

Strategy Building for Ecological Network in North-east Asia



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I . Introduction

- ❖ The Establishment of ecological network for preservation and management of wild animals regardless of the national boundaries began to be discussed in the international level out of a national level.
- ❖ Since the viewpoint that an ecosystem as a whole is one network out of a specific region for the preservation of natural ecosystem was proposed in 1990s, a conception of ecological network has come into spotlight in the preservation and management of an ecosystem.

- ❖ As for North-east Asia region, expansion of trans-boundary pollution due to rapid development and swift destruction of ecosystems emphasize the necessity of environmental cooperation
- ❖ But researches and activities for building ecological network in the international level are insufficient.



On Building of
Ecological Network
In North-east Asia

Analysis of relation
between surface Landcover
and Vegetation Index



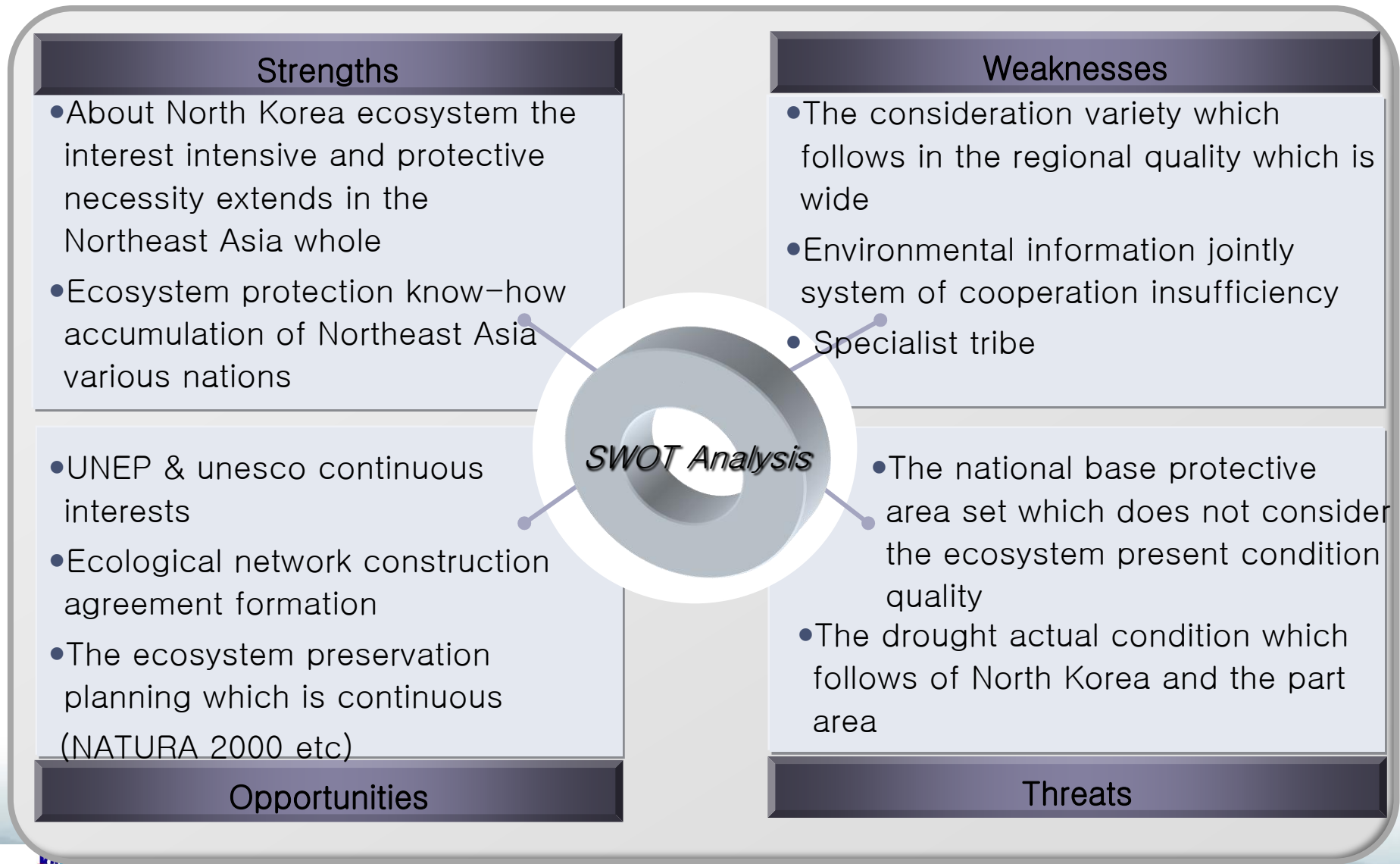
The significance of this study lies in the development of methodology for building North-east Asia ecological network through satellite images

II . Current Status and Comprehensive Analysis

Situation by country

Nation	Characteristic
Korea	<ul style="list-style-type: none">- The effort formulation for the mode of Ecological Network construction from national level- Accumulation of ecosystem pertinent data using satellite image
North KOREA	<ul style="list-style-type: none">- Developing an ecosystem preservation activity about the specific area- The nation the entire country the object does not designate the preservation area without being
China	<ul style="list-style-type: none">- Possesses a basic concept about the national mode of life network the concrete form nil
Japan	<ul style="list-style-type: none">- The mode of Ecological network plannings which are various being created- The important mode of Ecological network is many but, the connection tribe of the network between
Russia	<ul style="list-style-type: none">- The law preparation which is environmental protection technique recently set up- NGOs, Russian federation & National Assembly have interest in conservation
Mongol	<ul style="list-style-type: none">- International cooperation activity dullness, DATA constructions is difficult- Current status of Natural environmental conservation area is satisfactory

2. SWOT Analysis



3. Summarize

- Compares with Europe and about the international mode of ecological network depth of discussion, there is development level
- Even until currently North-east Asia international mode of Ecological network discussion is primary level
- But, the international joint research which leads international organization etc. about the North-east Asia mode of ecological network recognition grow larger
- Also, the recognition to come being high of importance of the border area,



- From the national level of ecological network research becoming accomplished steadily
- Consequently, in order for the international level of ecological network to be possible from the research which are data standardization and construction plan

