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journal or publication title	Journal of Integrated Field Science
volume	13
page range	9-12
year	2016-03
URL	<a href="http://hdl.handle.net/10097/64075">http://hdl.handle.net/10097/64075</a>

## Conservation Activities on Korean Rare and Endemic Plants —with a Special Reference to the Korea National Arboretum

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### **Abstract**

The current status of conservation activities on the Korean rare and endemic species was reviewed with a special reference to the Korea National Arboretum (KNA). In the Korean peninsula, there are 4,172 plant taxa including 360 endemics and 571 rare plants categorized at the national level by the IUCN criteria: EW 4, CR 112, EN 199, LC 70, and DD 112. The KNA has established various *in-* and *ex-situ* conservation programs in practice for GSPC goals since 2010. In order to improve the conservation activities, the KNA has managed specialized research projects as well as networking programs with other local governmental arboreta and NGOs in Korea. The main purposes of the research projects are to (1) survey, update, and evaluate the conservation and genetic status of Korean populations of rare endemic plants; (2) formulate an urgent conservation strategy; and (3) monitor the endangered populations based on the latest and accurate ecological and biological information. For the *ex-situ* conservation, the KNA has secured and propagated seeds and living collections of rare and endemic plants, and as a result, the KNA conserves about 70% of Korean rare plants as living collection and propagules. A total of nine conservation fences have been installed and monitored by the KNA as part of *in-situ* conservation. In addition, the KNA has carried out a re-introduction program for rare plants such as epiphytic orchids in natural habitats by developing propagation techniques with accurate genetic tags. The KNA also promotes training and international cooperation programs for the *in-* and *ex-situ* conservation activities for the East Asian biodiversity.

### **Introduction**

#### **Brief history and current status of rare plant conservation in Korea (adopted from Korea Forest Service 2008)**

The beginning of history of rare plant conservation in Korea began after the Korean War, when UN came to Korea and UNESCO under UN started its operation. The history of botany in Korea started with the introduction of main plant distribution by Western and Russian scholars in early 19th century and then was researched by Japanese scholars after the Japanese annexation of Korea. During tumultuous period after the independence in 1945 and Korean War, the plant research in Korea was performed locally by a few Western scholars. UNESCO played a central role in the research and its Korean partner was the Korea Association of Conservation for Nature (KACN). KACN was founded in December, 1963 as an academic inspection committee for natural resource conservation. It was the only academic NGO in Korea back then. The members of KACN consisted of mostly scholars in biology and forestry. Not only scholars in botany, but also scholars in various field such as wild animals, insects and fungus participated in the organization. Important regional research results were presented through the organization's publication Nature Conservation Magazine, the only available journal related to biology during the period.

Due to rapid industrialization in Korea, numerous habitats for important plants were threatened and destroyed. Corresponding to these issues, biologists publicized conservation reports for plant habitats, which needed to be distinguished as protected species (Prof. Deok-bong Lee: the first two selected species – *Cypripedium japonicum*, *Berchemia berchemiaefolia*). Initiated by Deok-bong Lee who designated *Cypripedium japonicum*, *Berchemia berchemiaefolia* as protected species (1969), the status of protected

rare plants included 106 species presented by Man-kyu Park (1975), 118 species by Young-no Lee (1981), and 79 species by Tchang-bok Lee (1987).

As Korea has become a more developed country, strategy to manage biodiversity and standardization of national biology management in policy are demanded. Since there are clear differences in the responsibilities of central government, local government, educational institution, and NGO, the role of each organization in the efficient management for national biology will occur. In this case, it is recommended that for rare plants by criteria central government should research, conserve and monitor critically endangered species and endangered species, and for vulnerable and least concern species local government should take the lead in those conservation activities. For data deficient species identification of habitat and criteria review should be proceeded as a next step.

