RESOURCES OF THE BOTANIC GARDEN OF IRKUTSK STATE UNIVERSITY:
Educational, Scientific and Socio-Ecological Aspects

Irkutsk 2005
This reference manual describes the history of creation and formation of socially and ecologically significant resources of the Botanic Garden of Irkutsk State University - the only botanic garden in the Lake Baikal region with a mission "To protect and enrich the flora of the Lake Baikal area and the world for people through public education, collection, propagation, research, and conservation of plants". The taxonomical, eco-biological, geographical structure of flora and collections of the Garden is described. Comparative study of some principal BG ISU resources with other university BGs of Russia was done. Comparison of the BGISU flora with major green zones and parks of Irkutsk city was completed. In additional to traditional educational and scientific tasks and roles of the university garden in times of transition, a new role for the regional BG ISU as an innovative institution is a facilitation of the development of life quality of local people via improvement and beautification of urban environment, greening of cities, repatriation and introduction of endangered edible and medicinal plants, introduction of new species, "horticultural therapy", etc. Current achievements, ways and directions of efficient use of the BG ISU complex resources are discussed in terms of satisfaction of local people needs via the combining of biodiversity conservation, plant introduction, commercialization of genetic resources, continuous education and public awareness.

This book was prepared for BGs professionals, botanists, gardeners, dacha owners, university students and teachers, geographers, school teachers, "green industry" specialists and individuals involved in greening projects, decision makers in regional administrative bodies, and for the broad spectrum of nature lovers.

© Irkutsk State University, 2005
# TABLE OF CONTENTS

THE FOREWORD .......................................................................................................................... 5

INTRODUCTION .......................................................................................................................... 7

1. WHAT IS THE BOTANIC GARDEN. DEFINITIONS AND FUNCTIONS .......................... 11
   1.1. DEFINITIONS .................................................................................................................... 11
   1.2. FUNCTIONS ....................................................................................................................... 11
   1.3. TYPES OF BGS ACCORDING TO THEIR FUNCTIONAL AND INSTITUTIONAL ORGANIZATION IN RUSSIA AND IN THE WORLD .......................................................... 14

2. ABOUT POSITIONING OF THE BG ISU AND ITS ROLES ............................................. 16
   2.1. THE STATUS AND COMMUNICATIONS OF BG ISU ................................................... 16
   2.2. FUNCTIONS OF BG ISU AND THEIR REALIZATION ............................................... 19

3. THE COMPARATIVE ANALYSIS OF DEVELOPMENT AND USE OF COLLECTIONS AND RESOURCES OF UNIVERSITY BOTANIC GARDENS ...................................................... 22

4. WHAT IS THE RESOURCES OF THE BOTANIC GARDEN OF ISU ............................... 26
   4.1. A GEOGRAPHICAL POSITION ...................................................................................... 27
   4.2. A RELIEF, GEOLOGY ..................................................................................................... 27
   4.3. FEATURES OF A CLIMATE AND A MICROCLIMATE .................................................. 27
   4.4. SOILS IN LAND OF BG ISU ........................................................................................... 31

5. A HISTORY OF THE BOTANIC GARDEN ESTABLISHMENT IN IRKUTSK AND FORMATION OF ITS COLLECTIONS ......................................................................................... 32

6. WILD FLORA OF BG ISU ....................................................................................................... 41
   6.1. AN OVERVIEW ............................................................................................................... 41
   6.2. THE TAXONOMICAL ANALYSIS OF WILD FLORA .................................................. 41
   6.3. THE ECO-BIOMORPHOLOGICAL ANALYSIS ............................................................... 43
   6.4. THE GEOGRAPHICAL ANALYSIS .................................................................................... 43
   6.5. COMPARISON OF NOT CULTIVATED FLORA OF BG ISU WITH ADJACENT FLORA .... 45
      6.5.1. THE ANALYSIS OF SIMILARITY AND DISTINCTION OF FLORA OF BG ISU WITH ADJACENT FLORA .............................................................................................. 49