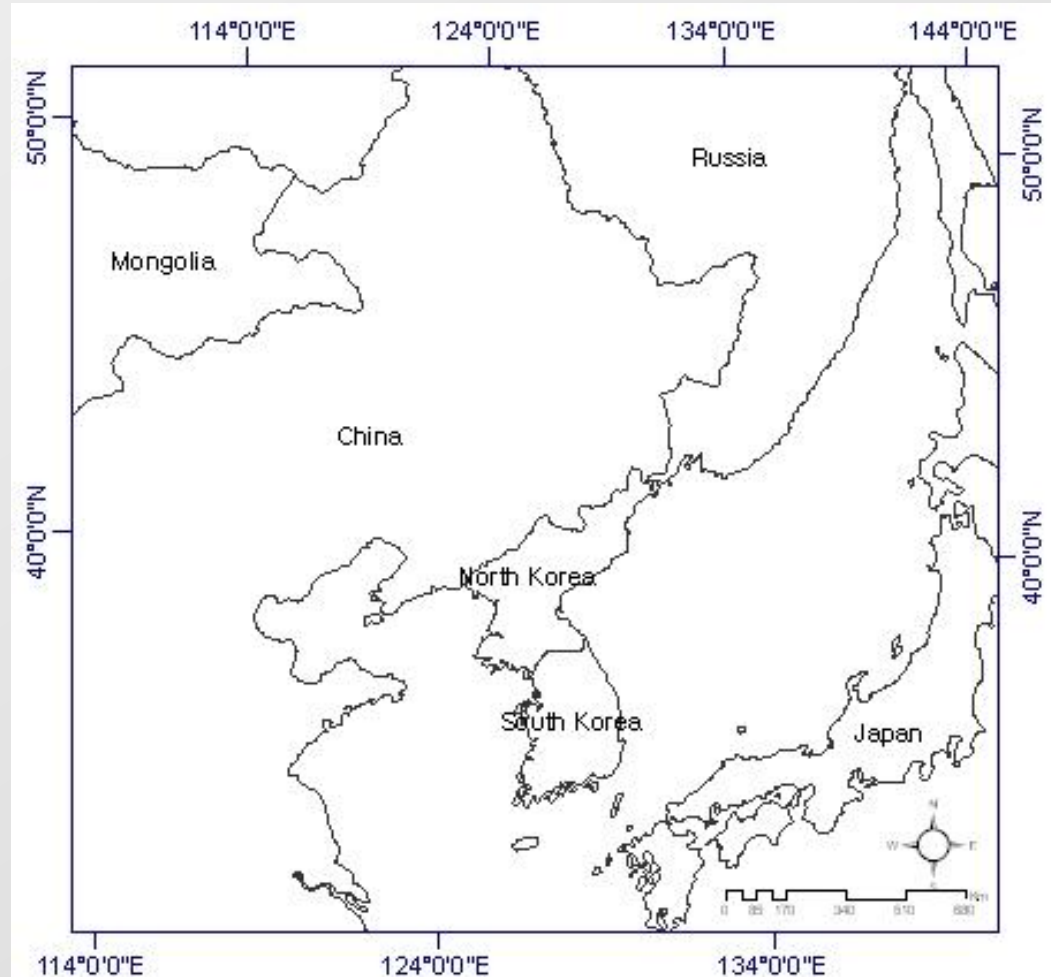
III . Case Study

Study Scope

❖ Space Scope

* South Korea, North Korea, the three northeastern prefectures in China, far-east Russia, and a part of Mongolia in North-east Asia region 6,984,884km²

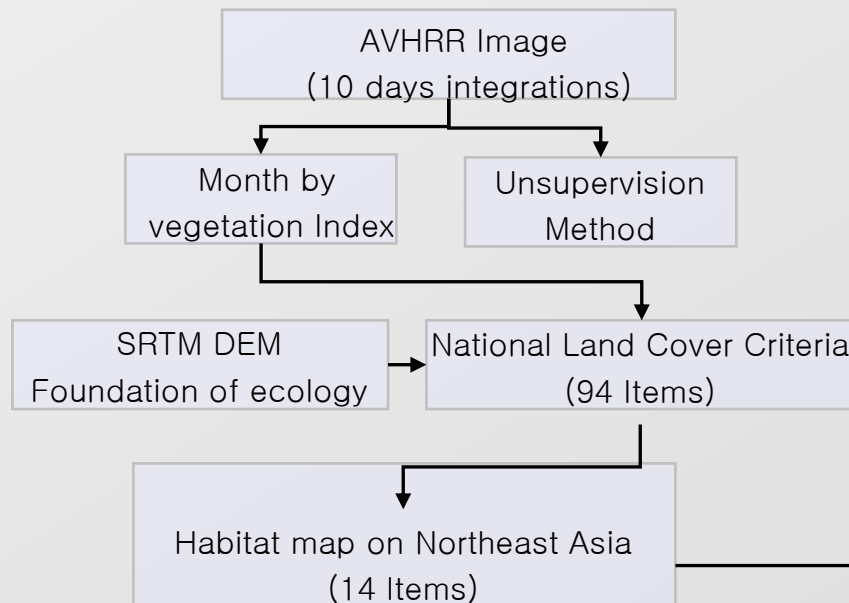
* Using the NOAA AVHRR, About 2,500 Image



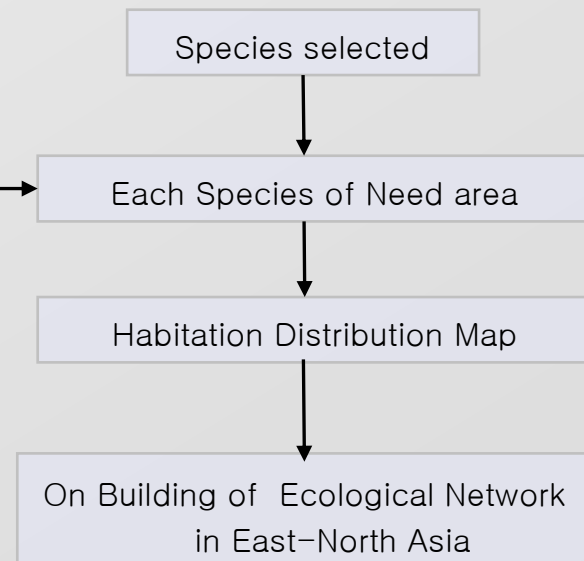
Method

- ❖ NOAA AVHRR images from 2007 January image about 2,500 investigations until of December
- ❖ NDVI extraction and Land cover map

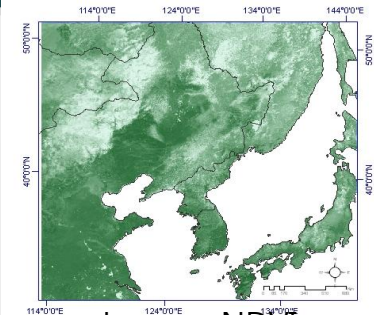
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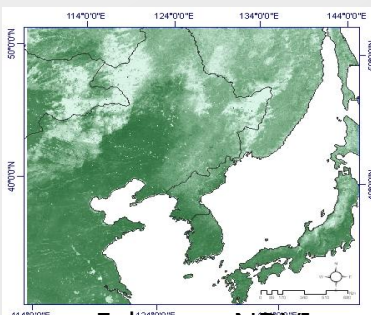
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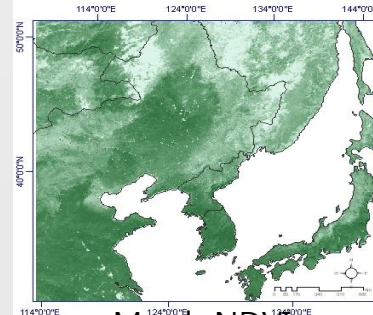
NDVI



