05.09.2014	Russia	Russian
8-12.09.2014	Mongolia	Russian
12.09.2014	Russia	Russian
30.09 - 03.10.2014	Russia	Russian
7-9.10.2014	Mongolia	Russian-Mongolian
25.03.2015	Russia	Russian
25-27.04.2015	Russia	Russian
01.05.2015	Mongolia	Russian-Mongolian
24-27.05.2015	Russia	Russian
27-28.05.2015	Mongolia	Russian
28.05.2015	Russia	Russian
3-5.06.2015	Russia	Russian-Chinese
20-22.06.2015	Russia	Russian
24-24.06.2015	Mongolia	Russian
25.06.2015	Russia	Russian
07.07.2015	Russia	Russian
28.07.2015	Russia	Russian
5-7.08.2015	Russia	Russian
07-11.08.2015	Russia	Russian-Mongolian
15-16.08.2015	Mongolia	Russian
23.08.2015	Russia	Russian
04-06.09.2015	Russia	Russian-Chinese-Japonensis
07-19.09.2015	Russia	Russian-Chinese

04-12.10.2015	Russia	Russian- Mongolian
4-5.09.2015	Russia	Russian
8-9.09.2015	Mongolia	Russian
23.09.2015	Russia	Russian
04-07.10.2015	Russia	Russian
06-08.04.2016	Russia	Russian
10-13.04.2016	Mongolia	Russian-Mongolian
13-15.04.2016	Russia	Russian
18-19.04.2016	Russia	Russian
25-27.04.2016	Russia	Russian
07.05.2016	Russia	Russian
07-8.05.2016	Mongolia	Russian
11-12.05.2016	Russia	Russian
15-29.05.2016	Russia	Russian-Chinese
25-26.05.2016	Russia	Russian
02.06.2016	Russia	Russian
05.06.2016	Mongolia	Russian
07-10.06.2016	Russia	Russian
21-22.06.2016	Russia	Russian
07.07.2016	Russia	Russian
18-21.07.2016	Russia	Russian
26.07.2016	Russia	Russian
27-28.07.2016	Mongolia	Russian
28-29.07.2016	Russia	Russian
08.08.2016	Russia	Russian
16-30.08.2016	Russia	Russian-Chinese
19-23.08.2016	Russia	Russian
10-11.09.2016	Russia	Russian
20-21.09.2016	Mongolia	Russian
21.09.2016	Russia	Russian
27.09.2016	Russia	Russian
2-4.10.2016	Russia	Russian

According to Daursky NR's study, WNC habitats are very vulnerable because of climate change and anthropogenic activity. It makes WNC population very vulnerable too. Wetlands in Dauria depend significantly on long-term climatic change. During dry 2000-2016, about 95% of lakes and small rivers in Dauria become completely dry. 2007-2009 were the driest years. The climate cycles cause radical transformation of wetlands and crane populations. For example, the big Barun-Torey Lake (the key breeding site of WNC in Russian Dauria) is completely dry since 2009 (fig. 138).



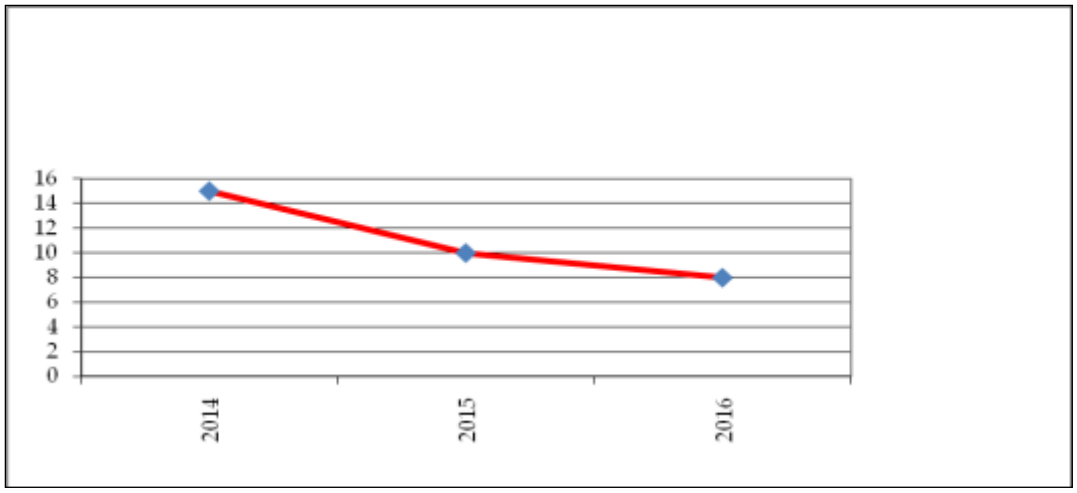
[Figure 138] Long term dynamic of the Torey Lakes and key breeding WMC habitats in Daursky Nature Reserve

2.2.4 Analysis of WNC population status during 2014-2016

According to the monitoring during the Project period, the status of WNC population was deteriorated significantly that:

1) The number of successfully breeding pairs was declined significantly (fig. 139),

2) The level of breeding success was declined significantly too (table 16). The situation was same on the Russian and Mongolian territories of the Daurian Steppes (site 1; fig.131).



[Figure 139] Dynamics of successfully breeding pairs of WNC in Russia in Daurian Steppes

[Table 16] Middle size of the brood of WNC (the average number of chicks in a brood)

2014	2015	2016
1.8	1.7	1.5

2.2.5 The main causes of WNC population deterioration within Daurian Steppes

No significant threats in Daursky NR. But, there are many threats outside of protected areas. Results of this study during the Project shows 4 causes of WNC population deterioration within Daurian Steppes as following,

1) Climate change and following loss of wetlands is the main cause of WNC population deterioration in the Daurian Steppes during 2014-2016 (both Russian and Mongolian territory) (see fig. 140)

[Figure 140] WNC breeding habitats in wet 1990s (left) and dry 2010s (right).

2) Spring hunting is a very important threat for breeding WNC and many other species of waterbirds on the Russian territory. The Spring hunting in Russia is very popular, and then a lot of hunters visit wetlands for this. Cranes are not game species, but spring hunting creates an intensive disturbance for breeding cranes. WNC starts to lay eggs in the third period of April; hunting season usually is started from May 1st, when the main parts of crane pairs are already incubating eggs. According to Daursky NR's study, on the hunting areas, up to 60% of breeding pairs of WNC can lose clutches because of hunting disturbance. Fortunately, no such similar threat in Mongolia.

3) Disturbance from humans and livestock is a very important threat for breeding WNC (both Russian and Mongolian territory). It makes big damage to WNC breeding success especially during dry climate periods with limited wetlands. There is a significant lack of sources of water and pastures during dry years. Therefore, a lot of cattle concentrate near few remained wetlands outside of nature protected areas (fig. 141). Horses are the most dangerous because they prefer to feed and rest near the water. Birds try to breed there (because they have not alternative place) but breeding success is very low.

