Detailed Project Report
on
Renovation & Modernisation of
Six Museum Galleries
of
Forest Research Institute, Dehradun, Uttarakhand

Submitted To

Ministry of Culture
Govt. Of India
New Delhi

By

Forest Research Institute
Dehradun,
Uttarakhand

Detailed Project Report

By

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1. ABSTRACT & EXECUTIVE SUMMARY

A. Abstract

Detail Project Report under Museum Grant Scheme: Renovation & Modernization of Museum of Forest Research Institute, Dehradun, Uttarakhand (Category-I).

Implementing agency: Forest Research Institute (FRI) under Indian Council of Forestry Research and Education, an autonomous organization of Ministry of Environment, Forests and Climate Change, Govt. of India, P.O. New Forest, Dehradun, Uttarakhand-248006

Project Leader: Director, Forest Research Institute, Dehradun.

Project Coordinator: Head, Silviculture Division, F.R.I., Dehradun.

Team members of Galleries of Museum of F.R.I.:

Team Members (Silviculture Gallery):

1. Shri V.K. Dhawan, Scientist-C, F.R.I.
2. Mrs. Ashan Zaidi, Artist F.R.I.
3. Museum Experts from National Museum, New Delhi

Team Members (Non Wood Forest Products Gallery):

1. Dr. A. K.Sharma, Head, NWFP Division, F.R.I., Dehradun.
2. Dr. B.P.Tamta, Scientist-E, NWFP, F.R.I
3. Dr.Pradeep Sharma, Research Officer, NWFP, F.R.I.
4. Museum Experts from National Museum, New Delhi

Team Members (Forest Entomology Gallery):

1. Shri Dr. Sudhir Singh, Head, Forest Entomology Division, F.R.I.
2. Dr. Mohd. Yousuf, Scientist-G, Forest Entomology Division
3. Dr. Arvind Kumar, Scientist-D, Forest Entomology Division F.R.I.
4. Dr. Arun Pratap Singh, Scientist-E , Forest Entomology Division F.R.I.
5. Museum Experts from National Museum, New Delhi

Team Members (Forest Pathology Museum Gallery):

1. Dr. Y.P. Singh, Scientist E Head, Forest Pathology Division, F.R.I.
2. Dr. Amit Pandey, Scientist F
3. Mrs. Ranjana Juwantha, Scientist B
4. Mr. Suresh Sharma, Research Officer
5. Dr. Shailendra Kumar, Research Officer

6. Mr. Rajiv Ahuja, Research Assistant I
7. Mr. Hemant Gupta, Research Assistant II

Team Members (Botany Division Gallery):

- **Herbarium**
  1. Dr. (Ms.) Sangeeta Gupta, Scientist-F, Head, Botany Division, F.R.I.
  2. Dr. Anup Chandra, Scientist-E, F.R.I.
  3. Ms. Ranjana Negi, Scientist-C, F.R.I.
  4. Dr. Praveen Kumar Verma, Research Officer -I, F.R.I.

- **Xylarium**

  1. Dr. (Ms.) Sangeeta Gupta, Scientist-F, Head, Botany Division, F.R.I.
  2. Dr.P.K. Pande, Scientist-E, F.R.I.
  3. Ms. Amita Chauhan, Research Assistant-II, F.R.I.
  4. Mr. B.M. Uniyal, Research Assistant-II, F.R.I.
  5. Museum Experts from National Museum, New Delhi

Team Members (Extension Gallery):

1. Shri Sandeep Kujur, IFS, Head, Extension Division, F.R.I.
2. Dr.Paramjit Singh, Scientist-F, F.R.I.
3. Dr. Charan Singh, Scientist D , F.R.I.
4. Mr. Rambir Singh, Scientist-C, FRI
5. Mr. Ajay Gulati, Research Assistant-1, F. R. I.
6. Museum Experts from National Museum, New Delhi

Project Period: Two years

Major work required to be done: I- Civil work, II- Electrical work, III-Interior work and IV-furniture. Up-gradation of dioramas/ models for easy interpretation for general public and for the first time, introduction of model interactive techniques using Braille for visually impaired visitors in the galleries of FRI Museum.

Project Cost: ₹ 85,211,225.00

(Eight crore Fifty Two lakh Eleven thousand Two hundred Twenty Five Only)

Submission of Project: Museum Grant Scheme (Category-I)

B. Executive Summary

Forest Research Institute is one of the prestigious forestry institutions in the South-East Asia. It is located in the sylvan surroundings of Doon Valley and housed in one of the most magnificent grandiose buildings that the country is proud of. Forest Research Institute (FRI) has a unique set of six galleries, very rich in their collections and of exceptional educational values. The museum is the oldest of the institute. Forestry research have been conducted on various aspects are displayed in the form of models in galleries of the museum of F.R.I. Forestry was taught to the foresters of the country for cultivation and management of forests of India, since then forestry has been revised keeping in view of protection and conservation of the forests. Various silvicultural techniques of forest management are applied in different types of forests in India. Protection forestry requires study of fungi and insects which cause harm to forest vegetation of the country. Important collections of wood samples and insects are displayed in the galleries through which wood and insect's samples are identified. The different users of the country send us such samples for identification. These important collections require up-gradation and renovation for proper display and systematic storage.

Forest Research Institute

The museum was created decades ago, which was not subjected to professional maintenance and updating. The fact is that diorama techniques were in their formative stages at that time. Years of neglect and lack of maintenance has made them unimpressive and out dated. Today, they remain as important collections representing many fields of forestry, but providing very little communication for education and enlightenment of the visiting public. A total reorganization of the exhibits is required along with civil and electrical repairs to bring the museum to international

standards and to make a dynamic center of public education and for the promotion of mass awareness on forestry and conservation of forest resources.

The picture of existing Silviculture Gallery

A project proposal under Museum Grant Scheme is being forwarded by Forest Research Institute, Ministry of Environment Forests and Climate Change (MoEF &CC), Govt. of India, Dehradun, Uttarakhand to Ministry of Culture, Govt. of India, New Delhi for renovation and modernization of 6 Galleries of the Museum of F.R.I**.** The museum will be the first of its kind in India wherein visually impaired visitors would also be able to interact with the help of Braille display techniques of forestry practices in India.