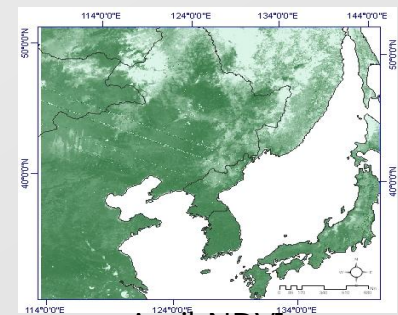
January NDVI



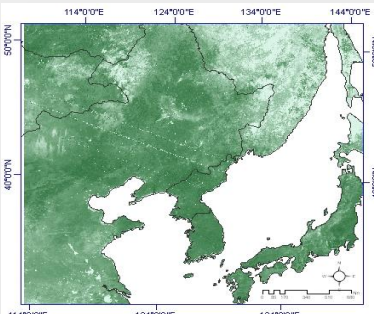
February NDVI



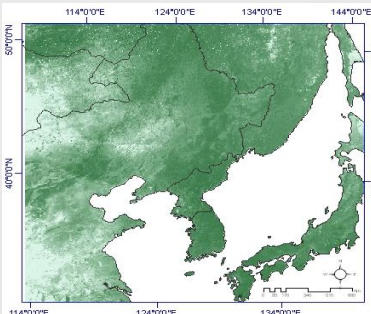
March NDVI



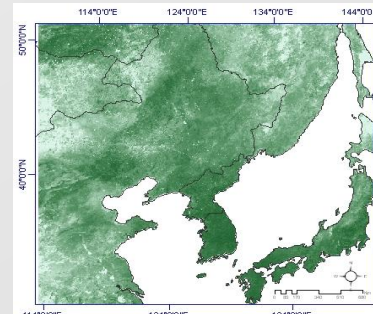
April NDVI



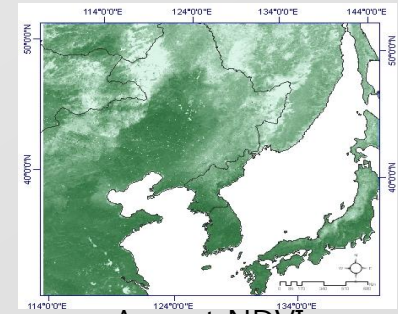
May NDVI



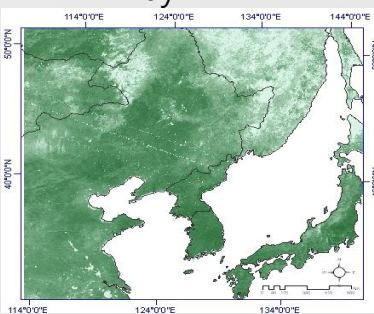
June NDVI



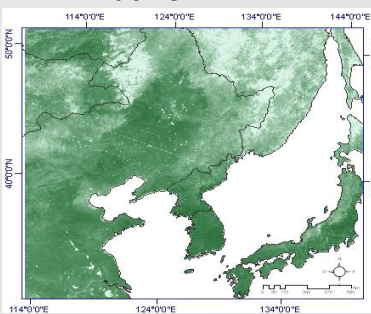
July NDVI



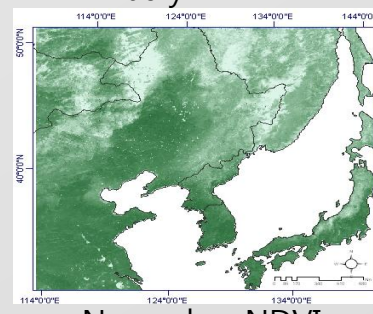
August NDVI



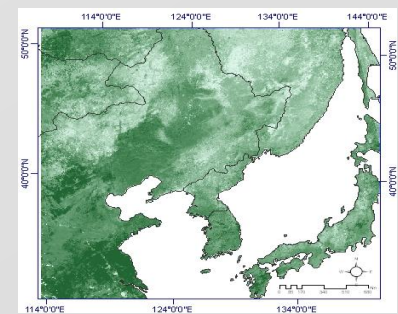
September NDVI



October NDVI

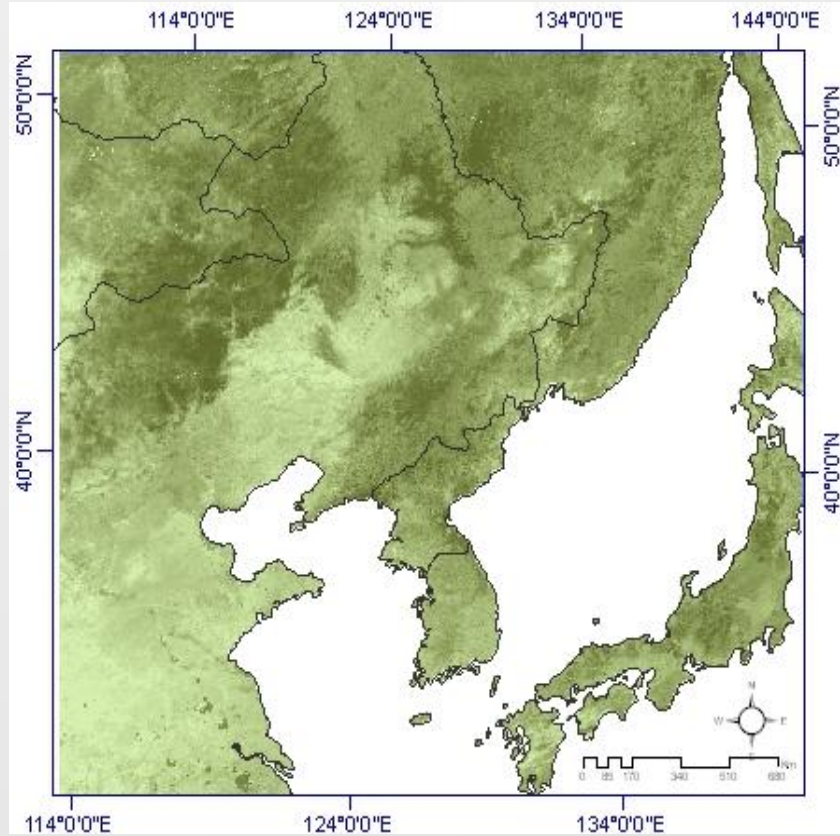


November NDVI

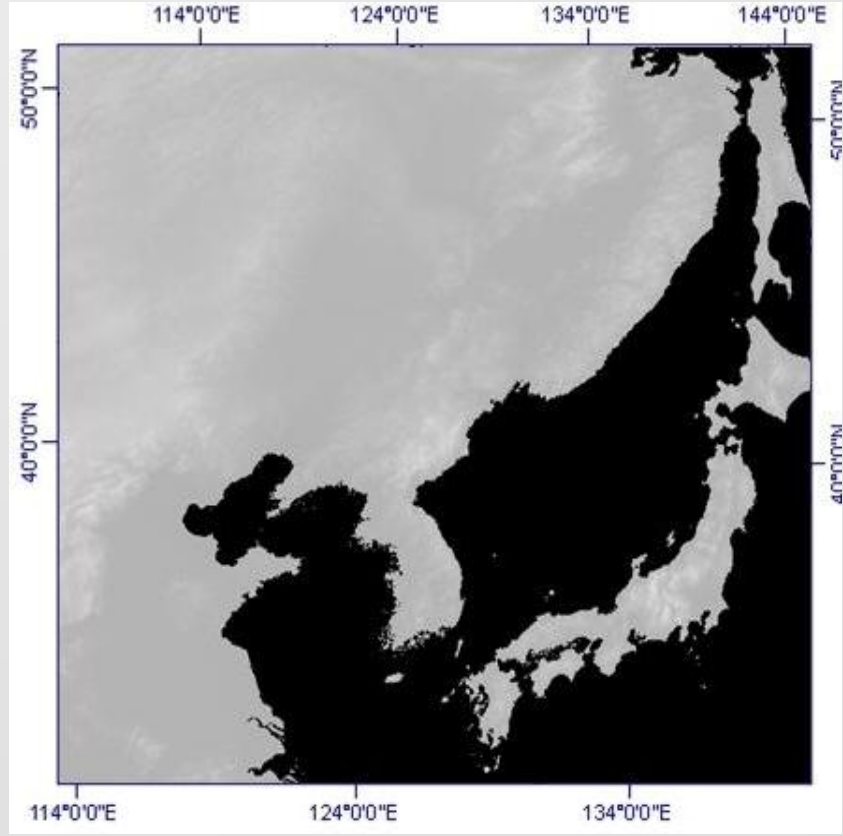


December NDVI

Foundation of Ecology & SRTM DEM



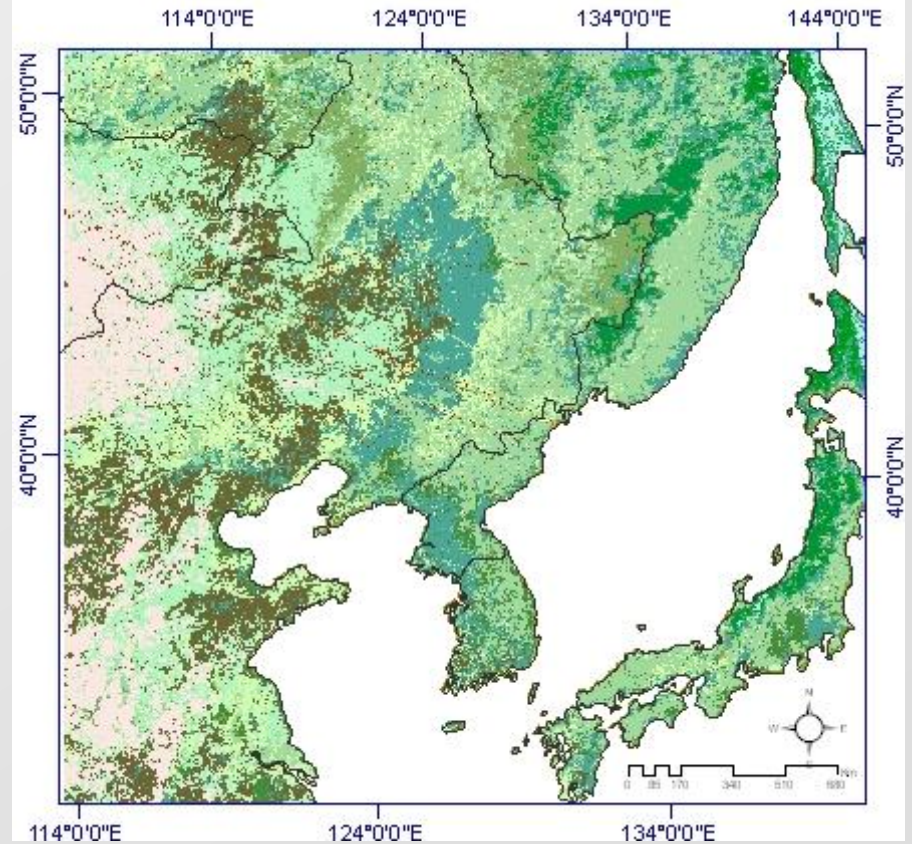
Foundation of ecology map



SRTM DEM

Landcover

일련	구	#	일련	구	#
1	URBAN	45	47	DRY EVERGREEN WOODS	
2	LOW SPARSE GRASSLAND	46	48	VOLCANIC ROCK	
3	CONIFEROUS FOREST	50	49	SAND DESERT	
4	DECIDUOUS CONIFER FOREST	51	50	SEMI DESERT SHRUBS	
5	DECIDUOUS BROADLEAF FOREST	52	51	SEMI DESERT SAGE	
6	EVERGREEN BROADLEAF FORESTS	53	52	BARREN TUNDRA	
7	TALL GRASSES AND SHRUBS	54	53	COLD SOUTHERN HEMISPHERE MIXED FORESTS	
8	BARE DESERT	55	54	COLD FIELDS AND WOODS	
9	UPLAND TUNDRA	56	55	FOREST AND FIELD	
10	IRRIGATED GRASSLAND	57	56	COLD FOREST AND FIELD	
11	SEMI DESERT	58	57	FIELDS AND WOOLLY SAVANNA	
12	GLACIER/ICE	59	58	SUCCULENT AND THORN SCRUB	
13	WOODED WET SWAMP	60	59	SHALL LEAF MIXED WOODS	
14	ISLAND WATER	61	60	DECIDUOUS AND MIXED TROPICAL FOREST	
15	SEA WATER	62	61	NARROW CONIFERS	
16	SHRUB EVERGREEN	63	62	WOODED TUNDRA	