[Figure 141] Livestock near WNC breeding habitats

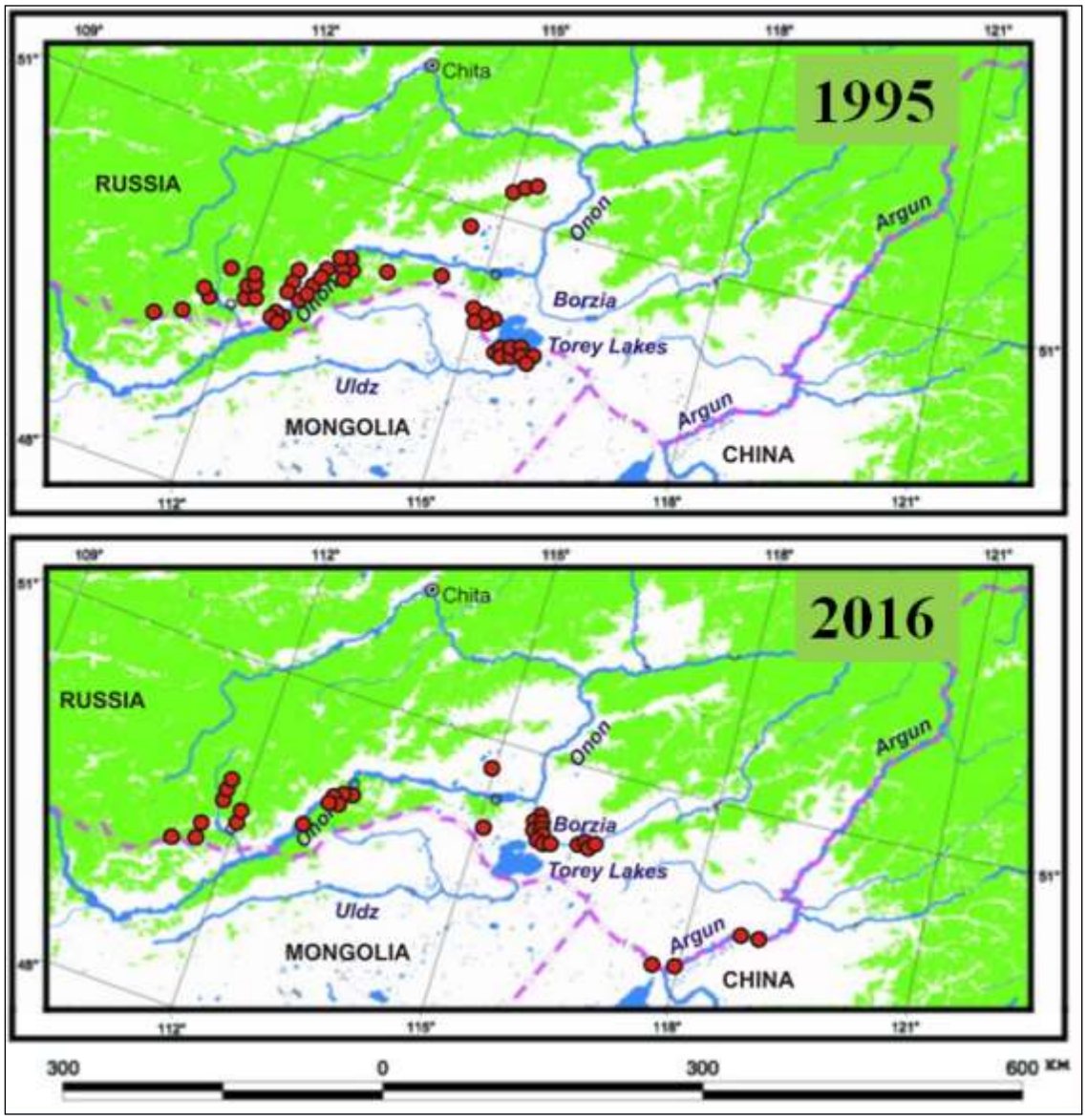
4) Often spring floodplain grassfires: annually, about 50% of crane breeding habitats are burned (outside of Daursky Nature Reserve). Grassfires are most often in May. Grassfires are most spacious during first years of dry climate period (because of reach dry vegetation). Human activity is the main cause of the grassfires. The main reason of fire is intentional, uncontrolled burning of dry last year's vegetation by local herdmen for deleting dry vegetation and "improvement" of the quality of pastures and hay making areas. Usually, people start the fire but do not stop it. Therefore, fire covers a huge area. The weather during spring is dry and windy – it supports fast moving of fire.

2.2.5 Analysis of WNC population status during 1990-2016

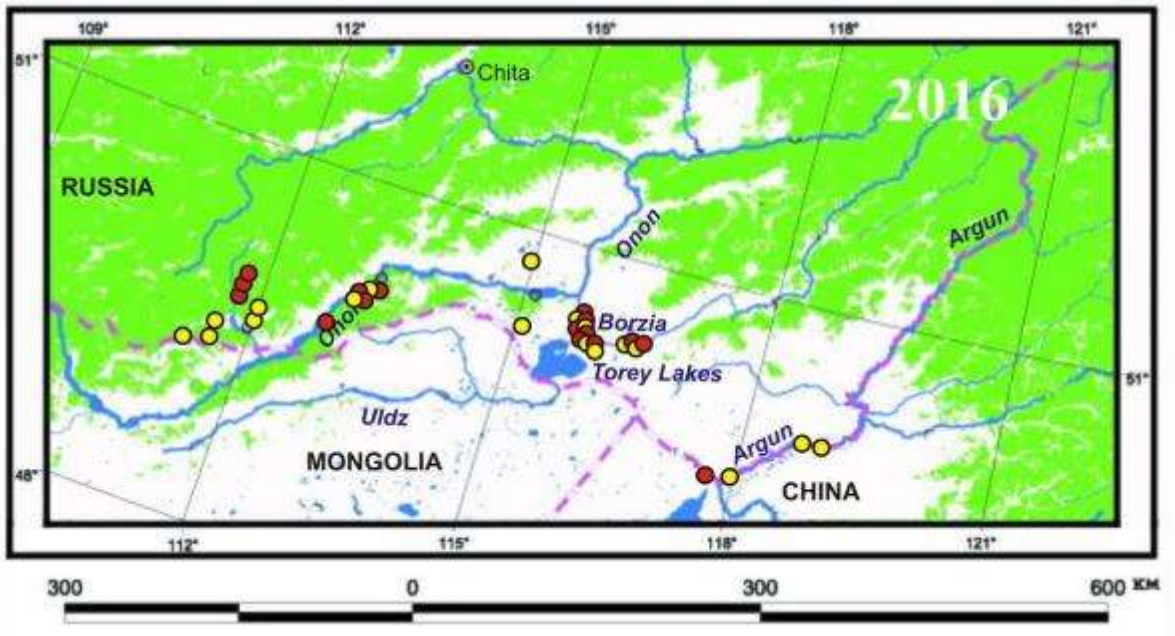
The last complete avia-census of WNC in Russian Dauria took place in 1995. It means no information about the status of the WNC there during 1996-2015. Therefore, the census 2016 was very important.

According to the census of 2016, the status population during last 20 years was deteriorated significantly including that:

- The breeding population of WNC was declined twice. About 100 territorial pairs were in 1995 (Goroshko, 2012), but only about 45 pairs remained in 2016 (fig.142),
- The level of breeding success was declined about twice too: breeding success in 2016 was very low - only 36% of territorial pairs had chicks (fig. 143).