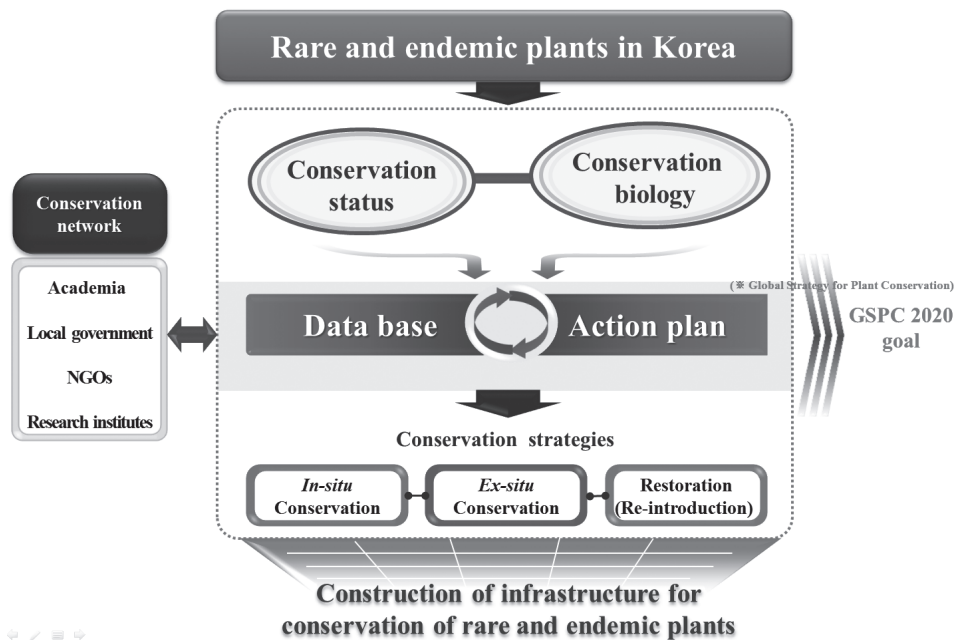
**Purpose of This Research**

4,172 plant taxa have been known in the Korean peninsula, including 360 endemics and 571 rare plants categorized at the national level by the IUCN criteria: EW 4, CR 112, EN 199, LC 70, and DD 112 (Korea Forest Service 2008). This research was carried out to generally understand the conservation activities for Korean rare and endemic plants in recent years with a special reference to the Korea National

Arboretum (KNA). Most of the results were based on research papers and reports (especially Son 2015) about conservation activities or programs of the KNA.

**Results and Discussion**

The KNA has established various *in-* and *ex-situ* conservation programs in practice for GSPC (Global Strategy for Plant Conservation) goals since 2010 (Son 2015). In order to improve the conservation activities, the KNA has managed specialized research projects as well as networking programs with other local governmental botanic gardens and NGOs in Korea. The KNA started an important project titled “Construction of infrastructure for conservation of rare and endemic plants in Korea” in 2010 with a 10 years plan. The main purposes of the research projects are to (1) survey, update, and evaluate the conservation and genetic status of Korean populations of rare endemic plants; (2) formulate an urgent conservation strategy; and (3) monitor the endangered populations based on the latest and accurate ecological and biological information. About 24 research teams from universities, national, public, and private arboretum (or botanical gardens), research institutes, NGOs, etc, participate in this project. An outline of the project is presented in Fig. 1. Some remarkable case results from the research are as follows:



**Fig. 1** An outline of the KNA project titled “Construction of infrastructure for conservation of rare and endemic plants in Korea”.

### 1. Phytogeography on rare and endemic species (with two case studies)

***Scrophularia takesimensis* Nakai (Choi et al. 2012):** *S. takesimensis* Nakai is a critically endangered plant species endemic to Ulleung Island, Korea. The researchers provide updated information on the distribution and conservation status of this species. They located 39 subpopulations and counted a total of 443 individuals, including some reintroduced. Observations of dried and broken branches, with fruits, of *S. takesimensis* along the coast may indicate dispersal by sea. The construction of coastal roads is the main threat to the species. To conserve this species more effectively, the researchers recommend that: (1) the two habitats identified as a priority for conservation should be afforded special protection, (2) habitats to the seaward side of coastal roads are more suitable than the habitat on the landward side for in-situ conservation, and (3) the presently known subpopulations require continuous protection and monitoring.

***Quercus myrsinifolia* Blume (Lee et al. 2014):** Most evergreen *Quercus* species are typical, dominant members of Korean evergreen forests. However, little is known about the distribution status of *Q. myrsinifolia* Blume there. To enhance our knowledge about their natural range in Korea, the researchers conducted field surveys based on specimen records and an extensive literature search. They also determined their exact number as a first step in planning their

conservation. The results indicated that these trees are strictly limited to Jin Island, and 169 mature individuals were the maximum number and occurred in only three subpopulations on that island. Previous mis-identifications and perhaps mislabeled locations for plant specimens were the main reasons for the earlier confusion about distribution. The researchers believe that these results can provide us guidance required for making specific recommendations for management interventions. These discoveries also demonstrate the value in having reliable information about plant specimens in general. They also speculated about what makes this species particularly vulnerable to local extinction.