17	SHRUB DECIDUOUS	64	63	HEATH SCRUB	
18	MIXED FOREST AND FIELD	65	64	COASTAL WETLAND - NW	
19	EVERGREEN FOREST AND FIELDS	66	65	COASTAL WETLAND - NE	
20	COLD RAIN FOREST	67	66	COASTAL WETLAND - SE	
21	CONIFER TROPICAL FOREST	68	67	COASTAL WETLAND - SW	
22	COLD CONIFER FOREST	69	68	POLAR AND ALPINE DESERT	
23	COLD MIXED FOREST	70	69	GLACIER/ROCK	
24	MIXED FOREST	71	70	SALT FLATS	
25	COLD BROADLEAF FOREST	72	71	MANGROVE	
26	DECIDUOUS BROADLEAF FOREST	73	72	WATER AND ISLAND FRINGE	
27	CONIFER FOREST	74	73	LAND WATER AND SHORE	
28	MOUNTAIN TROPICAL FORESTS	75	74	LAND AND WATER RIVERS	
29	SEASONAL TROPICAL FOREST	76	75	CROP AND WATER MIXTURES	
30	COLD CROPS AND TOWNS	77	76	SOUTHERN HEMISPHERE CONIFERS	
31	CROPS AND TOWN	78	77	SOUTHERN HEMISPHERE MIXED FOREST	
32	DRY TROPICAL WOODS	79	78	WET SCLEROPHYLL FOREST	
33	TROPICAL RAINFOREST	80	79	COASTLINE FRINGE	
34	TROPICAL DEGRADED FOREST	81	80	BEACHES AND DUNES	
35	CORN AND BEANS CROPLAND	82	81	SPARSE DUNES AND RIDGES	
36	RICE PADDY AND FIELD	83	82	BARE COASTAL DUNES	
37	HOT IRRIGATED CROPLAND	84	83	RESIDUAL DUNES AND BEACHES	
38	COLD IRRIGATED CROPLAND	85	84	CO-FOUND COASTLINES	
39	COLD IRRIGATED CROPLAND	86	85	ROCKY CLIFFS AND SLOPES	
40	COLD GRASSES AND SHRUBS	87	86	SANDY GRASSLAND AND SHRUBS	
41	HOT AND MILD GRASSES AND SHRUBS	88	87	BAMBOO	
42	COLD GRASSLAND	89	88	MOIST EUCALYPTUS	
43	SAVANNA (WOODS)	90	89	RAIN GREEN TROPICAL FOREST	
44	MIRE/ECG PEN	91	90	WOOLLY SAVANNA	
45	MARSH WETLAND	92	91	BROADLEAF CROPS	
46	MEDITERRANEAN SCRUB	93	92	GRASS CROPS	
47	DRY WOOLLY SCRUB	94	93	CROPS, GRASS, SHRUBS	