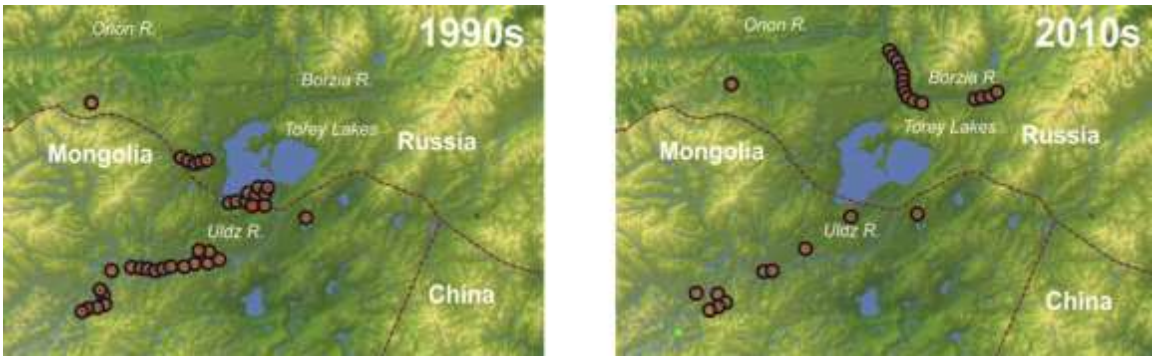


[Figure 142] Distribution of WNC breeding pairs in Russia in 1995 and 2016



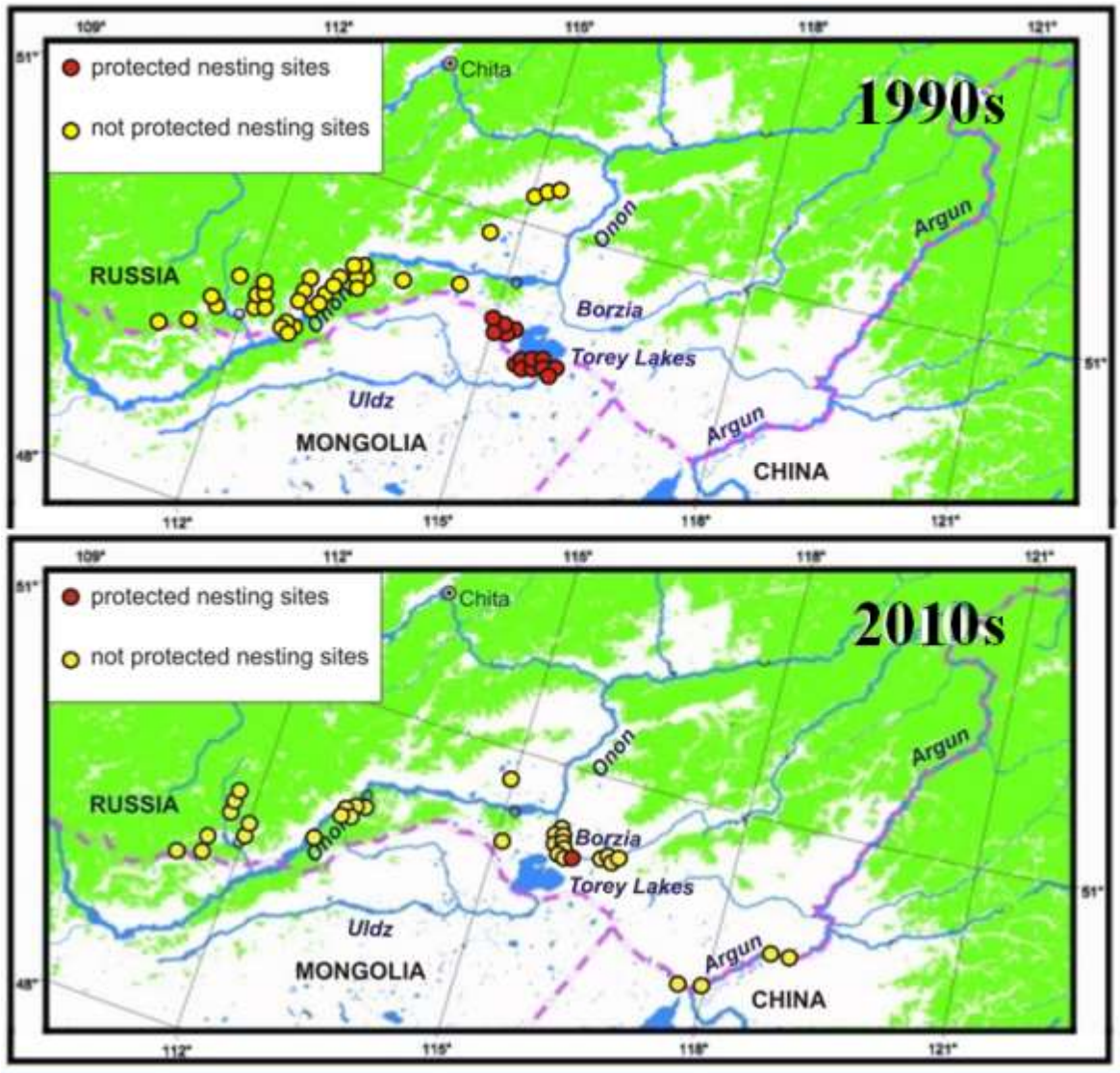
[Figure 143] Successful breeding pairs (red rings) and failure pairs (yellow rings) of WNC in Russia in 2016

There is also a significant change in the distribution of WNC during last 20 years (fig. 147). For example, in wet-1990s, up to 15 pairs of cranes nested on the Torey Lakes in the Daursky NR. At that time, the floodplain of the Borzya River was too swampy, cranes were not able to breed there. During dry 2000s, wetlands on the Torey Lakes dried up and became not suitable for breeding, but wetlands on the Borzia River dried up partially and became very good for breeding. Since 2009, WNC does not inhabit on the Torey Lakes, but up to 15 pairs of these birds breed on the Borzia River outside of protected area.



[Figure 144] Distribution of WNC breeding pairs in Daurian Steppes (Russia and Mongolia)

This study shows big problem with protection of WNC in Russia. In wet climate period (the 1990s) 15% of the population were protected (located within the protected nature areas) -15 pairs located in Daursky NR on the Torey Lakes. In dry period (the 2010s) only 2% of the population was protected (only 1 pair located in Dolina Dzerena Nature Refuge protected by Daursky NR). All other crane pairs breed outside of existing nature protected areas (fig. 145).



[Figure 145] Protection status of breeding pairs of WNC in wet 1990s and dry 2010s (Red rings: protected pairs, Yellow rings: not protected pairs)

2.2.6 Conclusion and Recommedation from the Research

So that the main conclusions of the research are following that:

1) Climate change has great influence on wetlands and WNC population. Existing many years duration of dry climate period (2000-2016) is critically unfavorable for the western breeding population of WNC because of significant reduce of wetlands, significantly reduce of forage resources, significant increasing of disturbance and many other anthropogenic threats,

2) During long-time period (1990-2016) and during the Project time period (2014-2016), **the status of WNC population in Russia and in Daurian Steppes (Russia and Mongolia) was deteriorated significantly** including,

- The number of breeding population was reduced twice and,
- The level of breeding success was reduced about twice too.

3) In Russia, 98% of WNC breeding habitats are not protected now. The breeding success of WNC living outside of protected areas is very low because there are many anthropogenic threats outside of protected areas.

4) The main anthropogenic threats (outside of protected areas) are included that,

- Spring hunting (in Russia),
- Disturbance from humans and livestock (in Russia and Mongolia)
- Often grass-fires. Other not so danger threats,
- Illegal hunting in Russian Dauria for using cranes for food,
- Illegal shooting of cranes by farmers because of crop depredation by cranes,
- Electric power lines collisions,
- Changes in hydrology and loss of suitable habitat due to water control projects and,
- Loss of habitats due to mining development (especially gold mining in the Onon River basin).

5) The western WNC population is needed urgent conservation actions and continues the study of biology and threats.

Based on the research and monitoring results of the Project, the following list of actions is recommended to be implemented in near future in Russia and DIPA as part of NEASPEC's program for Conservation and Rehabilitation of Habitats for Key Migratory Birds in Northeast Asia. The main recommendations for conservation of WNC and its habitats in Dauria are as follows,

- ✓ **Expansion territory of the existing nature protected areas and establishment a new nature protected areas. The Onon River basin is most important area for establishing new nature protected areas;**

- ✓ **Stop spring hunting or reduce negative influence of spring hunting to WNC (in Russia);**

- **Actions for stop spring hunting in Zabaikalsky Kray and Russia (letters to Government, public awareness, getting and publication more research data about negative influence of spring hunting to waterbirds) and,**

- **Establishment of special "Peace areas" on the key breeding sites of WNC in Dauria (spring hunting must be prohibited on these sites)**

✓ **Stop or reduce of negative effect of disturbance to WNC (education of local people is the most important) and,**

✓ **Stop and prevention of grassfires (education of local people is very important).**

Other recommendations for conservation of WNC and its habitats in Dauria are as follows,

- Work for reduction of crop depredation by cranes (for reduction of illegal shooting of cranes by farmers),
- Study and prevention of collision cranes on the electric power lines,
- Education of hunters,
- Continue study and monitoring of WNC population, distribution, migration and study ecology, threats, limiting factors using GPS\GSM loggers and PTT,
- Support Dauria transboundary monitoring network (DTMN). Ground monitoring should be annual, aerial monitoring should be at least one time during each 5 years and,
- Results of research and monitoring and the prepared recommendations used for next steps: implementation of conservation actions, capacity building, public awareness, development of subregional cooperation.