7. CULTIVATED FLORA OF BG ISU ......................................................................................... 52
   7.1. THE TAXONOMICAL ANALYSIS OF CULTIVATED FLORA ..................................... 52
   7.2. THE GEOGRAPHICAL ANALYSIS OF CULTIVATED FLORA .................................... 58
   7.3. THE ECO-BIOLOGICAL CHARACTERISTICS OF CULTIVATED FLORA ............... 61
   7.4. COLLECTIONS OF WOODY OUT-DOOR PLANTS ...................................................... 62
   7.5. COLLECTIONS OF HERBACEOUS PLANTS ................................................................. 68
      7.5.1. Some results of introduction of rare plant species ...................................................... 69
   7.6. PLANT COLLECTIONS IN GLASSHOUSES ................................................................. 75

8. FORMATION OF COLLECTIONS. A COLLECTION POLICY .......................................... 79
   8.1. FEATURES OF A MODERN COLLECTION POLICY OF THE BOTANICAL GARDEN FOR THE LAKE BAIKAL REGION ................................................................. 79
8.2. ACQUIRING AND UPDATING OF COLLECTIONS ...................................................... 80
8.3. USAGE AND SHARING OF GENETIC RESOURCES .................................................. 80
8.4. BENEFIT-SHARING ................................................................................................... 80
8.5. DOCUMENTATION AND REGISTRATION ................................................................. 81
8.6. A LABELING ............................................................................................................... 81
8.7. AVAILABILITY ............................................................................................................ 81
8.8. LIQUIDATION (DELETING) .......................................................................................... 82
8.9. UPDATING AND REVISION OF A COLLECTION POLICY .......................................... 82

9. DIRECTIONS OF USE OF THE BG ISU RESOURCES FOR THE YOKE ..................... 83
   9.1. RESOURCES OF BG ISU FOR PUBLIC EDUCATION AND AWARENESS ............... 88
      9.1.1. Participation of students ..................................................................................... 89
   9.2. INFORMATION RESOURCES ................................................................................... 89
   9.3. DEVELOPMENT OF RESOURCES .......................................................................... 90

THE CONCLUSION ............................................................................................................. 91

WHETHER IT IS POSSIBLE TO ESTABLISH A WORLD CLASS BOTANIC GARDEN IN THE LAKE BAikal REGION? ................................................................. 91
REGIONAL AND INTERNATIONAL PROSPECTS OF USE OF THE GARDEN RESOURCES ....................................................................................................................... 92
OBJECTIVES FOR THE NEAREST FUTURE: ................................................................. 93

THE BIBLIOGRAPHICAL LIST .......................................................................................... 94

THE INDEX OF NAMES .................................................................................................... 99

The appendix 1. The list of plants in collections of the Botanic Garden of Irkutsk State University ............................................................................................................ 100
The appendix 2. The list of not cultivated (wild) flora on territory of the Botanic Garden of Irkutsk State University ........................................................................................................... 231
The appendix 3. Gardens and facilities to be constructed in the Botanic Garden in the future ..................................................................................................................... 237
The appendix 4. The list of some popular informational websites which keeps links to the BG ISU site as a scientific and educational resource on botany, gardening and ecology ........................................................................................................... 238
The appendix 5. List of Botanic Gardens of Russia ................................................................................................................................. 241
INTRODUCTION

Mission of the Botanic Garden ISU: "To protect and enrich the flora of the Lake Baikal area and the world for people through public education, collection, propagation, research, and conservation of plants" (Kuzevanov, Sizykh, 2003)

In Russia and abroad the Botanic Garden of Irkutsk State University (BG ISU) is known as the Irkutsk Botanic Garden. This book has been conceived as a working tool and as a reference manual in order to summarize opportunities and prospects of use of the BG ISU resources. The prime attention is given to directions of practical use of resources of the Garden to support educational process and scientific works at the university in combination with educational, conservational and socially significant activities in the region.

Data on plant genetic resources and features of long term dynamics of their formation during the 65-year history of the BG ISU (fig. 2) are presented. For the first time the comprehensive report on taxonomical structure of plant collections and wild flora in the BG ISU territory is given. Materials on main directions of its complex educational, conservational and research work on introduction, preservation and practical use of plants of the Baikalian Siberia are summarized for the first time. These data on collections of the Garden were not published earlier. Plant species which have been received in the year 2004 were not included in the analysis (2021 samples).