2. Profile Sheet of the Institute

i. **Name of the organization:** Forest Research Institute, Dehradun

ii. **Registered address:** P.O. New Forest, Dehradun, Uttarakhand - 248006

iii. **E-Mail ID and Telephone No:**dir_fri@icfre.org, Ph no: 0135-2224444 (o)

iv. **Year of establishment of the organization:** 1906

v. **Type of Organization**: Institute under Indian Council of Forestry Research and Education, an autonomous organization under Ministry of Environment, Forests and Climate Change, Govt. of India.

vi. **Details of Registration:** ICFRE registered as a society under the Indian Society Act of 1860.

vii. **PAN Number:** MRTE00564E

viii. **Service Tax Number:** AAAAI170BGST003

ix. **Authorized contact person and designation:** Dr. Savita, Director, F.R.I.

x. **Name of Museums:**

A. Silviculture
B. Non Wood Forest Product
C. Entomology
D. Botany
E. Plant Pathology
F. Extension

xi. **Address/Location of Museums:** Forest Research Institute, P.O. New Forest, Dehradun 248006

xii. **E-Mail ID and Telephone No:** 0135-2755277, e-mail: dir_fri@icfre.org

xiii. **Year of establishment of Museum:** 1929

xiv. **Type of Galleries of the Museum: Scientific and Technological:**

- Silviculture (Forestry & Forest Management in India)
- Non Wood Forest Product (Information and Research on Minor Forest Products)
- Entomology (Identification of wood insects and Research on Forest Entomology)
- Botany (Testing of wood samples and maintenance of Herbarium and Xylariums)
- Plant Pathology and Fungarium (Information on wood fungi and Research on Forest Pathology)
- Extension (Display of Research Activities of FRI/ICFRE and activities under Social Forestry of India)

xv. Details of collection in the Museum:

a. **The Silviculture Gallery** has an excellent display of the forest management practices developed over a century ago and most of which are being used even today in various regions of the country. The displays are mostly in the form of dioramas/models, paintings, photographs and numerous forestry equipments.

b. **The NWFP Gallery** has an excellent display of the various NWFPs (~2000 displays) classified on the basis of their usage into distinct categories viz., Drugs / Medicinal Plants, Edibles, Aromatics, Gums, Gums & Resins, Tans & Dyes, Fibre and Flosses, Bamboo & Canes and their products including handicraft items, Lac, Katha, and misc. items collected over a century ago and most of which are being used even today in various regions of the country. The displays are mostly in the form of dried collections and numerous equipments and art works.

c. **The Entomological Gallery** has an excellent display of more than 3,000 of forest-insect-pest-damaged wood samples, and 18,000 identified forest insect species collected over a century.

d. **The Forest Pathology and Fungarium Gallery** has an excellent collection of forest pathology specimens and exhibits and housed in a building with high arched ceiling in which artifacts and specimens have been displayed. The displays are mostly in the form of models, display specimens, posters, paintings and other exhibits. In Fungarium the disease specimens and fungal fruiting bodies are kept inside the envelopes in cabinet boxes and almirahs. The Fungarium houses nearly 12000 specimens of forest diseases and fungi which are preserved and maintained. The specimens of diseases of forest plants and fungi have been maintained after pressing, drying and mounting on herbarium/ specimens sheets with details of the collection written on the sheets such as name of the disease, its causal organism, host name, locality of collection, date of collection and name of the collector. Each sheet has been secured in a brown paper envelope which also contains details about the specimen. The specimens of the museum and fungarium are regular maintained (twice a year) after spraying with para-dichlorobenzene and putting naphthalene balls inside the envelope to keep away the insect infestation and microbial attack.

e. **The Botany Gallery** contains **DD Herbarium** is the second largest herbarium in India. It houses *Ca.* 3,30,000 specimens and *1300* valuable Type specimens. The oldest specimen housed in the herbarium dates back to 1807. Besides collection from the Indian region, it

contains specimens from all over the world. It is extensively consulted by researchers, students, taxonomists and educational institutes across the country.

The **Xylarium I & II** has an excellent display of the woods from all over India as well as most of the commercial woods of other countries. It was developed over a century ago and are being used every day to carry out wood identification for the entire country. The displays are mostly in the form of wood samples, photographs and numerous wooden exhibits**.**

f. **The Extension Division Gallery** was set up in the early eighties had the traditional furniture and show cases found in the other galleries of FRI. Most of the exhibits are in the form of panel displays along the wall, except for a couple of central structures and some wood samples and wooden articles displayed on the floor. The overall impression that one gets from the existing display is that of a temporary exhibition put together with the help of posters, photographs and write-ups. It remained lack of coherent thought and storey line in its display. Few displays regarding beginning of Social Forestry in India were highlighted. It does not highlight the contribution of FRI towards social forestry has an excellent display of the forest management practices developed over a century ago and most of which are being used even today in various regions of the country. The displays are mostly in the form of dioramas/models, paintings, photographs and numerous forestry equipments.

xvi. **Is collection /part of collection is registered:** NA

xvii. **Annual Budget:** More than one crore for the organization but a meager amount is available for the museum.

xviii. **Source of funding:** Funds are provided by Ministry of Environment and Forests and Climate Change, Govt. of India. Revenue is also generated through externally aided projects (Domestic and International), consultancies, trainings and extension programmes.

xix. **Authorized contact person and designation:** Head, Extension Division, FRI, P.O. New Forest, Dehradun, Uttarakhand – 248006

Telephone: 0135- 2758606, 2224255

Mobile: 09411112194

Email: headext@icfre.org

3. Mandatory Documents

i. **Copy of registration:** Enclosed

ii. **Memorandum of Association or Trust Deed:** NA

iii. **Letter of support from State Government:** NA

iv. **Letter of Recommendation from District authority:** NA

v. **Authorization Certificate:** NA

vi. **Bond in Finalized Format:** Enclosed

vii. **Audited statement of accounts for last three years:** Enclosed

4. Background information

a) Organization

i. **History of the organization:** Established as Imperial Forest Research Institute in 1906, Forest Research Institute (FRI) Dehradun is a premier institution under the autonomous council; Indian Council of Forest Research and Education (ICFRE) MoEF & CC, Govt. of India. Styled in Greeko Roman Architecture by C.G. Blomfield, the main building is a National Heritage which was inaugurated in 1929. The Institute's history is virtually synonymous with the evolution and development of scientific forestry, not only in India, but over the entire Indian sub-continent. Set in a lush green estate spread over 450 hectares, with the outer Himalayas forming its back drop; the Institute's main building is an impressive edifice, marrying Greco-Roman and Colonial styles of architecture. It is fully equipped with laboratories, library, herbarium, arboreta, printing press and experimental field areas for conducting forestry research, quite in keeping with the best of its kind anywhere in the world.

ii. **Aims and Objectives of the organization:**

a. **Aims:** To carry out forestry research for improvement of forests of the country and improvement of livelihood potential of the poor people. The institute disseminates research results to wood based industries in making various products like paper and pulp, plywood, furniture etc. from various types of woods. The Extension division acts as an interface between the institute and the outside, including ICFRE institutes, government organization, farmers, industries, Non Government Organization (NGOs) and Self Help Groups (SHGs) for transfer of information and technologies developed at the institute. It organizes seminars, training courses and exhibition in the institute and at different places, besides publishing technical bulletins, brochures, pamphlets, poster etc.