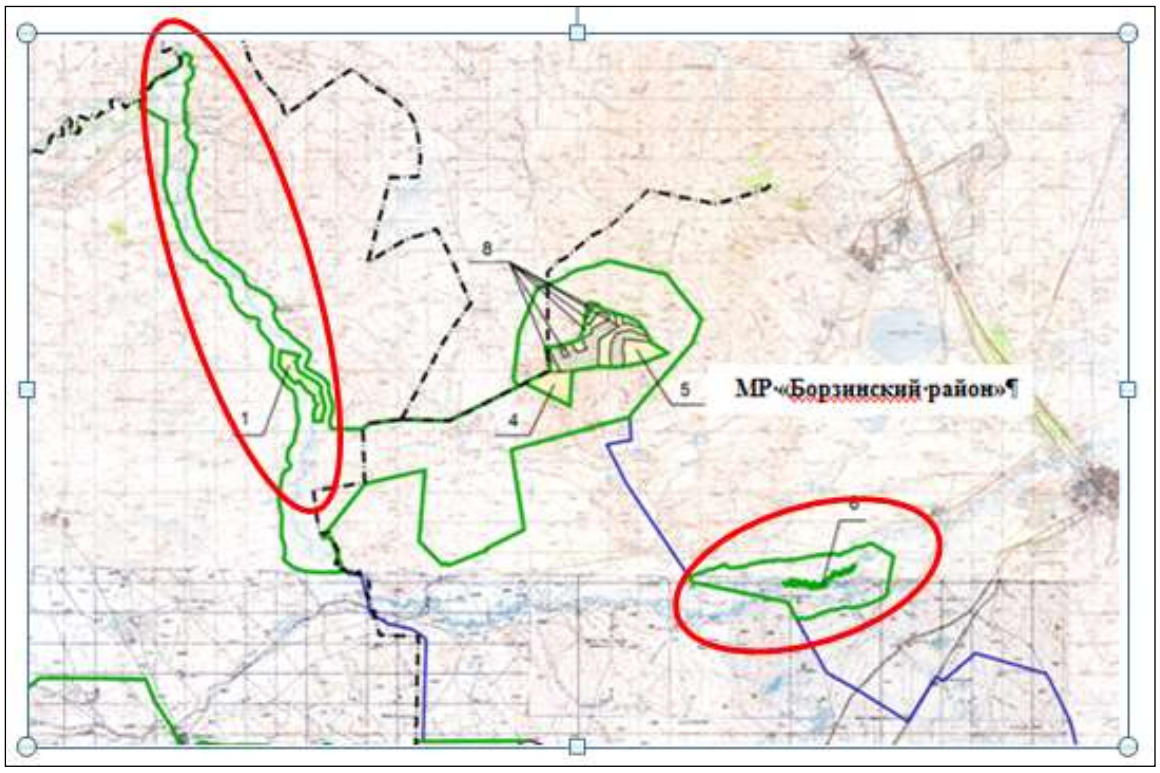
2.3 Capacity Building

Multi-level capacity building took place including: 1) local and regional (staff of Daursky NR and DIPA, local community, Government of Zabaikalsky Kray, and other organizations and agencies of Zabaikalsky Kray); 2) national level in Russia (Government of Russian Federation, the Red Book Commission of the Russian Federation), 3) international (intergovernmental Commissions and Working Groups, DIPA and different organizations).

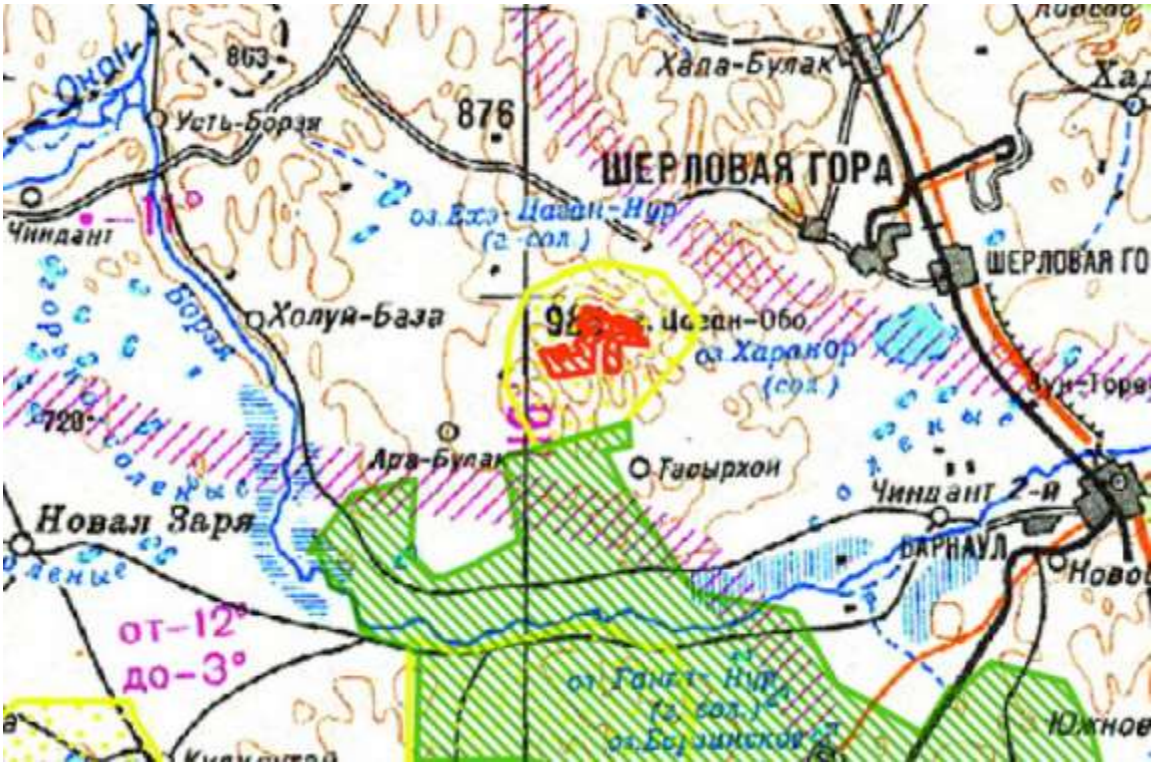
2.3.1 In Daursky NR, Special Programm of study, monitoring and conservation of WNC (2014-2024) was developed officially confirmed and included in Daursky NR budget.

2.3.2 Work for expansion of the Daursky NR and the national level Nature Refuge "Dolina Dzerena" (managed and protected by Daursky NR) was started.

During 2015-2016, documents were prepared for the includsion of important WNC breeding habitats in the protected area (fig. 146-147). Now only one breeding pair of WNC is located on the Borzia River on the territory of the Nature Refuge "Dolina Dzerena"; after expansion, the all 22 pairs on the Borzia River will live in the protected area of Nature Refuge "Dolina Dzerena".



[Figure 146] Scheme of expansion of the Nature Refuge "Dolina Dzerena" and Daursky NR (green line and red circles on the figure)



[Figure 147] Map of existing area, green one

2.3.3 In 2015 and 2016 feed was provided for breeding and migratory WNC during spring and autumn time (fig. 148).

Spring is an important and critical period for breeding WNC because forage resources in nature are very limited. The feeding helps successful breeding of WNC. 15 small personal feeding places were created for WNC breeding pairs on the breeding habitats. In autumn time three big feeding places were created on the gathering sites of the cranes (for help to southward migration success and reduce mortality of WNC). 390 kg of wheat and 80 kg of corn were used for this. This work was done with help of the State Service for the protection, control and regulates the use of wildlife in Zabaikalsky Kray.