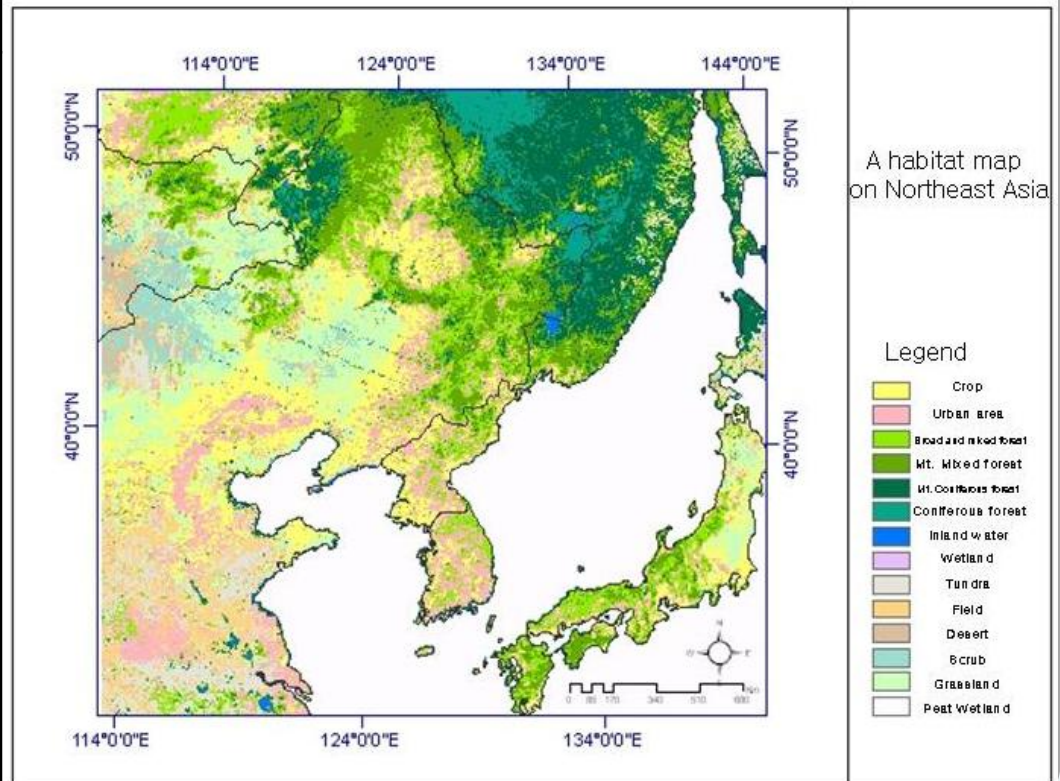


National Landcover Criteria(Olson, 1994)

Habitat Map on North-east Asia

❖ Habitat map on North-east Asia is divided into 14 items.

	Habitat map on Northeast Asia	National Land Cover Criteria
1	Mt. Coniferous forest	3, 4, 18, 22
2	Mt. Mixed forest	23, 24
3	Broad leaved and mixed forest	5, 6, 25, 26, 60
4	Coniferous forest	21, 27, 61, 62
5	Grassland	2, 7, 10, 40, 42
6	Scrub	16, 17, 47, 59, 64, 87
7	Wetland	13, 45, 65, 66, 67, 68, 73, 74, 75
8	Peat Wetland	44
9	Inland water	14
10	Tundra	9, 53, 63
11	Urban area	1
12	Field	36, 55, 56, 57, 76
13	Crop	30, 31, 35, 37, 38, 39, 92, 93, 94
14	Desert	8, 11, 50, 51, 52



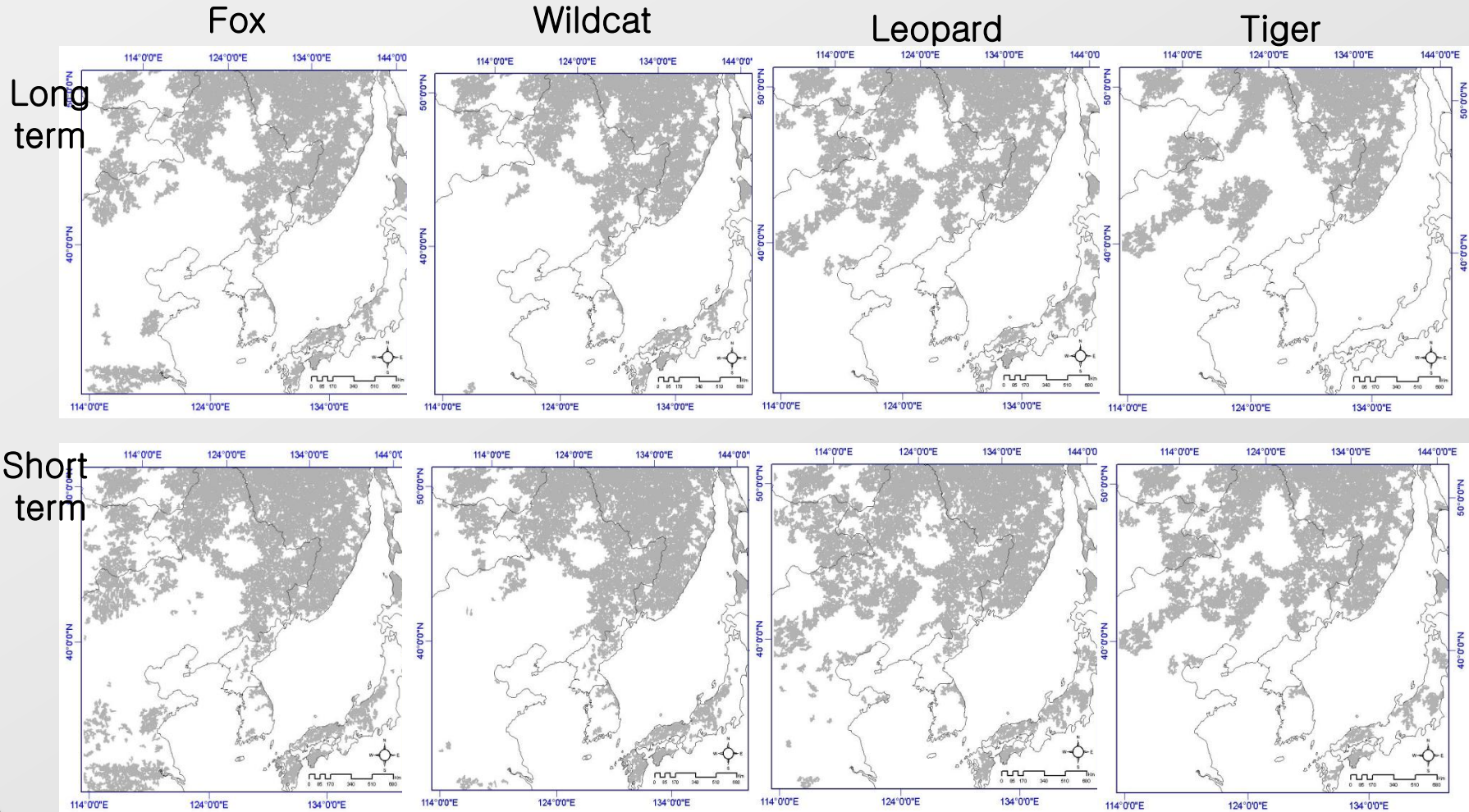
Needed area of Flagship Species for Habitat