b. Objectives:

- To undertake, aid and promote forestry research and their applications.
- To develop and maintain a national library and information centre for forestry and allied sciences.
- To act as a clearing-house for research and general information related to forests and wildlife.
- To develop forestry extension programmes and propagate the same through mass media, audio-visual aids and extension machinery.
- To provide consultancy services in the field of forestry research, education and allied sciences.
- To undertake other jobs considered necessary to attain these objectives.

iii. Organizational structure and management: The institute is headed by a Director who is assisted by a Registrar. Forestry research is carried out in its fifteen divisions, viz, Botany, Cellulose and Paper, Chemistry, Ecology and Environment, Entomology, Extension, Forest Products, Forest Soil and Land Reclamation, Genetics and Tree Propagation, Non wood Forest Product, Pathology, Resource Survey and Management, Silviculture, Bio- informatics & GIS and Climate Change & Forest Influences. At the regional level, FRI is now responsible for the forestry research needs of the States of Uttarakhand, Uttar Pradesh, Haryana, Punjab, Chandigarh and Delhi, with the sharpening of its focus on the most populous and agriculturally most developed areas in the country. The institute is poised to achieve greater heights by an accelerated research pace in finding solution in forestry problem of this ecologically fragile region. Its research mandate includes research in ecology, regeneration, tending and management of forests, utilization for forest products including Minor Forest Products and at the national level research on forest inventory methods, Watershed Management, Socio-Legal aspects of Forestry, Use of Remote Sensing in Forestry, Forestry Operations relating to Nursery, Planting, Tending Harvesting and Transport. In addition, the institute continues to provide leadership in research area relating to plants systematic, forest pathology, forest entomology, forest soil and application of biotechnology in forestry.

iv. Support base, benefactors: Ministry of Environment, Forests & Climate Change, Govt. of India is the main funding agency with yearly grant. Benefactors are the State Forest

Departments of Uttar Pradesh, Uttarakhand, Punjab, Haryana and Delhi and Forest Corporations of various states, Centers, State level Universities etc.

v. **Financial resources and summary balance sheets:** Financial aid is provided by MOEF&CC, Govt. of India for implementation of normal plan research projects. Revenue is also generated through externally aided (foreign and domestic) projects (EAPS), sale of forest products (plants, wood), sale of technologies, consultancies, trainings and extension services etc.

vi **Additional/special/specific information:** Forest Research Institute has been given the status of Deemed University in 1991. This institute offers MSc. programs in Environment Management, Cellulose and Paper Technology, Wood Science & Technology, Forestry Management. Along with this, it offers two P.G. Diploma courses in Aroma Technology and Natural Resource Management.

5. Museum Galleries

i. **History of the Museum:** The museum was established in 1929 with the opening of the new building at New Forest Campus, Dehradun. The museum has exceptional educational and research value, being a part of the premier forestry institution in the country.

ii. **Aims and objectives of the Museum:** To spread awareness amongst forestry personnel, scientists, visitors from various organizations from India and abroad, students and individuals on forestry species identification, protection and management techniques for improvement of forest biomass and productivity.

iii. **Background of the collection:** The dioramas/models were made by expert museologists as per direction of forestry experts during 1920's. The invaluable paintings were prepared by the artists of the organization and photos/pictures were arranged by forestry experts of the country. Collection of large number of wood and plant samples, samples of insects and fungi and forestry tools were prepared by Indian and British foresters over a period of decades. The Entomological gallery of the museum has an excellent display of more than 3,000 of forest-insect-pest-damaged wood samples, and 18,000 identified forest insect species collected over a century. The samples were not only collected from India but also from neighboring countries like Pakistan, Burma, Nepal, Bhutan, Srilanka etc.

iv. **Organizational structure and management of the galleries of the museum:** The galleries are organized and managed by Heads of Silviculture, Entomology, Pathology, Non-Wood Forest Products, Extension and Botany Divisions of F.R.I. There is one staff engaged in each gallery on contract basis with the sole job of looking after the gallery. However the Scientists & Research Officers of the division regularly monitor the upkeep & displays.

v. **Financial resources and summary Budgets:** Limited budget is provided by the institute as and when required for their maintenance under Museum Revolving Fund.

vi. **Ancillary infrastructure available:** Souvenir shop, Ticket counter, National Information and Library (Envis), Arboretum, Bambusetum, Botanical garden.

vii. **Other activities of museums besides display:** Regular TV shows on wild life and forests. VVIPs, VIPs, IFS and SFS probationers, teachers and students from various universities are highlighted about technical inputs of the models and displayed samples.

viii. **Visitor profile and visitor comments:** VVIP, VIP, dignitaries from India and abroad, forest officers, scientists, teachers and students of schools and universities, foreigners, farmers and individuals.

6. Details of the collection

(A) Silviculture Gallery:

- **The composition of the collection:** The gallery has 12 dioramas/ models which display forest management techniques used in different types of forests of India. It has collection of antique photographs of legendry foresters and paintings of various floral and faunal species. Numerous tools used in various forestry operations have been collected over a period of time & are displayed. It also has a showcase of a stuffed tiger. The following dioramas, paintings and models are displayed in the gallery: -
- **Diorama/model of Uniform System of forest management:** - This system aims at creating forest crops of uniform age group. The system is used to obtain regeneration of uniform age of teak, sal, chir and other conifers forest crops of India.
- **Irrigated plantation of shisham (*Dalbergia sissoo*): -** Shisham is a valuable timber. It is cultivated throughout the greater parts of India. For raising plantation, seedlings are raised in the nursery under irrigated conditions. The entire operation passes through different phases, viz. clearing the site, preparation of soil and seed beds, sowing, germination, transplanting etc. which are shown in the model.