### 2. Ex-situ conservation

For the *ex-situ* conservation, the KNA has collected and propagated seeds and living collections of rare and endemic plants, and as a result, the KNA conserves about 70% of Korean rare plants as living collection and propagules (Son 2015). Main facilities of *ex-situ* conservation in KNA are seed bank, propagation center (greenhouse, bed, tissue culture room), and conservation gardens. The nine local governmental botanical gardens have established the conservation garden for the duplicated conservation of living collections of KNA. In particular, they try to manage the *ex-situ* conserved individuals with accurate genetic tags as proposed with a case study of *Euchresta japonica* Hook. f. ex Regel (Fig. 2; Choi et al. 2013).

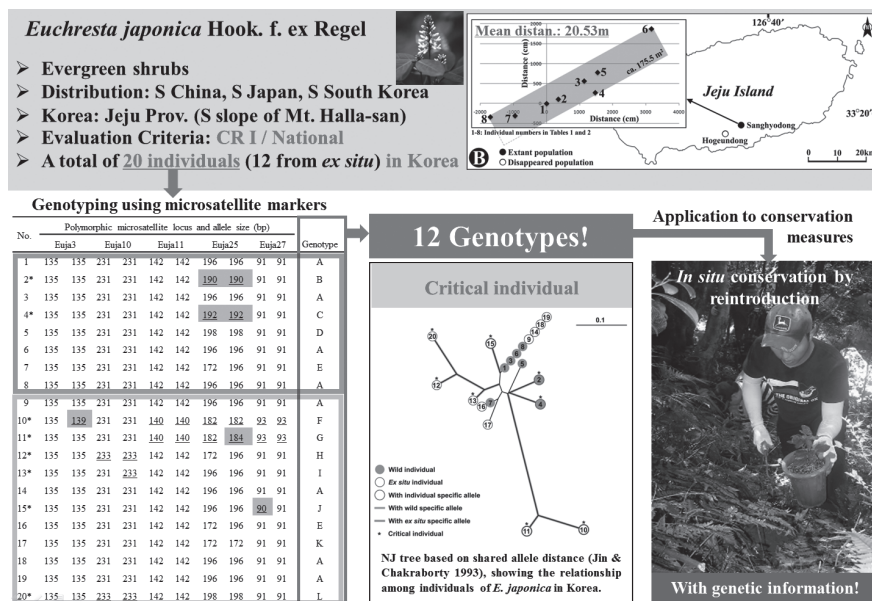


Fig. 2 The result of a case study (with *Euchresta japonica*) about the importance of genetic information in conservation measures (Choi et al. 2013).

### 3. In-situ conservation

A total of 9 conservation fences for rare and endemic species which have only one or two habitat in Korea have been installed and monitored by the KNA as part of in-situ conservation (Table 1; Son 2015). Most of all, the population sizes have been increased

continuously after the installation of up-to-date conservation fences. In addition, the KNA has carried out a re-introduction program for rare plants such as epiphytic orchids in natural habitats by developing propagation techniques with accurate genetic tags.

**Table 1** The current status of conservation fences for *in-situ* conservation by KNA.

No.	Taxon	Year of installation	Region
1	<i>Forsythia saxatilis</i> (Nakai) Nakai	2008	Gangwon Province
2	<i>Caragana fruticose</i> (Pall.) Besser	2008	Gangwon Province
3	<i>Prunus choreiana</i> H. T. Im	2008	Gangwon Province
4	<i>Ribes komarovii</i> Pojark.	2008	Gangwon Province
5	<i>Cypripedium guttatum</i> Sw.	2009	Gangwon Province
6	<i>Habenaria radiata</i> (Thunb.) Spreng.	2010	Gyeonggi Province
7	<i>Cypripedium japonicum</i> Thunb.	2012	Gangwon Province
8	<i>Veronica pusanensis</i> Y.Lee	2013	Busan Metropolitan City
9	<i>Lychnis wilfordii</i> (Regal) Maxim.	2014	Gangwon Province

### 4. International cooperation and network

The KNA also promotes trainings and international cooperation programs for the *in-* and *ex-situ* conservation activities for the East Asian biodiversity. The KNA has managed a national and public arboretums joint research council since 2010. In addition, they held the IUCN Red List Training Workshop in 2011. The KNA also attempts to encourage citizens' interests in rare and endemic plants in Korea by means of various exhibition events with a topic of rare and endemic plants in Korea.

#### Acknowledgement

This research was financially supported by Changwon National University in 2015-2016

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