[Figure 148] Feeding of WNC on the Borzia River (green circles - breeding areas of WNC pairs, small red spots - spring feeding places, big yellow spots - autumn feeding places)

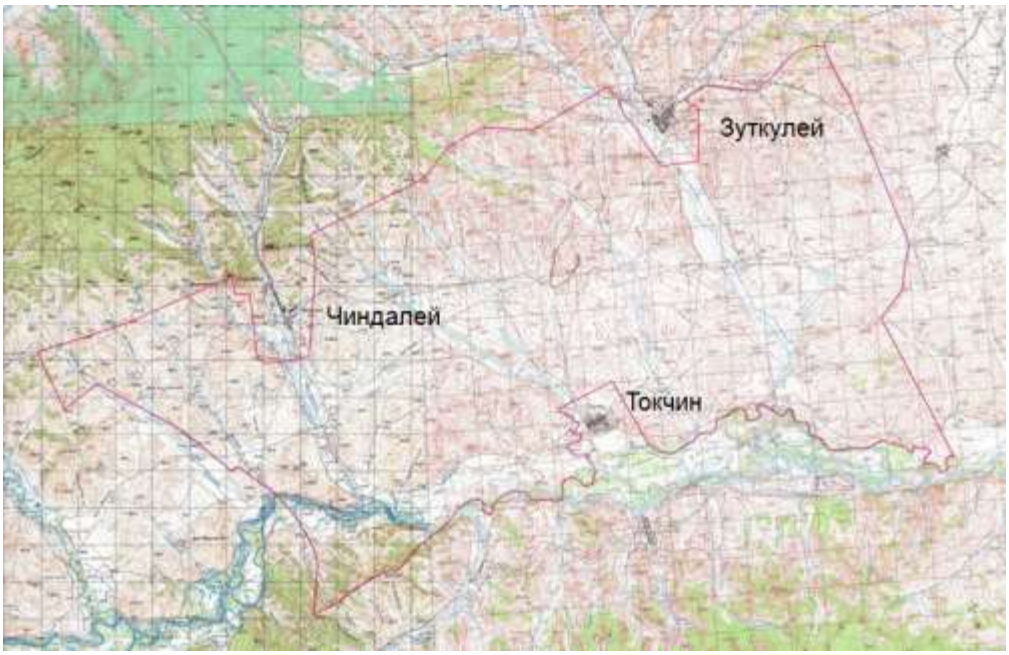
2.3.4 Seminar "Study and monitoring of waterbirds" (with special attention to WNC) was provided in Daursky NR in 02.06.2015 for staff of DIPA (Russia, Mongolian, Chinese DIPA researchers) (fig. 149).

[Figure 149] The Seminar "Stud and monitoring of waterbirds"

2.3.5 The 4th International Conference "Cranes of Palearctic: (Biology, Conservation, Management)" was held in Daursky NR during 1-4 September 2015. 69 crane specialists from 9 countries took part in the conference. 8 presentations were dedicated to WNC (including presentations about Russian and Mongolian Dauria). On September 3rd, all participants visited habitats of WNC on the Borzia River, observed breeding WNC and discussed problems of conservation this species.

[Figure 150] Observation of WNC habitats by participants of the conference

2.3.6 Documents for the establishment of the new nature protected area regional level Refuge "Duldurginsky" was prepared during 2014-2016 and have sent to the Government of Zabaikalsky Kray in 2016. Meeting with local community and Government was provided: the local community confirms the establishment of this refuge. The Duldurginsky Refuge is included in the plan of establishing new protected areas for 2017 and confirmed by Government of Zabaikalsky Kray. The Duldurginsky Refuge has area 68 891, 32 hectares, it is located in the Onon R. basin and include habitats of some WNC (fig. 151).



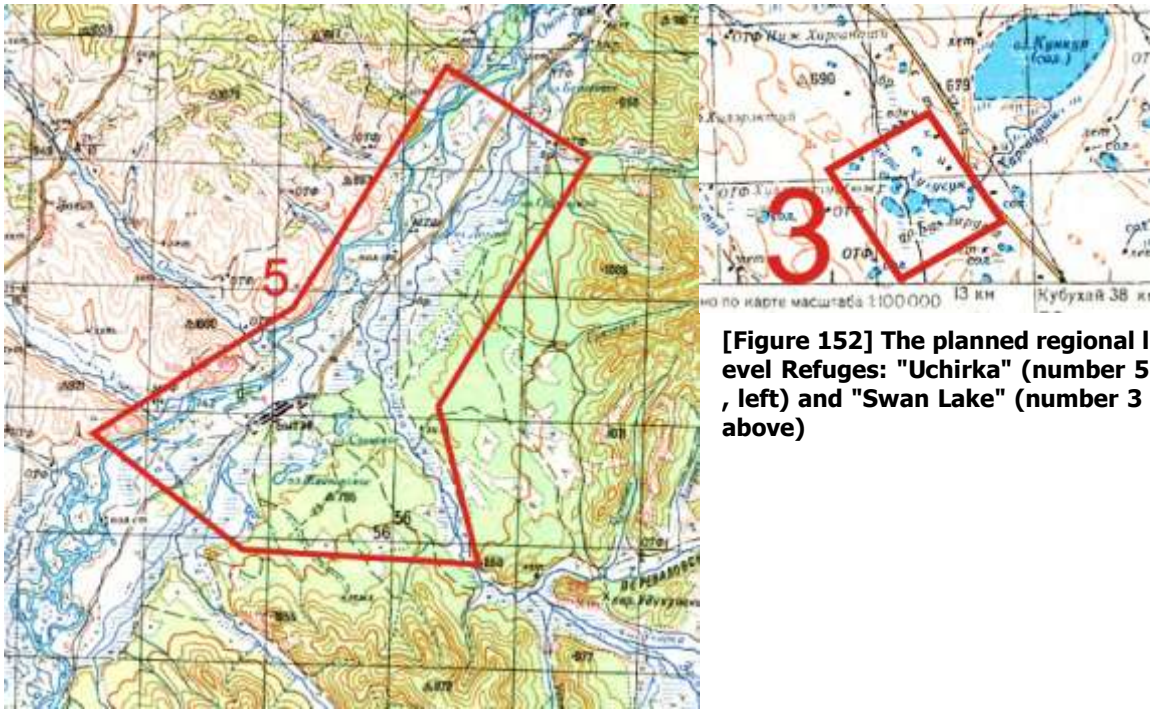
[Figure 151] The future Duldurginsky Refuge

2.3.7 Report and some official letters about the critical present status of WNC and proposed conservation actions was prepared by Daursky NR and sent to the State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray (March 2014, 2015, 2016).

The most important proposed conservation action is stopping spring hunting on the key breeding habitats of WNC on the Borzia River. In result, State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray together with Daursky NR have stopped spring hunting on the Borzia River in 2014, 2015 and 2016. The Borzia River is the most important breeding area of WNC on the Russian territory of Dauria. In April 2014, State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray together with Daursky NR organized two big meetings with local hunters for explanation local stop of spring hunting. It has a very good result: many WNC clutches have been saved and significantly increased breeding success.

2.3.8 Report about the critical present status of WNC and proposed conservation actions was presented by Oleg Goroshko at the meeting of the Red Book Commission of Zabaikalsky Kray (December 2016).

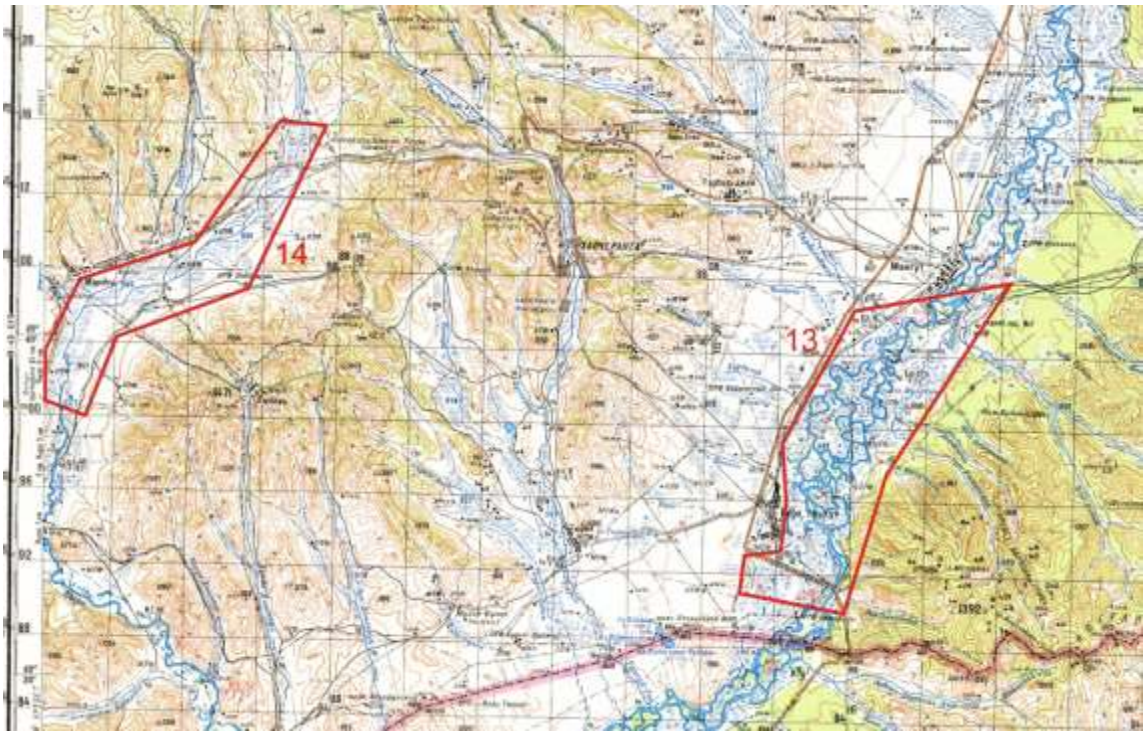
The most important proposed conservation actions: establishment a new nature protected area for WNC on the Onon River - Refuges "Uchirka" and "Swan Lake". In result, Government of Zabaikalsky Kray included this very important WNC habitats (it supports more 10 breeding pairs) in the official plan of establishing new protected areas (fig. 152) and Government confirmed preparation of special regional Program for study and conservation of WNC.