- **Forest Nursery:** - For artificial regeneration of forest, the seed is first sown in the forest nursery and seedlings are reared. Such nurseries are located near the plantation site and are equipped with facilities of irrigation and fertilization. The grown up seedlings when reach the desirable age are transplanted in the forest. The model displays seed beds and different age gradation of seedlings in the different beds.
- **Altitudinal zonation of forest types:** - The species composition of forests found at different elevation varies according to altitudinal variation. The model is an attempt to indicate forest species that occur at elevation ranging from plains to the higher hills.
- **Consequences of Deforestation:** - The most serious consequences of deforestation are soil erosion and deterioration of water regime of land. Such lands can neither support human population nor can sustain any agriculture and so are abandoned by inhabitants. The role of vegetation hence becomes evidently clear.
- **Modern logging tools:** - The exploitation of timber from forest in modern times requires use of sophisticated design of saws, axes etc. These tools are designed to render the logging operations economic, easy and safe for the operation as well as the growing stock. Some specimens of such tools are displayed. These are **1.** Bow saw with blade 'Roter Pfeil' **2.** Lamber (Racker) Saw. **3.** Cleaver with handle ' steinemann' **4.** Debarking spades etc.
- **Skyline Crane:** - The use of skyline crane is resorted to in the timber transportation in the circumstances of difficult terrains at mountain sites as shown in the model. The ropeway helps cling the timber by means of hooks. The ropeway can be coiled /uncoiled by use of a crane. The ropeway acts transportation pathway.
- **Model of 100 years of Indian forestry:** - Old specimens of timber are kept in showcases.
- **Thinning in the forest:** - The model shows reducing the forest crop density by cutting of trees. These techniques help to enhance availability of light and air to the young regeneration.
- **Sampling measurements of forest growth:** - The model shows sample plot techniques methods for determining the forest growth. Growth of timber/ha/yr could be determined by sample plot technique.
- **Coppice regeneration of forest management:** - The model shows regeneration of forest from the cut stump of the trees which produces sprouts after the cutting. Sal &

teak forest are managed under this system to provide immediate demand of wood for the people.

- **Clear felling system of forest management:** - The system consists of clear felling of forest growth and regenerating the area by artificial means, immediately thereafter. The shifting cultivation of North- East is an appropriate illustration of this model.
- **Selection system of forest management:**- This model shows an ideal system of forest management. The essence of the system is to work the forest with close harmony with nature and without causing deterioration of site. The system is applied in national parks and sanctuaries of India especially for protection of sites.
- **Sloppy, eroded mountain side:** - The model shows the techniques to be adopted to conserve the water and soil on sloppy and eroded mountain sites. Contour trenching; contour terracing and planting are suitable measures which are shown in the model.

Other exhibits in the gallery include mounted specimens of the tiger, new and old paintings of wild life and forests, a panel showing forest types of India, several tools of silviculture, wood cross sections and a large number of wooden objects and equipments presented in a disjointed manner..

Display of paintings and photographs of forest trees and wildlife in Silviculture Gallery

Collections displayed through models/dioramas, pictures & trophies in Silviculture Gallery of FRI

Display of various Indian and English tools used for forestry operations in Silviculture Gallery

i. **Qualitative description:** As given in point i.

ii. Quantitative details and accession lists:

Sl. No.	Name of Artifact	Numbers	Documentation
1.	Model on Uniform System of forest management	1	40/1
2.	Model on Irrigated plantation of shisham (*Dalbergia sissoo*)	1	40/2
3.	Model on Forest Nursery	1	40/3
4.	Model on Altitudinal zonation of forest types	1	40/4
5.	Model on Consequences of Deforestation	1	40/5
6.	Modern logging tools	42	69/42
7.	Skyline Crane model	1	68/1
8.	Model on 100 years of Indian forestry	1	68/2
9.	Model on Thinning of the forest	1	68/3
10.	Model on Sampling measurements of forest growth	1	40/6
11.	Model on Coppice regeneration of forest management	1	40/7
12.	Model on Clear felling system of forest management	1	40/8
13.	Model on Selection system of forest management	1	40/9
14.	Model on re-clothing sloppy and eroded mountain sides	10	41/2
15.	Mounted specimen of the tiger	1	64/1
Paintings of birds			
16.	Lesser florican (*Sypheotides Indica*) bird painting	1	37/71
17.	Narcondam Hornbill (*Aceros navcondami*) bird painting	1	37/72
18.	Himalayan quail (*Ophrysia superciliosa*) bird painting	1	37/73
19.	Himalayan monal (*Lphophorus impejamus*) bird painting	1	37/74
20.	White bellied sea eagle (*Haliaeetus leucogaster*) bird painting	1	37/75
21.	Black nacked crane (*Grus nigricollis*)	1	37/76
22.	Cheer pheasant (*Catreus wallichii*)	1	37/77
23.	Siberian crane (*Grus leucogeramus*)	1	37/78
24.	Indian bustard (*Ardeotis nigriceps*)	1	37/79
25.	Jerdon's courser (*Rhinoptilus bitorquatus*)	1	37/80
26.	Eurasian spoon bill (*Platalea leucorodia*)	1	37/81
27.	White – winged duck (*Cairina scutulata*)	1	37/82
28.	Pink headed duck (*Cairina scutulata*)	1	37/83
29.	Hodgson's frogmouth (*Batrachostomus hodgsoni*)	1	37/84
30.	Blood pheasant (*Lthaginis cruentus*)	1	37/85
31.	Sunda teal (*Anus gibberifrons*)	1	37/86
32.	Nicobar pigeon (*Caloenas nicobarica*)	1	37/87
33.	Sclater's monal (*Lophophorus sclater*)	1	37/88
34.	Jerdon's baze (*Aviceda jerdoni*)	1	37/89
35.	Great Hornbill (*Buceros bicornis*)	1	37/90
Paintings of Animals			
36.	Lesser or Red Panda (*Ailurus fulgens*)	1	37/91
37.	Leopard or Panther (*Panthera pardus*)	1	37/92
38.	Lion Tailed Macaque (*Macaca silensus*)	1	37/93
39.	Lapped Langur (*Presbytis pileatus*)	1	37/94
40.	Brown Bear (*Ursus arctos*)	1	37/95
41.	Hog Badger (*Arctonyx collaris*)	1	37/96
42.	Himalayas Tahr (*Hemitragus jemlahicus*)	1	37/97
43.	Chinkara (Gazelle)	1	37/98
44.	Guar or Indian Bison (*Bas gaurus*)	1	37/99