Materials of the manual present a structure of out-door and in-door collections in relation to other garden's resources. They show directions of resources use in educational, conservational and scientific works as well as in public services to satisfy current needs for well-being of local people. Directions of mutually advantageous cooperation with department, faculties and divisions ISU are suggested.

Materials are intended for the decision-making processes connected with management and rational use of resources of the Irkutsk Botanic Garden.

In a context of present work we considered following resources of the BG: a human manpower (working hours and qualification), plants cultivated in collections and in wild, land (territory), buildings, facilities, materials, technical equipment, tools, an infrastructure, literature and information, as well as some other materials and financial resources which can be used to support the mission of the BG ISU and for the improvement of quality of life through improvement of an environment and ecological literacy of the population in the region.

As a methodological basis of this work we are developing a view on the multipurpose role of university botanic gardens as a socially and ecologically valuable resource in the region. Botanic gardens is a part of the regional system of strictly protected natural territories designed for nature conservation, mobilization and use of biodiversity and genetic resources of plants in-situ and ex-situ for needs of people as end-users (fig. 3).

Therefore the purpose of this work was also to summarize some results of formation of resources accumulated at the BG ISU, and also to see possible ways of their future development and use for education and enlightenment of the local people for their participation in nature conservation.

We ask you to forward your comments, remarks and suggestions to the Botanic Garden ISU address: 664039. Irkutsk, 93 Koltsov Street, 93 or by e-mail: vic@bogard.isu.ru
Fig. 1. A satellite photo of Irkutsk city showing location of the Botanic Garden of ISU (marked with a green star and a white border line) in relation to other facilities and institutions of the Irkutsk State University. It is obvious that the territory of the BG ISU is a natural continuation of the Kayskaya Pine Grove.

Location of main buildings and institutions of the ISU is marked with numbers:

1 - 1-st building (Institute of Mathematics and Economics, Institute of Applied Physics, Internet Center, Faculty of Physics, etc.);
2 - 2-nd building (university president office and administration);
3 - 3-rd building (Faculty of Geology, Institute of Biology, etc.);
4 - 4-th building (Biology and Soil Faculty);
5 - 5-th building (Institute of Justice);
6 - 6-th building (Faculty of Chemistry, Faculty of Geography, Institute of Coal and Petrochemical Synthesis, Faculty of Service and Advertisement, etc.);
7 - The International Faculty, Baikal Institute of Business and International Management, Law Institute, etc.;
8 - Faculties of History, Psychology, Phylogeny and Journalism, Institute of Social Sciences, etc.;
9 - Scientific Library;
10 - Hostel No 10
Fig. 2. Long term dynamics of introduction of plants in BG ISU collections of BG ISU showing cumulative curves of numbers of received (upper curve) and survived (lower curve) plant taxa from 1940 to 2003. Numbers of taxa are shown near each curve. X-axis – years, Y-axis – total number of taxa (species, varieties, forms)
Fig. 3. Positioning and roles of the botanic garden in regional system of movement of genetic resources of plants *in-situ* and *ex-situ* for mobilization, introduction, preservation, repatriation, development of biotechnologies and products, and biodiversity use for needs of other institutions and well-being of people as end-users. Arrows show directions of resources transfers including returns as benefit-sharing from commercialization of biodiversity and developed products.

Fig 4. Distribution of botanic gardens within the Russian Federation. University BGs marked with black dots (www.sevin.ru/collections/gardens/)
Fig. 5. Map of strictly protected natural territories and sites of environmental, conservational, recreational, historical and cultural importance in Irkutsk Oblast (State Report, 2003)
Fig. 6. Comparison of basic resources of university botanic gardens of the Russian Federation in relation to sizes of territory (area), staff (number of employees) and number of taxa (species, varieties and forms) in collections. Data from the review «Botanical gardens and dendrology parks of higher educational institutions», 2004). The symbol (■) specifies a positioning of the Botanic Garden of ISU among other university gardens marked with the symbols (♦).
Fig. 7. A territory of the Botanic Garden of ISU. A - the aerial photo from A.A.Rogozin's archive (1993); B – prospective master plan of 1984 (prepared by the Siberian Branch of GiproVUZ, Krasnoyarsk)