[Figure 152] The planned regional l evel Refuges: "Uchirka" (number 5 , left) and "Swan Lake" (number 3 above)

2.3.9 Report about the critical present status of WNC and proposed conservation actions was presented by Oleg Goroshko at the meeting of the Red Book Commission of Zabaikalsky Kray with the participation of the State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray (May 2015).

The most important proposed conservation action is the establishment of "Peace areas" for stopping spring hunting on the key breeding habitats of WNC within whole Zabaikalsky Kray. In result, the Government of Zabaikalsky Kray and the State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray approved the establishing 6 "Peace areas" for WNC (map of two such areas on the Onon River near the Mongolia (see on the fig. 153). During 2016, documents were prepared for establishing of "Peace areas"; the documents were sent to the Government of Zabaikalsky Kray and the State Service for the protection, control and regulate the use of wildlife in Zabaikalsky Kray.



[Figure 153] The two planned "Peace areas"

2.3.10 Report about the critical present status of WNC and proposed conservation actions was prepared by Daursky NR and sent to the Red Book Commission of the Russian Federation. The following result is that information and proposed conservation actions will be included in the new issue of the Red Data Book of Russian Federation (must be published in 2017-2018).

2.3.11 Involvement of local people living near important for WNC wetlands to long-term conservation and monitoring of WNC and wetlands.

During 2014-2016, 190 local families (690 people) were visited and educated. WNC calendars and posters, and brochures about rare species of waterbirds (including WNC) printed and distributed in 2016 and previous years; Daursky NR discussed WNC and wetlands and explained how local

people together with the staff of Daursky NR can conserve the WNC and organize the sustainable use of wetlands. During discussing local people's attitude towards wetland and WNC conservation was investigated, and also asked about changes in the condition of wetlands and waterbird populations when compare to the past. Local people were invited to take part in the monitoring of WNC and conservation of them. People were asked to record data on the number of birds and other important information. Daursky NR explained to people how to save the birds. Local people were given the number of telephones of the staff of the Daursky Nature Reserve, and locals were asked inform Daursky NR about causes of poaching or any other illegal activity on wetlands for stop of illegal activity by the staff of Daursky Nature Reserve (mobile-telephone of deputy director Oleg Goroshko and telephone of the Daursky Nature Reserve office were printed in the brochures, calendars, and posters). The Daursky NR has established WNC Guard Network of local people (it includes 252 people that want to help to conserve waterbirds). Local people were asked to motivate other local people to conserve and monitor of WNC and wetlands, and some extra copies of brochures, calendars and posters were given to those agreed to do such work. Brochures, calendars and posters were also distributed through local governments, and local community leaders. The calendars and posters were published by Daursky NR, the brochures were published by Daursky NR with the financial help of the Asian Waterbird Conservation Fund.

[Figure 154] Involvement of local people to conservation of WNC

2.3.12 One member from Russian project team (staff of the Daursky NR, Svetlana Balzhimaeva), participated in the Korean DMZ Joint Study of the NEASPEC project "Conservation and Rehabilitation of Habitats for Key Migratory Birds in North-East Asia" (30th January – 4th February 2015).

2.4 Public Awareness

2.4.1 Publishing Education materials

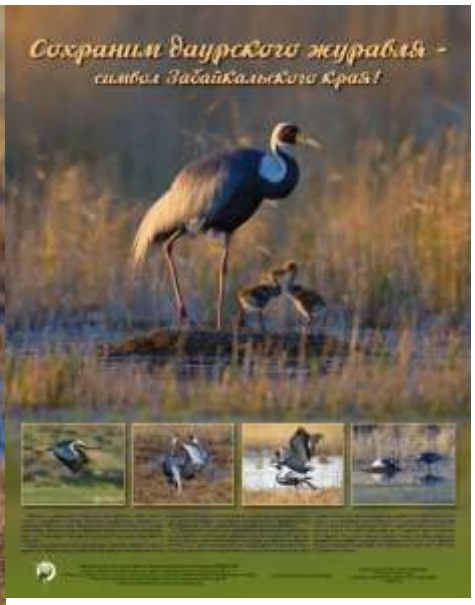
During 2014-2016 calendar, poster, and brochure were published and used for educational purposes:

1) Big calendar (1A size) with photo and text about WNC (fig. 156); (published in 2015). It is included short text about WNC and threats, calls for help in the conservation, contact telephones of Daursky NR.

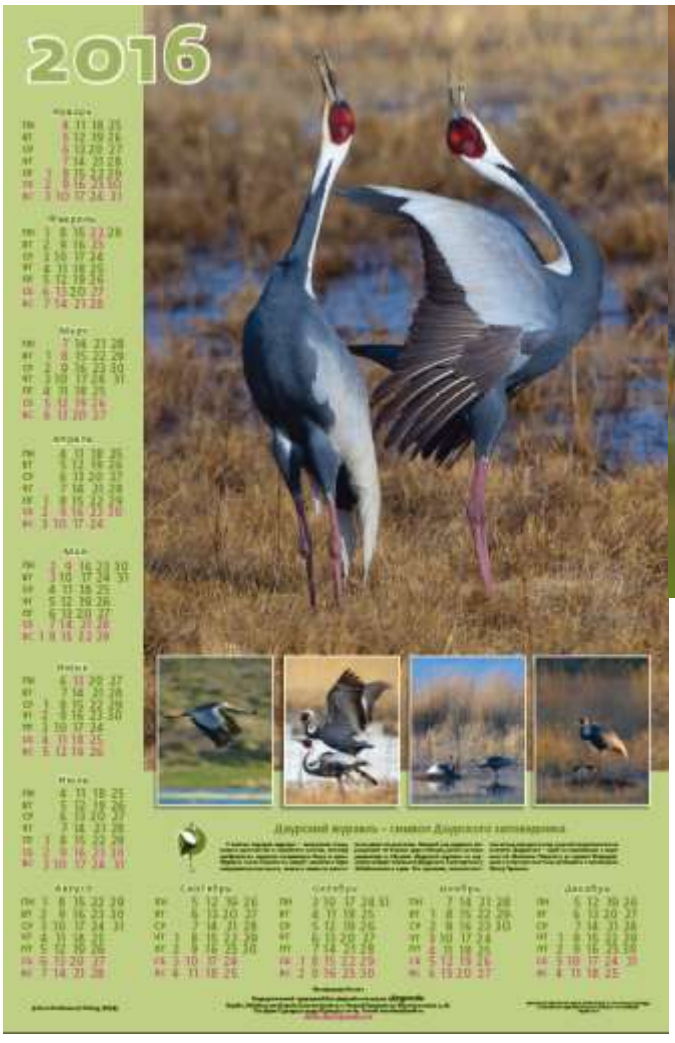
2) Big poster (2A size) with photo and text about WNC (fig. 155); (published in 2016). It is included short text about WNC and threats, calls for help in the conservation, contact telephones of Daursky NR.