45.	Hoolock Gibbon (*Hylobates hoolock*)	1	37/100
46.	Yak (*Bos grunniens*)	1	37/101
47.	Nilgiri Langur (*Prestigtis johnii*)	1	37/102
48.	Loris (*Loris tardigardis*)	1	37/103
49.	Lynx (*Felis lynx*)	1	37/104
50.	Shapu (*Ovis orientalis*)	1	37/105
51.	Dugong/sea low (*Dugong dugon*)	1	37/106
52.	Indian one horned Rhinoceros	1	37/107
53.	Indian Pangolin (*Manis crassicaudata*)	1	37/108
54.	Snow Leopard (*Panthera uncla*)	1	37/109
55.	Tiger (*Panthera tigris*)	1	37/110
56.	Indian Elephant (*Elephas maximus*)	1	37/111
57.	Musk Deer (*Moschus moschiferus*)	1	37/112
58.	Binturong (*Arctictus binturong*)	1	37/113
59.	Takin (*Budorcas taxicoor*)	1	37/114
60.	Sloth Bear (*Melursus ursinus*)	1	37/115
61.	Tibetan Antelope (*Panthelops hodgsoni*)	1	37/116
62.	Golden Cat (*Felis temminchi*)	1	37/117
63.	Desert Cat (*Felis libyca*)	1	37/118
64.	Wild Buffalo (*Bubalis bubalis*)	1	37/119
65.	Markhor (*Capra falconeri*)	1	37/120
66.	Indian Wolf (*Conis lupus pallipas*)	1	37/121
67.	Indian Lion (*Panthera leo*)	1	37/122
68.	Spotted linsang (Prionodon pardicolor)	1	37/123
69.	Indian Wild Ass (*Equus hemionus khur*)	1	37/124
70.	Himalayan Mouse – hare (*Ochotonaroylei*)	1	37/125
71.	Black Buck (*Antilop cervicapra*)	1	37/126
72.	Four Horned Antelope (*Tetracerus quadricornis*)	1	37/127
73.	Swamp Deer (*Rucervus duvaucelii*)	1	37/128
74.	Leopard Cat (*Felis bengalensis*)	1	37/129
75.	Ermine (*Mustela erminea*)	1	37/130
76.	Cheetah (*Acinonyx jubatus*)	1	37/131
77.	Golden Langur (*Presbytis geei*)	1	37/132
78.	Slow Loris (*Nycticebus coucang*)	1	37/133
79.	Ibex (*Capra ibex*)	1	37/134
80.	Clouded Leopard (*Neofelis nebulesa*)	1	37/135
81.	Kashmir Stag (*Cervus elaphus hunglu*)	1	37/136
82.	Nilgiri Tahr (*Hemitragus hylocrius*)	1	37/137
83.	Brow – Antlered deer or Thamin (*Cervu sedli*)	1	37/138
84.	Caracal (*Felis caracal*)	1	37/139
85.	Indian Chevrotain mouse deer (*Tragulus meminna*)	1	37/140
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142.	*Tectona grandis*	1	45/10/2
143.	*Pinus roxburghii (chir)*	1	45/10/3

144.	*Maduca longifolia*	1	45/10/4
145.	*Bridelia retusa*	1	45/10/5
146.	*Casuarinas equisetifolia*	1	45/10/6
147.	*Dalbergia cultrate*	1	45/10/7
148.	*Dillenea indica*	1	45/10/8
149.	*Adina cordifolia*	1	45/10/9
150.	*Albizzia lebbek*	1	45/10/10
151.	*Abies pindrow*	1	45/10/11
152.	*Acacia Arabica*	1	45/10/12
153.	*Acacia catechu*	1	45/10/13
154.	*Fraxinus floribunda*	1	45/10/14
155.	*Garuga pinnata*	1	45/10/15
156.	*Holaarrhoena antidysenterica*	1	45/10/16
157.	*Lagerstroemia toentosa*	1	45/10/17
158.	*Pongamia glabra*	1	45/10/18
159.	*Tamarindus indica*	1	45/10/19
160.	*Chloroxylon swietenia*	1	45/10/20
161.	*Cupressus torulosa*	1	45/10/21
162.	*Dalbergia sissoo*	1	45/10/22
163.	*Duabanga sonneratioides*	1	45/10/23
164.	*Gmelina arborea*	1	45/10/24
165.	*Cupressus torulosa*	1	45/10/25
166.	*Dalbergia oliveri*	1	45/10/26
167.	*Dalbergia latifolia*	1	45/10/27
168.	*Terminalia myriocarpa*	1	45/10/28
169.	*Terminalia chebula*	1	45/10/29
170.	*Terminalia arjuna*	1	45/10/30
171.	*Stereospermum suveolens*	1	45/10/31
172.	*Stephegyne parvifolia*	1	45/10/32
173.	*Podocarpus neriifolia*	1	45/10/33
174.	*Mesua ferrea*	1	45/10/34
175.	*Mangifera indica*	1	45/10/35
176.	*Lagerstroemia flos-reginae*	1	45/10/36
177.	*Juglans regia*	1	45/10/37
178.	*Holeptelea intergrifolia*	1	45/10/38
179.	*Grewia tilaefolia*	1	45/10/39
180.	*Pterocarpus dalbergloides*	1	45/10/40
181.	*Albizzia procera*	1	45/10/41
182.	*Picea morinda*	1	45/10/42
183.	*Soymida febrifuga*	1	45/10/43
184.	*Ougeinia dalbergioides*	1	45/10/44
185.	*Artocarpus lakoocha*	1	45/10/45
186.	*Artocarpus hirsute*	1	45/10/46
187.	*Artocarpus chaplasha*	1	45/10/47
188.	*Anthocephalus cadamba*	1	45/10/48
189.	*Michelia champaca*	1	45/10/49
190.	*Quercus lamellose*	1	45/10/50
191.	*Sterculia villosa*	1	45/10/51
192.	*Trewia nudiflora*	1	45/10/52
193.	*Acacia leucophloea*	1	45/10/53
194.	*Xylia dolabriformis*	1	45/10/54
195.	*Diospyros melanoxylon*	1	45/10/55
196.	*Dillenia indica*	1	45/10/56