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a laboratory building</td>
</tr>
<tr>
<td>2</td>
<td>greenhouse</td>
</tr>
<tr>
<td>3 and 26</td>
<td>greenhouses for flowers and vegetables</td>
</tr>
<tr>
<td>4</td>
<td>a seed house</td>
</tr>
<tr>
<td>5</td>
<td>greenhouse</td>
</tr>
<tr>
<td>6</td>
<td>working pavilion of summer season</td>
</tr>
<tr>
<td>7</td>
<td>summer dining room</td>
</tr>
<tr>
<td>8</td>
<td>workshops, warehouses</td>
</tr>
<tr>
<td>9</td>
<td>the laboratory building of zoo-display</td>
</tr>
<tr>
<td>10 and 12</td>
<td>apartment houses (4 and 2 apartments)</td>
</tr>
<tr>
<td>11</td>
<td>a hostel</td>
</tr>
<tr>
<td>13</td>
<td>a part-time farm</td>
</tr>
<tr>
<td>14</td>
<td>an apiary</td>
</tr>
<tr>
<td>15</td>
<td>a zoo-display</td>
</tr>
<tr>
<td>16</td>
<td>a pine grove</td>
</tr>
<tr>
<td>17</td>
<td>a small arboretum</td>
</tr>
<tr>
<td>18</td>
<td>a systematic arboretum</td>
</tr>
<tr>
<td>19</td>
<td>a plot for medicinal plants</td>
</tr>
<tr>
<td>20</td>
<td>a plot for rare plants</td>
</tr>
<tr>
<td>21</td>
<td>a plot for ornamental plants</td>
</tr>
<tr>
<td>22</td>
<td>a plot of cultural plants</td>
</tr>
<tr>
<td>23</td>
<td>a site of moistureloving vegetation</td>
</tr>
<tr>
<td>24</td>
<td>a plot of natural flora</td>
</tr>
<tr>
<td>25</td>
<td>garage</td>
</tr>
</tbody>
</table>
Fig. 8. Location of main objects, facilities and gardens at the territory of BG ISU (T.Yakusheva, V.Kuzevanov, 2004).
Objects listed counter-clockwise starting from the red dot: educational building, naturalistic garden, demonstration glasshouse, administration building, main glasshouse, apricot garden, apple garden, garden of stony fruits, nursery for woody cultures, nursery for ornamental perennials, large arboretum, pine grove, Koltsov street entrance, collection of fruit plants, evaluation garden for ornamental perennials, collection of trees, Baikalian garden of native flora, lilac collections, small arboretum, ecological trail, pear garden, nut gardens, collection of perennials, nursery of berries cultures
Fig. 9. Structure of the territory use of the Botanic Garden of ISU in % of the total area of 27.08 hectares (as on September, 2004).

From the top:

Collections (3.2%)
Gardens (3.85%)
Nurseries (7.1%)
Park zone (42.9%)
Native pine grove (33.7%)
Demonstration plots for public excursions (1.3%)
Roads, trails, paths (4.2%)
Maintenance area (0.95%)
Building and facilities (1.3%)
Others (1.5%)
Fig. 10. The project of the initial master plan for the Irkutsk Botanic Garden in 1940 (author Paul I. Malinovsky). From archives of the BG ISU and the Irkutsk Oblast Museum of Regional Studies.

A – subdivisions (quarters) of the Irkutsk Botanic Garden territory (a photocopy of the original project of 1940);
B - imposing of the initial master plan of the Irkutsk Botanic Garden in 1940 on the modern map of Irkutsk city in 2005
Fig. 11. An expert estimation of dynamics of resource potential of the BG ISU during 1989-2003 (Kuzevanov, Sizykh, 2004). The resource potential (in relative units) was estimated by a group of 5 experts-managers as an integrated parameter of productive forces, including people, collections of plants, an infrastructure, the basic assets for production and incomes. Two periods of dramatic decrease in the resources are reactions to "perestroika" in the country after the "shock therapy" in 1990-1993 and on devaluation of national currency in 1998-1999 are visible. Smaller deviations from the general trend are reactions to actions on internal re-structuring and change management activities.