3) Brochure "Guide to not game species of Zabaikalsky Kray" for the education of hunters (fig. 157). The brochure was published in 2016 and dedicated to rare species of waterbirds including WNC.

4) For educating people during 2014-2016, some brochures published in 2013 were used and dedicated rare species of cranes (fig.158).



[Figure 155] The WNC poster (above)



[Figure 156] The WNC Calender (Left)

[Figure 158] The brochure about rare waterbirds

[Figure 157] brochure about cranes and some other rare birds

2.4.2 During 2014-2016 the annual competition of children ecological drawings with special attention to cranes were organized.

This annual competition is organized by Daursky NR since 1998. It is very popular competition in Zabaikalsky Kray. During 2014-2016, more than 2,800 drawings about cranes were collected. In 2014, the competition was international (Russian, Mongolian, Chinese) and was organized by DIPA. In 2016, the competition was all-Russian, a lot of drawings were received from different regions of Russia. The best drawings for exhibitions about cranes were used and published in albums and calendars (for example see fig.159).

2.4.3 In 2015 and in 2016 children competition of theatrical performances and cartoons made by children collectives were organized.

58 collectives (360 children) took part. The each collective acted its theatrical performances at least 5 times in different places for different peoples (in schools, hospitals, theater, etc.). So, many people saw these performances (fig. 160). Some works are published on the Internet:

- ✓ The film about cranes "Theatre of Shadows" (2016): https://www.youtube.com/watch?v=GywJZEUGi7Q

The film "Cranes" (2015): https://www.youtube.com/watch?v=JqjHVvWrulU

[Figure 159] The calendar

[Figure 160] The theatrical performances

2.4.4 During the Project period 2014-2016, many other ecological education actions dedicated cranes also took place (see Table 17).

[Table 17] Education programmes between 2014 and 2016

Date	Name	Place (Russia)	Number of involved people
09.09.2014.	Speech on the regional "Radio of Russia" about cranes	Zabaikalsky Kray	
22.09.2014	Small video the regional TV about cranes	Zabaikalsky Kray	
15.09.2014.	Photo-exhibition «Flying cranes»	Onon District, Zabaikalsky Kray	80
06.09.2014.	Festival « Goodbye cranes!»	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	134
10.09.2014	Small crane festival	Kulusutay Village, Onon District, Zabaikalsky Kray	85
11.09.2014	Small crane festival	Builesan Village, Onon District, Zabaikalsky Kray	50
12.09.2014	Small crane festival	N.Zaria Village, Onon District, Zabaikalsky Kray	12014
12.09.2014	Small crane festival	Krasnaia Imalka Village, Onon District, Zabaikalsky Kray	44
14.09. 2014	Field observation of cranes (guide: staff of Daursky NR)	Daursky NR	26
16-17.09. 2014	"Crane Day" (lectures, video, plays)	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	100
29.03.2015	Crane festival	The Transbaikal Museum of Local Nature and History, Chita City, Zabaikalsky Kray	150
30.09.2015	"Goodbye cranes" (lectures, video, plays)	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	30
5.10.2015	Crane plays	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	32
16.12.2015	"Cranes of Transbaikalia" (lectures, video)	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	29
29.03-1.07.2015	Photo-exhibition «Daurian Cranes»	The Transbaikal Museum of Local Nature and History, Chita City, Zabaikalsky Kray	330
3.04.2015	Lecture, video «Daurian Cranes».	Visitor Center of Daursky NR, Chita City, Zabaikalsky Kray	20
18.08. 2015	Lecture for school teachers «Daurian Cranes».	Visitor Center of Daursky NR,	26
11.03.2015.	Photo-exhibition «Cranes in Dauria»	The Transbaikal Museum of Local Nature and History, Chita City, Zabaikalsky Kray	260
2.09.2015.	Exhibition of children paintings «Cranes in Dauria»	Visitor Center of Daursky NR	56
6.09.2015.	"Crane Day" (lectures, video, plays)	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	42 чел
19.09.2015	Seminar "Cranes " (lectures, video,)	Visitor Center of Daursky NR	2015 чел
17.07.12016.	"Crane Day" (lectures, video, field observation of cranes)	Visitor Center of Daursky NR, Daursky NR	22 чел
7.09. 2016	"Crane Day" (lectures, video, plays)	N.Tsasuchey Village, Onon District, Zabaikalsky Kray	172 чел

2.5 Subregional cooperation

2.5.1 For study and monitoring WNC, there has been close cooperation with Mongolian and Chinese staff of DIPA (table 16). 11 joint studies in Russia and Mongolia had taken place (fig. 161). These works were very important for experience exchange, training of staff, and development next steps of research and conservation cooperation in DIPA.

[Figure 161] Joint study of WNC in 03.06.2015 on the Borzia River in Russia by Russian-Chinese team

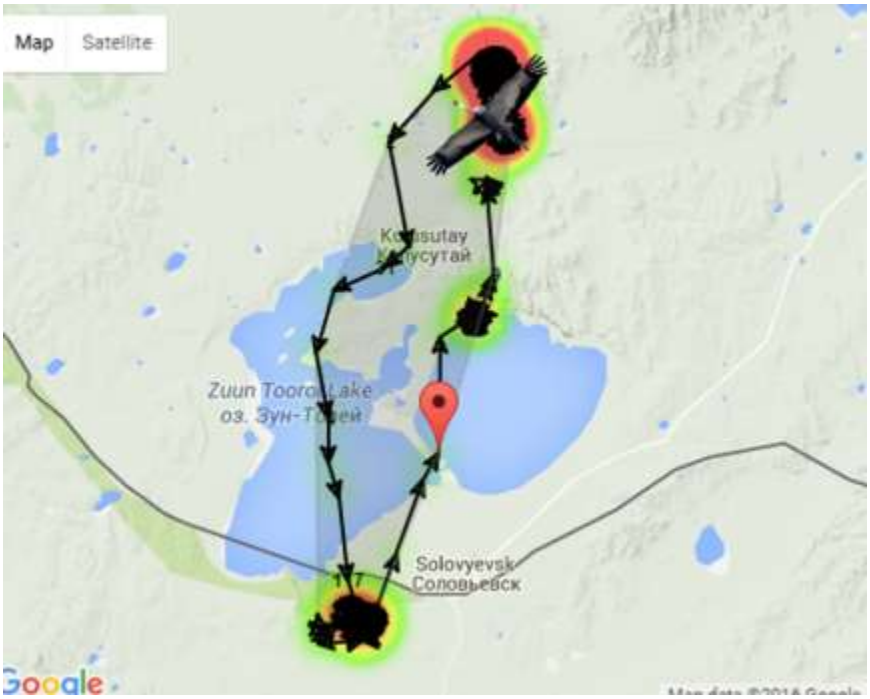
2.5.2 Three trilateral DIPA meetings of staff for discussing results of the joint cooperation and planning new cooperation actions: 14-15.04. 2014 (in Mongolia), 1-2.06.2015 (in Russia), 01-03.12.2015 (in China). Annually the Plan of DIPA joint actions for one year period is planned and signed (fig.162). In 2015 a multi-year duration plan-the Program of cooperation within the Dauria international protected area (DIPA) for the years 2016-2020 was also signed. WNC was included as priority vulnerable species in this program: "Conservation and restoration of the populations of rare species and ecosystems. Finding out and preventing threats to the ecosystems and populations of rare species-conservation and restoration of the Great Bustard, the White-naped Crane, the Swan Goose, the Saker Falcon, the Steppe Eagle, the Siberian Marmot, the Mongolian Gazelle."

[Figure 162] Working meetings of DIPA staff

2.5.3 Important discussion about cooperation for study waterbirds, planning of close monitoring cooperation, and development of optimal joint study and monitoring methods was during the DIPA Seminar "Study and monitoring of waterbirds (with special attention to WNC)" (02.06.2015) (fig. 149).

2.5.4 As part of the joint study at Dauria, there has been cooperation with the Mongolian NEASPEC Project team: Tseveenmyadag Natsagdorjiin, Nyambayar Batbayar and other people (Mongolia WSCC and Institute of Biology at Mongolian Academy of Sciences, Mongolia). During 06-11.08.2015 a joint study of WNC took place in Russia on the Borzia River (fig. 163). During this joint study, WNCs were banded and marked WNC by loggers. This gives very good information about transboundary migrations of WNS and uses habitats in Russia and Mongolia (fig. 164).