197.	*Carapa moluccensis*	1	45/10/57
198.	*Xylia xylocarpa*	1	45/10/58
199.	*Wrightia tomentosa*	1	45/10/59
200.	*Tetrameles nudiflora*	1	45/10/60
201.	*Bassia latifolia*	1	45/10/61
202.	*Quercus dilatata*	1	45/10/62
203.	*Bombax malabaricum*	1	45/10/63
204.	*Bombax insigne*	1	45/10/64
205.	*Pinus excels*	1	45/10/65
206.	*Pinus roxburghi*	1	45/10/66
207.	*Bassia latifolia*	1	45/10/67
208.	*Quercus incana*	1	45/10/68
209.	*Pinus excelsa*	1	45/10/69
210.	*Albizzia odoratissima*	1	45/10/70
211.	*Albizzia amara*	1	45/10/71
212.	*Ailanthus excels*	1	45/10/72
213.	*Aesculus indica*	1	45/10/73
214.	*Aegle marmelas*	1	45/10/74
215.	*Artocarpus integrifolia*	1	45/10/75
216.	*Pterocarpus santalinus*	1	45/10/76
217.	*Santalum album*	1	45/10/77
218.	*Terminalia tomentosa*	1	45/10/78
219.	*Bisctiofia javanica*	1	45/10/79
220.	*Eugenia jambolana*	1	45/10/80
221.	*Diospyros tomentosa*	1	45/10/81
222.	*Pterocarpus santalinus*	1	45/10/82
223.	*Pterocarpus marsupium*	1	45/10/83
224.	*Pterocarpus dalbergioides*	1	45/10/84
225.	*Melia azedarach*	1	45/10/85
226.	*Melanorrhoea usitata*	1	45/10/86
227.	*Podocarpus neriifolia*	1	45/10/87
228.	*Odina wodier*	1	45/10/88
229.	*Mimusops elengi*	1	45/10/89
230.	*Excaecaria agallocha*	1	45/10/90
231.	*Quercus serrata*	1	45/10/91
232.	*Bucklandia populnea*	1	45/10/92
233.	*Kydia calycina*	1	45/10/93
234.	*Crataeva religiosa*	1	45/10/94
235.	English, German and Indian tools used in various Forest Operation, French Resine **EQUIPMENTS** 1) English forest implements 2) Engilsh planting implements 3) German forest implements 4) Modern logging equipment, hard tools 5) Indian felling implements 6) Indian forest implements 7) Indian sickles & lopping implements	11 Parts I, 15, II 6, 17,11 1 1 1 1 1 1	 9/11 8/5 10/15 14/32 13/17 15/23
236.	Wood cross sections	2	-
237.	Large number of wooden objects	18	-
238.	Horns mounted	2	54/2
239.	Stand wooden revolving	2	46/15
240.	Show case of Rocks and Soil Samples	5	41/3

241.	Show case of Seeds	11	41/4
242.	Stand wooden and colour plates	10	45/1
243.	Stand wooden for soil samples	1	47/1

iii. **Antiquity, authenticity and registration:** It is a part of Silviculture division in FRI since a century and has been collected or preserved by the legendry foresters and scientists. The display/model is antique and authentic.

iv. **Tentative value of collection and insurance:** NA

v. **State of preservation, storage arrangements:** The models and paintings are preserved from time to time with utilization of local resources and professionals.

vi. **Display- status, potential and constraints:** The models require to be upgraded keeping in

view the development of new technologies in the field of forestry. Today, they remain as important collections representing many fields of forestry, but providing very little communication to educate and enlighten the visiting public. The displays of dioramas currently are not interactive. The displays also require upgrading and refurnishing. Currently only professional foresters and forestry scientists are able to understand the displays of dioramas. A total reorganization of the exhibits is required due to change of forestry practices over a long period of time to bring the Silviculture gallerey to international standards and to make it a dynamic center of public education and for the promotion of mass awareness on forestry and conservation of forest resources. A lot of potential is available for making the models more interactive for the general public by application of displays of touch screens and scrollers. The up-gradation will be done predominantly by utilizing the existing old models. There is a constraint of funds for their up-gradation from the limited fund available at the institute

(B) Non Wood Forest Products Gallery:

i. **The composition of the collection:** The gallery has wooden almirah's and display showcases of British period displaying different categories of NWFPs classified according to their usage into 15 categories.

It also has a showcase of large Ivory from Tamil Nadu, dating 1935 and weighing about 38.2 kgs. The total collection of displayed samples and exhibits is ~1700+.

The following are displayed in the gallery: -

- Drugs & Spices: -
- Edible Forest Products:
- Cutch & Katha
- Fatty Oils
- Essential oils
- Gums
- Gum-Resins
- Tans
- Dyes
- Grasses & Fibres
- Stem & Bast Fibres
- Fibre from Leaves
- Flosses
- Resin Products
- Turpentine Oil & Rosin
- Bamboo Products
- Bamboo specimens
- Elephant Tusk
- Foreign Exchange earners
- Pine logs displaying different methods of resin tapping
- Tools used in Rill method
- Miscellaneous item & Artifacts
- Lac & its Products
- Cane furniture and artifacts

Collections displayed in NWFP gallery of FRI

Display of various NWFPs in gallery

ii. Qualitative description: As given in point i.

iii. Quantitative details and accession lists: The total diversity of NWFPs represented in sample / artifacts is around 1700+ :

- 12 wooden almirah's,
- 9 wooden showcases
- 4 extra large double view showcases
- 17 old paintings + photographs,
- 12 Tools for Rill method of resin tapping,
- 81 bamboo samples,
- 33 samples of Hill bamboo/ ringal ,
- 5 pinewood logs displaying resin tapping methods,
- 23 Indian sickles and lopping implements,
- ~350+ Misc. artifacts,

- ~ 260 Drugs & Spice samples
- ~ 100 +Edible products
- ~150+ fatty oils & aromatic samples
- ~200+ gums & gum resin samples
- ~100 bamboo & cane products
- And others

iv. **Antiquity, authenticity and registration:** It is a part of NWFP division in FRI since a century and has been collected or preserved by the legendry foresters and scientists. The display/model is antique and authentic.

v. **Tentative value of collection and insurance:** NA

vi. **State of preservation, storage arrangements:** The collections and paintings are preserved from time to time with utilization of local resources and professionals.

vii. **Display- status, potential and constraints:** The displays require to be upgraded keeping in view the development of new technologies in the field of forestry. Today, they remain as important collections representing many fields of forestry, but providing very little communication to educate and enlighten the visiting public. The displays currently are not interactive. The displays also require upgrading and refurnishing. Currently only professional foresters and forestry scientists are able to understand the displays of dioramas. A total reorganization of the exhibits is required due to change of forestry practices over a long period of time to bring the NWFP gallery to international standards and to make it a dynamic center of public education and for the promotion of mass awareness on forestry and conservation of forest resources. A lot of potential is available for making the displays more interactive for the general public by application of displays of touch screens and scrollers. The up-gradation will be done predominantly by utilizing the existing old models. There is a constraint of funds for their up-gradation from the limited fund available at the institute.

(C) Entomology Gallery:

i. **The composition of the gallery:**

The gallerey has three main parts: a) Entomological collection showing wood damaging insects, b) Zoological collections and c) National Forest Insect Collection (NFIC) each with following components:

A. Entomological Collection: Located on the ground floor

a) Display of insect damaged wood samples by wood inhabiting insects to various types of converted woods and timber.

b) Display of beneficial insects like honey bees, Showcase

c) Termites and damage caused by them

d) Section on various types of insect management strategies.

e) Drawings and Photographs and water colour drawings of various forest defoliators.

f) General insect diversity of Indian forests

g) Section on rearing of insect in the laboratories for various types of laboratory studies.