- ❖ Four flagship species selected as priority, based on current status and literature review
- ❖ The habitat conditions of the four flagship species were identified unit 100 km²

Dividing	Fox		Wildcat		Leopard		Tiger	
	Long	Short	Long	Short	Long	Short	Long	Short
Mt. Coniferous forest	>20	>4	>20	>4	>40	>8	>200	>40
Mt. Mixed forest								
Broad leaved and mixed forest								
Coniferous forest								
Grassland								
Scrub	>20	>4						
Peat Wetland	>20	>4						
Tundra	>20	>4						

* Reference : The area which is concrete ECNC(2002)& Darman et al.(2003)

Potential Habitat Map by Landcover



A Potential Habitat Map

- ❖ In selected four flagship species about long-term and short-term standard for potential habitat area extracted
- ❖ Potential habitat area for Tiger (short term) 991,375km²
- ❖ Potential habitat area for Leopard (long term)1,651,576km²

Stable Habitat Area for Selected Species

Species	Area(km ²)
Wildcat (long term)	1,151,593
Wildcat (short term)	1,404,758
Fox (long term)	1,335,567
Fox (short term)	1,646,700
Leopard (long term)	1,334,158
Leopard (short term)	1,651,576
Tiger (long term)	991,375
Tiger (short term)	1,334,158

Ecological Network Mapping

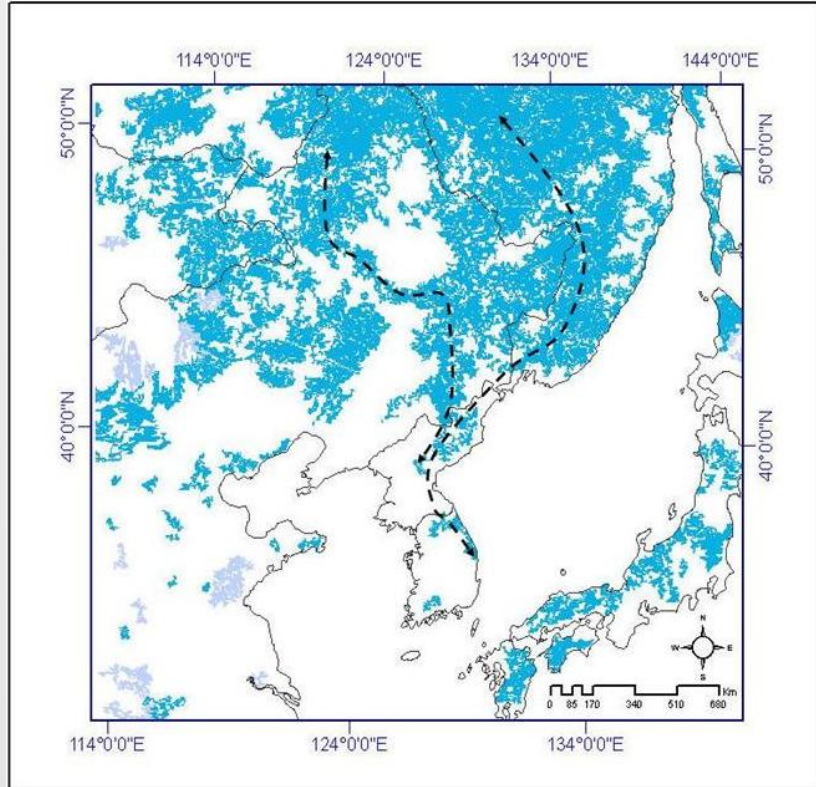
- ❖ Core area is overlay of potential habitat by four flagship species
- ❖ Independence core area : Each four flagship species habitat area is 20,000km²
- ❖ Dependency area : Each four flagship species habitat area is 4,000km²

Designation Criteria for Core Area by Target Duration

Division	Designation Criteria	
	long term	short term
Independence core area	- Union habitat of Wildcat, fox, Leopard and Tiger (over area is 20,000km ² -)	- Union habitat of Wildcat, fox, Leopard and Tiger (over area is 20,000km ² -)
Dependency area	- Species habitat area is under 20,000km ²	- Species habitat area is under 4,000km ²

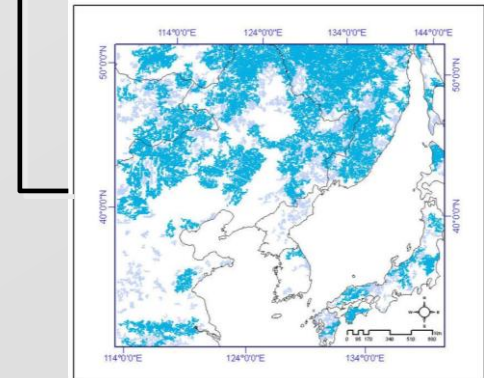
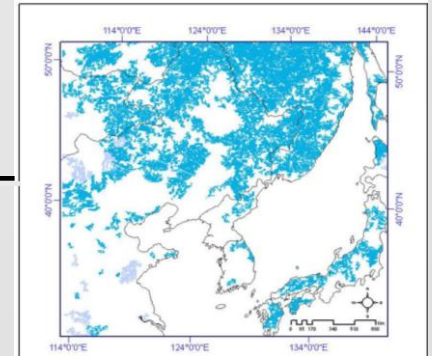
Ecological Network Mapping

- ❖ The corridor set which is an important element in the international ecological network
- ❖ The core area which selects at the strong hold connection corridor set



North-east Asia Ecological Network Mapping

Independence core area (short term)



Independence core area (Long term)