X – years, Y – resources, in relative units (expert estimations)
Fig. 12. A few examples of successful introduction of woody plants in the Botanic Garden of ISU: A) *Phellodendron amurense*; B) *Juglans mandshurica*; C) *Quercus mongolica*; D) *Amygdalus pedunculata* (photos from the BG ISU archive)
Comparison of green zones and parks of Irkutsk city according to abundance and density of plant species

- number of species
- density of species per hectar
- trend curve for species abundance
- trend curve for species density

**Fig. 13.** Comparison of some main green zones and parks of Irkutsk city according to abundance (A) and density (B) of species of trees, shrubs and herbaceous plants. Digits near each park dots specify numbers of species or species density per hectare. See Fig. 14 as well.
Comparison of abundance of species in green zones and parks of Irkutsk city

Fig. 14. Comparison of abundance (richness) of total flora of main green zones and parks of Irkutsk city and its suburbs.
Names of the green zones from left to right: Park PK – park Parizhskoi Kommuny, Star grove – roscha Zvezdochka, Thomson’s garden – Sad Thomsona, CPC&R – Central park of culture and recreation, BGISU – Botanic Garden of Irkutsk State University, Kaiskaya grove – Kaiskaya roscha. Digits near names show numbers of species in the green zones.

\[ y = 73.788 \ln(x) - 3.8404 \]
\[ R^2 = 0.7681 \]
Fig. 15. Graphical comparison of dendro-flora of Central Siberia, suburbs (vicinities) of Irkutsk city, Kaiskaya Grove-II, Botanic Garden of ISU (thick red curve) by number of species in families. For a basis of graphical comparison the ordered number of families ranked in decreasing order according to abundance of species in dendro-flora of Central Siberia is taken. Dashed line separates families of introduced Allien families are located to the right from the dashed lane (they do not exist in native flora of Central Siberia).

Abbreviations: ФЦСиб - Central Siberia, БСдикая - not cultivated dendro-flora of the BG ISU, БСколл - cultivated dendro-flora of the BG ISU, Окрестности Иркутска – suburbs of Irkutsk city
Fig. 16. Graphic representation of comparison by number of species in families of dendro-flora of Kaiskaya grove-II and Botanic Garden of ISU in relation to suburbs (vicinities) of Irkutsk city. Presentation of data was made using a method of calculation of the residues with the removed trend (row of basic line) where the data for suburbs (vicinities) of Irkutsk were taken as basic line (coincides with the X-axis). The plot shows residues after subtraction of the data for vicinities of Irkutsk from data of dendroflora of Kaiskaya grove and BG ISU. It is visible, that cultivated dendroflora of the BG ISU has much more diversified variety of woody plant in comparison with adjacent Kaiskaya grove and suburbs (vicinities) of Irkutsk city. See Fig. 15 for descriptions and abbreviations.
Fig. 17. Graphical comparison by abundance of species in families of dendro-flora for Kaiskaya grove-II, Botanic Garden of ISU, Star grove, Park of the Commune of Paris, CPC&R, Thomson's Garden, Sukachyov's Museum manor in relation to suburbs (vicinities) of Irkutsk city. It is visible that the dendro-flora of the Botanic Garden of ISU has much greater diversity of woody plants due to introduced species of trees and shrubs which makes the Garden a good source of genetic materials for greening of regional cities and settlements. See Fig. 15 and 16 for descriptions and abbreviations.
Fig. 18. Dynamics of monthly visitation to the informational and educational web-site of the Botanic Garden of the ISU (http://www.isu.ru/insts/botsad/) during last 3-year period (from December, 2001 till April, 2005). The schedule is generated by the counter of the portal MAIL.RU (http://top.mail.ru/stat?id=59999; what=hits; period=0). X-axis – time, moths; Y-axis – number of visits