B. Zoological Collection: Located in the gallery (first Floor) with floor area of

a) Displays of trophies. and skins of mammal (tigers, leopard, panther, cats, wild buffalos, sea cow, deer, ant eater, etc)

b) Display of skins, eggs and nests of various species of birds

c) Wet collection of embryos of mammals, Snakes, lower invertebrates, etc.

C. National Forest Insect Collection (NFIC)

a) General Collection

b) Type Collection

c) Wet Collection of termites and larvae

d) Collection of blown larvae

e) Collection of slide mounted material

f) Duplicate Collection.

A. Entomological Collection:

Table 1.: Display of insect damaged wood samples

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m^2)		
				per unit	Total	Grand total	per unit	Total	Grand Total

1	Almirah type (4 shelves)	32	1.80x0.40x 2.40	1.73	55.36	161	1.80x0.40x4 shelves = 2.88	92.16	155.16
2	Horizontal (3 shelves)	14	2.55x1.90x 1.56	7.55	105.7		0.70x2.50x 2+2.50x0.40=4.5	63	

a) Display of insect damaged wood samples by wood inhabiting insects to various types of converted woods and timber: The gallery contains about 2847 exhibits, representing the groups of insect pests and their nature of damage, including the exhibits showing the damage caused by insect pests to seeds, seedlings, standing trees, felled timbers, bamboos and also finished products. These exhibits, models, charts and photographs have been painstakingly collected over the last more than nine decades. All the wood exhibits are displayed in 34 wooden almirah type showcases and 13 horizontal showcases with volume of 161m^3 and shelf area of 155 m^2 as given in Table- 1.

All exhibits are arranged alphabetically according to plant genera (A-Z), starting from *Abies spectabilis* to *Zizyphus xylopyra*. The names of plants genera are indicated on the top of the display showcase; damaged wood sample, insect pests and their life stages are duly labelled and exhibited in the show case. The important forestry pests like Sal heartwood borer (*Hoplocerambyx spinicornis*), Teak defoliator (*Hyblaea puera*), Teak skeletonizer (*Eutectona machaeralis*), Toon shoot borer (*Hypsipyla robusta*), Poplar defoliators (*Clostera cupreata, C. fulgurita*), Deodar defoliator (*Ectropis deodarae)*, Shisham defoliator (*Plecoptera reflexa*), Babool stem and root borer (*Celosterna scabrator*), their biology, life history and nature of damage have been depicted along with the methods of their control. Some of the insecticidal application equipments have also been exhibited. Light trap model has also been exhibited in gallery. More recently, some exhibits on latest researches such as natural resistance of timber against termites, sex pheromones, NPV (Nuclear Polyhedrosis viruses), fungal pathogens and aerial application of insecticides have also been displayed, through charts, photographs and models. The gallery has also been annexed with a vast collection of identified insect specimens, particularly Butterflies, Moths, Beetles, Bugs, Dragonflies, Damselflies, Wasps and different flies of the country.

b) Display of beneficial insects like honey bees, silk worms, lac insects, insect pollinators, predators (various wasps): Beneficial insects like honey bees, various species of silk worms and silk produced by them, lac insects and different types and uses of lac; pollinator bees and other insects like butterflies and insect predators like wasps and their multi storied nests are displayed in one horizontal and one rectangular showcases both with total volume of 11 m^3 and display area of 8.6 m^2 as given in Table 2.

Table 2.: Display of beneficial insects

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m^2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
1	Rectanglular (2 shelves)	1	3.54x0.58x 1.77	3.63	3.63	11.18	3.54x0.58x 2shelves= 4.10	4.10	8.6
2	Horizontal (3 shelves)	1	2.55x1.90x 1.56	7.55	7.55		0.70x2.50x 2+2.50x0.40=4.5 m	4.5	

c) Termites : A section is dedicated for termites and the damage caused by them. In this section a real termite mound of *Odontotermes obesus* is displayed with inside view of royal chamber for the queen. Termite mounds of other species are also displayed. Specimens of queen and colony members belonging to different castes are on display. Life history of the termites, their biology and damage, particularly in buildings and their control measures have also been displayed in one horizontal showcase and one cylindrical dispay (Termite mound). Total volume and area of display are 4.7 m^3 and 4.8 m^2, respectively as given in the Table 3 below

Table 3.: Display of Termites

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
1	Cylindrical	1	1.20 Dia	1.39	1.39	4.71	1.13	1.13	4.83
2	Rectangular (2 shelves)	1	2.05x0.9x1.80	3.32	3.32		2.05x0.9x 2 =3.7	3.7	

d) Section on various types of insect management strategies including chemical control in nurseries, ariel sprays in forests, biological control, etc, biological control of teak defoliators In one of the exhibit all biological control agents of teak defoliators (*Hyblaea puera* and *Eutectona machaeralis*) and Toon shoot borer, *Hypsipyla robusta* are shown. A web of life including their other alternative host plants, pests of alternative insect hosts. natural enemies, their collateral hosts and the host plants of collateral hosts illustrating that how a single organism is linked with the existence of several other insects and palnts. Light traps and their use in insect pest monitoring and mechanical control are displayed. Various types of insecticide application equipments are displayed. Total volume and area of display are 82.8 m^3 and 21.2 m^2, respectively as given in the Table 4 below

Table 4: Display of insect management strategies

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total

1	Cylindrical	2	3.65 dia x 2.15 h	41.41	41.41	82.8	10.6	21.2	21.2

e) Drawings and photographs of various forest defoliators. On the walls of Zoological gallery, and display boards drawings and photographs of insect pests are depicted. Area of display of these is about 478.6 m^2, as given in the Table 5 below **.**

Table 5: Display of Drawings and Photographs

	Type of show case	No	Dimensions LxH (m)	Display area per show case	Total display area	Grand Total
1	Wall showcases	14	2.5x1.5	3.75 m^2	52.5 m^2	78.6 m^2
2	Display boards	4	3x2	6 m^2	24 m^2	
3	Display windows	14	0.3x0.5	0.15 m^2	2.1 m^2	

f) General insect diversity of Indian forests: Insect diversity belonging to different insect orders is displayed in an area of 8.64 m^2 and volume of 3.45 m^3 as given in the table 6 below:

Table 6: Display of general insect diversity of Indian forests

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
1	Almirah type	2	1.80x0.40x2.40	1.73m^3	3.45 m^3	3.45 m^3	1.80x2.40x 4.32	8.64 m^2	8.64 m^2

g) Section on rearing of insect in the laboratories for various types of laboratory studies. These are displayed in an area of 5.76 m^2 and volume of 3.45 m^3 as given in the table 7 below:

Table 7: Display on rearing of insect in the laboratories

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
1	Almirah type	2	1.80x0.40x 2.40	1.73m^3	3.45 m^3	3.45 m^3	1.80x0.40x 4 shelves= 2.88	5.76 m^2	5.76 m^2

B. Zoological Collection: There are 577 registered items as given below.

a) Displays of trophies and skins of mammal (tigers, leopard, panther, cats, wild buffalos, sea cow, deer, ant eater, etc), birds, their eggs and nests; rodents, corals; mollusks etc. are displayed in an area of about 60 m^2 as given in the Table 8 below.