[Figure 163] Joint Russian-Mongolian study of WNC in Russia



[Figure 164] Local migrations of marked WNC in Dauria

2.5.5 As part of the joint study at Dauria, there has been close cooperation with Chinese crane specialists Guo Yumin (professor of the Beijing Forestry University). Together with Guo Yumin, the Daursky NR had a joint study of WNC in Russia during 07-19, September 2015, 15-29, May 2016, 16-30, August 2016. Censuses has been made and monitoring of WNC population was carried out, breeding biology was studied, 3 WNC and 6 Demoiselle Cranes were marked by rings and loggers (fig. 165).

[Figure 165] Joint study with Guo Yumin from China

2.5.6 Report about the critical present status of WNC and some other rare species and proposed conservation and cooperation actions was presented by Oleg Goroshko during the meeting of the intergovernmental commission "Joint Russian-Mongolian Commission for the Environment" (Moscow, 24-25, November 2016). In result, three very important paragraphs were included in the Protocol for implementation:

1) "Parties indicated a strong negative impact on spring hunting to populations of waterbirds, including globally threatened species, especially in Dauria Steppes near the state border;

2) The parties draw attention to the need to stop spring hunting at key gathering sites of migratory waterbirds and breeding areas of globally threatened species of birds (Swan Goose, White-naped Crane, Great Bustard) within the territory of Zabaikalsky Kray, and;

3) The sides pointed out the need for the development and adoption of urgent measures on the study, preservation and restoration of the Great Bustard and White-naped Crane.

2.5.7 Report about critical present status of WNC and some other rare species and proposed conservation and cooperation actions was presented by Oleg Goroshko during the meeting of the intergovernmental Working Group on Transboundary Protected Areas and Biodiversity Conservation in the Commission for the Preparation of Regular Meetings of Heads of Governments of Russia and China (Vladivostok, Russia; 05-06, July 2016). In result, an important paragraph were included in the Protocol for implementation: "Parties supported the proposal for the creation of Peace Zones in the key habitats of rare species of birds in the south of the Trans-Baikal region, Russia."

2.3 Conclusions and recommendations

The NEASPEC Project significantly improved the study and conservation of WNC in Dauria and in Russia, and significantly improved the international cooperation in DIPA. The main conclusions and recommendations for needed in Dauria conservation actions are on the end of *the Section 2.2 Scoping Surveys and Joint Studies*.

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IV. Summary and Conclusion

The NEASPEC Nature conservation project for migratory birds, '**Conservation and Rehabilitation of Habitats for Key Migratory Birds in North-East Asia with special emphasis on Cranes and Black-faced Spoonbills'** (hereinafter the Project), implemented from 2013 to 2016, was the first project to be implemented for NEASPEC migratory bird flagship species since the adoption of the NEASPEC Nature Conservation Strategy in 2007.

Knowledge, data and expert connections

Through this project, key habitats could be identified to ensure the survival of Black-faced Spoonbills, Hooded Cranes and White-naped Cranes in North-East Asia. The scoping surveys at each habitat analyze the ecological, economic and social conditions and provide suggestions for further regional and international cooperation for the conservation and rehabilitation of these sites. The outcomes contribute to improving the harmonization of data, methods, and techniques among key habitats.

Two Joint Studies of transboundary areas, the Korean DMZ area in 2015 and DIPA in 2016, respectively, were successfully held with multi-lateral and multi-level participation including experts, practitioners and local residents in the region. They provide meaningful information, knowledge and experiences to be shared for border areas and for soughting conservation and management plans. In the future, the subregional cooperation framework of NEASPEC and the established expert connections through the Project can be utilized for other joint studies and awareness raising programmes to more than 20 border areas in North-East Asia.

Local and subregional capacity-building as well as awareness-raising

In particular, awareness-raising and capacity building programme of the Project was that once again recognized as an important element of subregional cooperation framework to conserve nature together. The North-East Asian Young Conservation Leadership Program (NEA-YCLP) was successfully implemented as the training program for early-career researchers and practitioners in the subregion and it was a follow-up to the pilot project 'the young scientists training programme for Black-faced Spoonbills' in 2006 implemented by BirdLife International Asia Division. It brought together young scientists and practitioners from North-East Asia to learn about the ecological characteristics of key species of the subregion and on habitat conservation and management measures from senior experts. In the future, a training programme for these groups should be developed into regular one. The International Black-faced Spoonbill School held in Incheon, the breeding ground of BFS in ROK was a great programme for local residents and students to learn about the BFS and its habitat with experts and activists working in wintering areas such as China, Japan and Taiwan. Besides education programme for secondary school students and training programme for young scientists, environmental education camp, students and staff exchange programme, photo exhibition, bird festival and eco-tourism were suggested for the future cooperation and collaboration tasks in the region.

The Project again confirmed main threatening factors to key migratory birds' habitats in the region: Loss and degradation of habitat for climate change, change of water regime, on-going development projects and human interferences.

Recommendations

For the action forward in the NEASPEC framework, the national focal points and participants in the Beijing Workshop, which was held on 28th and 29th November 2016, suggested following :

- For ensuring the survival of Black-faced Spoonbills, securing tidal-flat is very important, especially in the Yellow Sea eco-region. In addition to the conservation of **tidal-flats**, **water-filled rice paddy** is very important for Black-faced Spoonbills during raising their chicks, within a radius of 20 km from breeding grounds, which can provide critical freshwater food for chicks of the bird. Besides breeding ground in ROK and China, it is needed to pay attention to the uninhabited islands on the west coast of DPRK, the breeding grounds of the bird discovered in the mid of 1990s. It is necessary for NEASPEC member States to cooperate to **investigate and monitor uninhabited islands** and tidal flats in the west coast of DPRK.

- In the case of Hooded Crane, it is necessary to **secure more wintering areas to disperse the wintering population** of Hooded Crane concentrated in the Izumi in Japan. In recent years, more than 1,000 Hooded Cranes have regularly been wintering in Suncheon Bay in ROK and it should be a best practice to disperse the birds' population. Therefore, it is urgent to secure a stable foraging and roosting sites in Cheonsu bay, which is found to be used by thousands of Hooded Cranes during south and north migration routes. In the NEASPEC subregion, **comparison and crossover studies of wintering sites are needed** among Chongmingdongtan in China, Cheonsu bay and Suncheon bay in ROK and Izumi and Yashiro in Japan.

- In the case of White-naped Cranes, **simultaneous monitoring in September** to the gathering places of the bird in Mongolia is urgently required for identifying numbers, trends, and crossover as the birds are gathering to migrate to the south.

- In particular, since both Cranes and Black-faced Spoonbills are closely linked to agriculture, **subregional guidelines for linking farming methods and local farmers to enhance the biodiversity** is need to develop and relevant best practices all over the world also need to collect and share. It could encourage and support NEASPEC member States to refine and coordinate their domestic policies through agreements on agricultural practices that can contribute to the conservation of key migratory birds in North-East Asia. Once the guidelines are developed, NEASPEC member States could carry out collaboration projects among similar areas. For example, comparative study on the habitat conservation and agriculture between White-naped Cranes' habitat in Mongolia and Korea.

Last but not least, in terms of the institutional context for the conservation of key habitats, the key habitats in the North-East Asia are still not properly protected by domestic law, such as most breeding grounds of Black-faced Spoonbills in ROK, the breeding grounds of BFS in China, the breeding grounds of White-naped Cranes in the north-eastern part of Mongolia, the stop-over and wintering sites of Hooded Cranes in Cheonsu Bay in ROK etc. Therefore, recommendations and encouragement to countries in the subregion are needed to promote conservation and rehabilitation of key habitats under the relevant domestic laws. Also, for the transboundary area in the region, expansion of existing protected areas is needed. For example, the breeding populations outside of DIPA has been growing over the past 20 years so that for the proper protection of the whole population, the expansion of the protected area is urgently needed. In the case of the Korean DMZ area, adequate legal protection measures are needed for the rice paddies in Cheolwon where the cranes constantly use as foraging sites.