Ecological Network Mapping

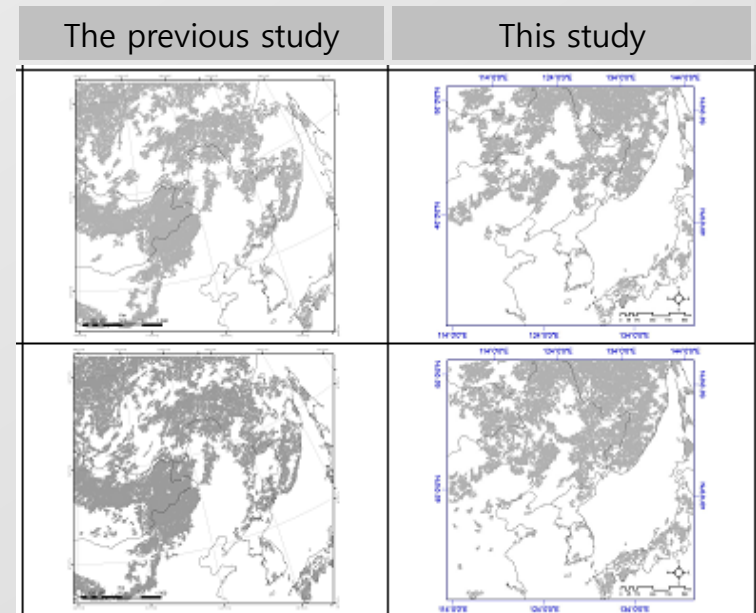
- ❖ The result of the analysis of the ecological networks in the whole North-east Asia region showed that there were key areas partly dispersed in the Korean Peninsula but whether the key areas would be maintained in the long term.
- ❖ As for China, there were key areas only in the border areas around the Tuman River and in parts of the three northeastern prefectures. Russia had wide-ranged areas that can be functioned as stable habitats for most species, and it is sufficient for the nation to play a key role in building North-east Asia ecological network.
- ❖ As a result of the actual conditions of ecological networks, most of North-east Asia region including the Korean Peninsula was in poor conditions, requiring appropriate measures and their operation as soon as possible.

Verification with Previous Study

- ❖ Existing Choi, Jungyoung(2005) Ph.D degree researches, the Northeast Asia mode of life network analysis
 - * About Mammalians 4 and birds 2 stable habitat in standard analysis
 - * Using Satellite Image NOAA AVHRR (About 2,500), Overlay Method
- ❖ Difference with preceding research
 - * Unsupervisor classification improvement
 - * Atmospheric Correction improvement
- ❖ The leopard which shows the most change
 - * Regional change from the short-term/long-term side the Chinese eastern area being damaged confirmation

Long term

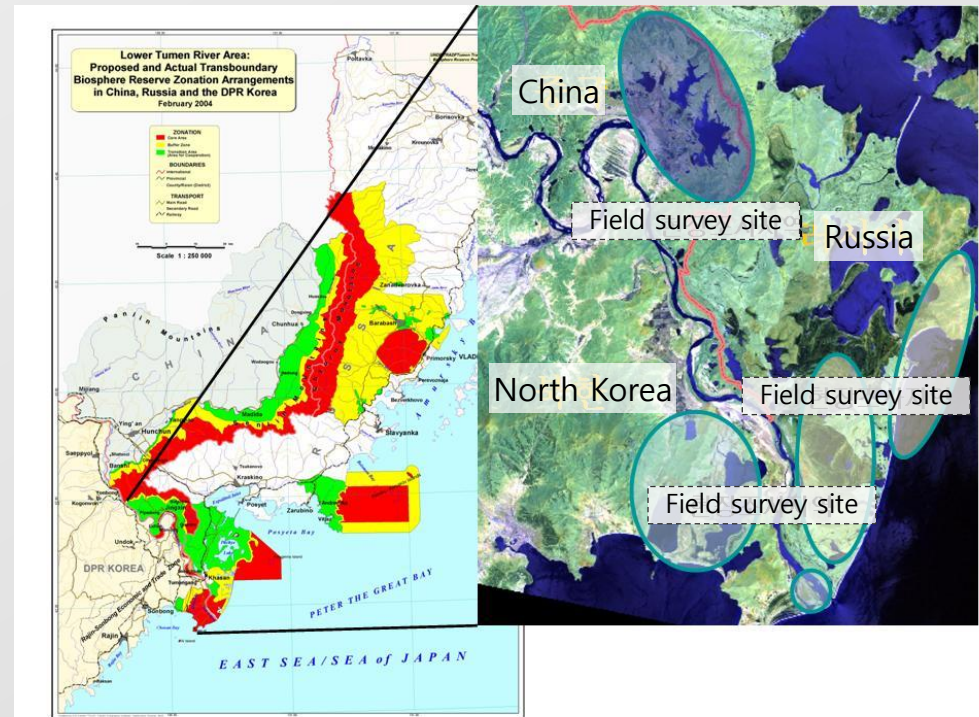
Short term



Leopard

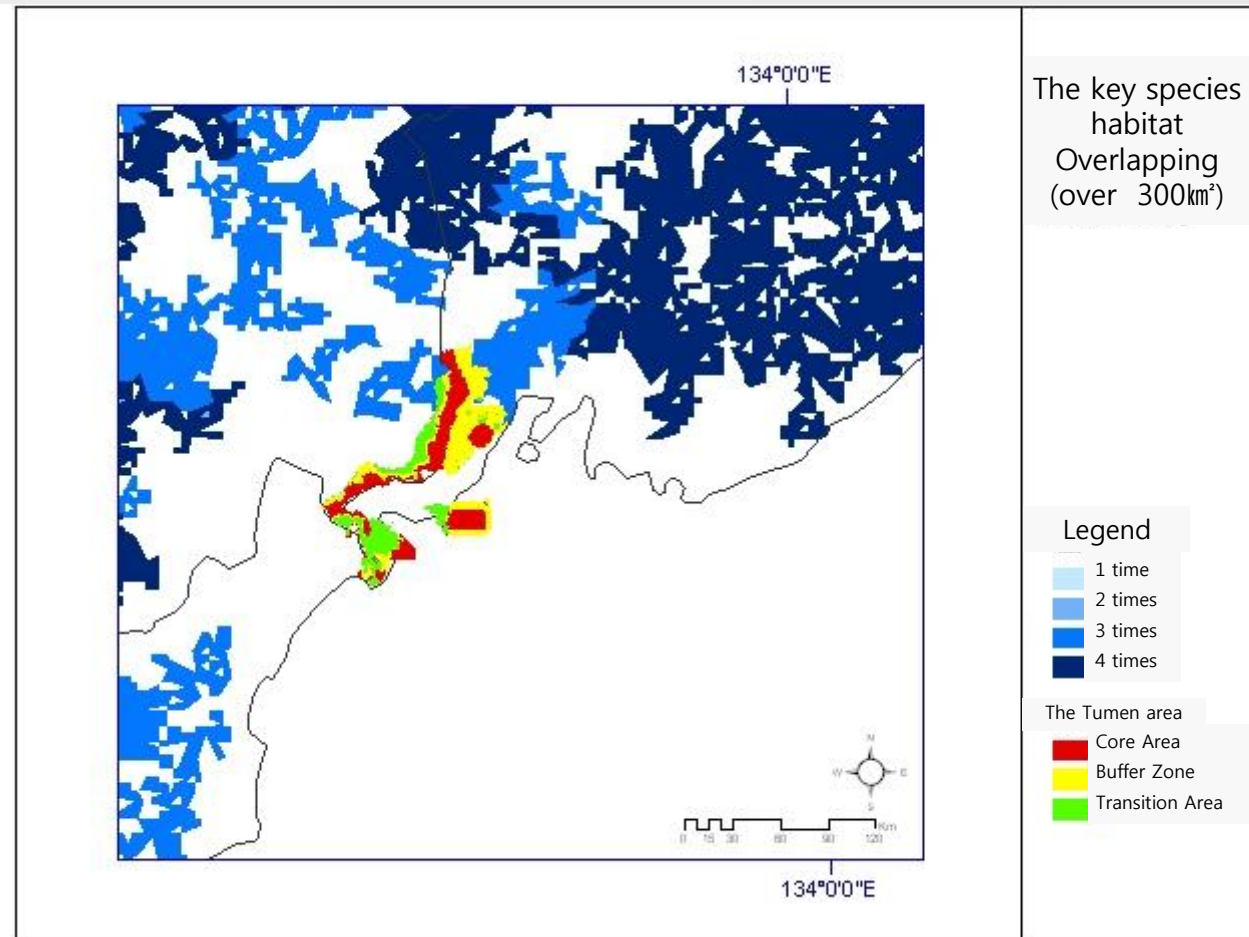
Biosphere Reserve of the Border areas around the Tumen River

- ❖ The goal of the study accomplished by UNDP is to confirm the proper area for the Biosphere Reserve of the border areas around the Tumen river.
- ❖ The study about a birds' conservation area selection like the crane in wetlands
 - * This study selects the mammals as the key species, confirms the stable habitats.
- ❖ A overlapping analysis is limited only in north part of the previous study



The Tumen River Biosphere Reserve and Field Survey Areas

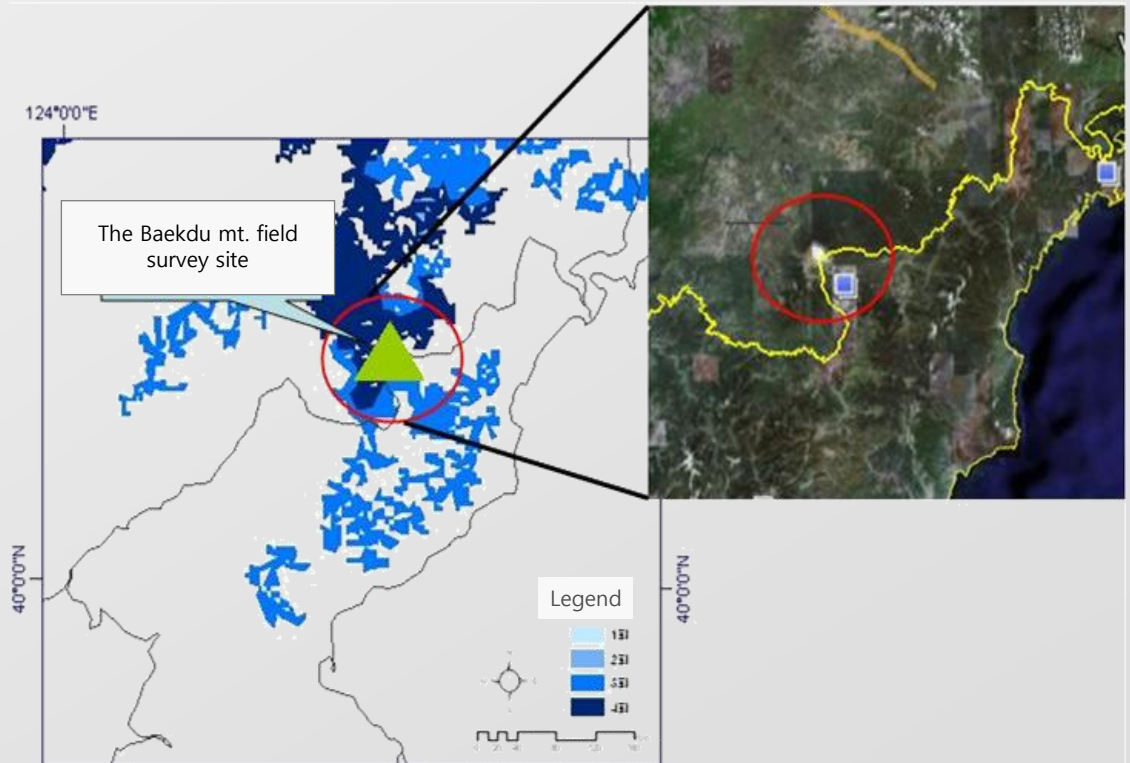
Biosphere Reserve of the Border areas around the Tumen River



The comparative analysis of the Tumen Biosphere Reserve and the study area

Field Survey of Ecological Network

- ❖ The field survey sites are selected the Baekdu mt. that is overlapped the four species habitats.
- * The areas are overlapped in the standard of long and short terms and contained the main corridor areas
- ❖ The field survey sites contained 17 points and the sites are surveyed by data of the habitats of the sites' long and short terms and GPS.



The field survey site the Baekdu mt.

Field Survey of Ecological Network

No.	Nation	Coord.(X)	Coord.(Y)	Date	Image	Field survey
1	China	429095.06	4657901.02	Nov. 06. 2008.	Mountain coniferous Forest	<i>Picea jezoensis</i>
2		436683.49	4657597.49		Mountain coniferous Forest	<i>Picea jezoensis</i>
3		433041.05	4658204.56		Mountain coniferous Forest	<i>Picea jezoensis</i>
4		421506.64	4658508.10		Mountain coniferous Forest	<i>Picea jezoensis</i>
5		417864.19	4656990.41		Mountain coniferous Forest	<i>Picea jezoensis</i>
6		417560.65	4653347.97		Mountain coniferous Forest	<i>Picea jezoensis</i>
7		417560.65	4652740.89		Coniferous Forest	<i>Abies holophylla</i>
8		415132.36	4648491.37		Coniferous Forest	<i>Abies holophylla</i>
9		414828.82	4647884.30		Coniferous Forest	<i>Abies holophylla</i>
10		421203.10	4653651.50		Coniferous Forest	<i>Abies holophylla</i>
11		421506.64	4649705.52		Mountain Mixed Forest	<i>Abies nephrolepis</i>
12		415739.43	4646973.69		Mountain Mixed Forest	<i>Abies nephrolepis</i>
13		410579.30	4641813.56		Mountain Mixed Forest	<i>Abies nephrolepis</i>
14		433041.05	4663668.23		Mountain Mixed Forest	<i>Abies nephrolepis</i>
15		424845.54	4661847.01		Mountain Mixed Forest	<i>Abies nephrolepis</i>
16		415132.36	4659722.25		Deciduous and Mixed Forest	<i>Betula ermanii</i>
17		408151.00	4649705.52		Deciduous and Mixed Forest	<i>Betula ermanii</i>

Field Survey of Ecological Network

- ❖ The result of vegetation classification by a image process, the field survey sites are classified as mountain coniferous, coniferous, mountain mixed, deciduous and mixed forests.
- * It was surveyed 15 sites (coniferous forests) of 17 sites as *Picea jezoensis*, *Abies holophylla*, *Abies nephrolepis* and other 2 sites (deciduous and mixed forests) as *Betula ermanii* (deciduous forest).
- ❖ The vegetation classification is verified as reliable results by a field survey.`



Field survey figures

IV. Future Work

- ❖ Promotion projects by phases will be need to promote North–east Asia ecological network
- ❖ Constructing a council with IUCN–registered agencies based on EABRN or USESCAP building infrastructure such as a scope of cooperation and organizational system
- ❖ Standardizing principles and criteria & confirming the limitation of subjects for North–east Asia ecological network, constructing database for the major species (flagship species) by nations and their habitats
- ❖ Collecting data related to ecological networks of individual nations, constructing cooperative system among foreign research agencies and industry–university–research–government

Thanks!