Table 8: Display of Trophies and other dry zoological collection

		No	Dimensions LxW (m)	Display area	Total display area	Grand Total
1	Skins	2 Tiger 2 Bear	On walls	1.5x3.0 1.5x2	9 m^2 6 m^2	
2	Trophies	105	On walls		26 m^2	
	Skeletons	1 leopard 1 Dogoung	in show cases	1.65x0.34x0.80 2.33x0.86x0.86	0.56 m^2 2.0 m^2	

		1 Ostrich		0.42x0.35x0.64	0.15 m^2	59 m^2
	Mammal skulls	39			On wall of area(1.2x1.3) 1.56m^2	
	Birds	58 birds and Bird eggs (183 types)	2 Show cases	2.33x0.86	4.0 m^2	
	Rodents	16	1 show case	2.33x0.86	4.0 m^2	
	Molluscs		1 show case	1.5x 1	1.5 m^2	
	corals	50	1 show case	2.33x0.86	4.0 m^2	

b) Wet collection of embryos of mammals, Snakes, lower invertebrates, etc. in 236 jars (Snake collection in 138 jars, fish collection 30 jars, amphibian collection15 jars, invertebrates 45 jars, mammal embryos 8 jars preserved in formalin solution. Snake and fish collection is placed on 6 tables each of dimension 186x45 cm. Rest is in a showcase with four shelves are displayed in an area of about 15 m^2 as given in the Table 9 below.

Table 9: Display of wet zoological collection

		No	Dimensions LxWxH (m)	Display area per show case	Total display area	Grand Total
1	Snakes	138 jars	5 tables of 3 shelves 1.86x0.45x0.40	1.86x0.45x 3 shelves= 2.5	12.5 m^2	15.0 m^2
2	Fish	30 jars	1 table with 3 shelves 1.86x0.45x 0.4	1.86x0.45x 3 shelves= 2.5	2.5m^2	
	Amphibian	11 jars	Show case with display on both sides	1.3x0.15x 4 shelves	0.78	
	Mammal embryos	8 jars				
	invertebrates	44 jars				

B. National Forest Insect Collection

The composition of the collection:

The collection hold more than 3,00,000 insect specimens categorized into about 18,000 authentically identified species which are all accessioned. NFIC is housed at the first floor of the main building, in a hall measuring 25x90 ft in the division of Forest Entomology. It is one of the best-maintained collections of our country. The Collection has following components.

a) <u>General Collection.</u> This unique collection has pride of holding about 3,00,000 pinned specimens. The collection is represented under 24 orders, 121 superfamilies, 281 families, 5589 genera and about 18,000 authentically identified species In the NFIC order Coleoptera is fairly well represented with about 9,000 species, followed by Lepidoptera with 3674 species, Hymenoptera with 1228 and Hemiptera with about 1224 species, Isoptera with 855 species, Diptera with 540 spp., species, Thysanoptera with 46 species, Orthoptera with 248 species, Odonata with 137 species, Neuroptera with 80 species, Dermaptera with 45 species, other orders like Collembola and other Apterygota,

Embioptera, Ephemeroptera, Mecoptera, Siponoptera, Phthiraptera, etc are negligible in number. Collection is stored in 158 wooden cabinets, with volume of about 200 m^3 occupying and area of 158 m^2 as given in the table 10.

Table 10: Collection in NFIC

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
1	General and type collection in Cabinetseach with 20 drawers	158 with	1x1.25x1m			198			158
		3160 drawers	0.45 x 0.45 x 0.065 m	1.73	3.45	20.45	0.013	640	850
	Duplicate collection								
		1500 boxes	0.32 x 0.437 x 0.08m	0.011	17		0.139	210	

b) Type Collection: Type specimens are the scientifically most valuable specimens of the natural history collections and their importance continuously increases with time. They are unique and therefore, irreplaceable. They are very important to science as they are definitive standards of reference which provide objectivity in scientific nomenclature (IZCN, 1999). These standards are internationally recognized by the scientific community for the identification and naming of species. Although type specimens have been traditionally used in taxonomic research, their continuing role is to document biodiversity and its distribution through time and space and to serve as a resource for education (Winker, 2004).

Furthermore, the ICZN (1999; Article 72.10) emphasizes the responsibility of the institutions in which type specimens are held in trust for science. Additionally, according to the ICZN (1999), Recommendation 72F, itis recommended that those institutions implement all necessary actions for the safe preservation of the type specimens. These recommendations include: (1) Type specimens should be clearly marked denoting their status as types, (2) Type specimens should be available for study, (3) Type lists should be published, and (4) Information pertaining to types should be communicated when requested

In NFIC types of about 1800 species of different categories are present. The highest number of types, 1244 species, are in the order Coleoptera with 460 holotypes and 784 paratypes; followed by Hymenoptera (309 species) with 226 Holotypes and 83 paratypes. Third biggest is Hemiptera with holotypes of 171 species and paratypes of 30 species.

c) **Wet Collection**

Wet collection: NFIC has a large wet collection preserving larvae of beetles and moths; termites are also stored in alcohol.

NFIC has a large collection of larvae of the order Lepidoptera, Coleoptera, Isoptera and other soft bodied insects. Larval collection is stored species wise in small tubes which in turn are kept immersed in bigger jars filled with alcohol. About two thousand species of larvae are kept in 5118 glass tubes stored in 148 5 l capacity jars in two big almirah each with five shelves. Similarly termite collection has 855 species stored in alcohol jars in 8 showcase almirah each with four shelves. This collection is of immense utilization for chaetotaxy, and identification of pests when they are in the larval damaging stage. wet collection is stored in about 10 almirahs with total volume of 20 $m^3$and slef area of 38 m^2 as given in table 11 below

d) **Collection of blown larvae**

Table 11 : Collection in NFIC

	Type of show cases	No	Dimensions LxWxH (m)	Display Volume (m^3)			Display Area (m2)		
				per unit	Total	Grand total	per unit	Total	Grand Total
Larvae	Almirah with 6 shelves	2	1.5x0.5x2		4	20		9	38
Termites	Almirahs with 4 shelves	8	1.5x0.6x2		16			29	

NFIC has a unique collection of blow larvae of moths.

Another unique attraction of NFIC is a collection of blown larvae. In this collection the larvae of Lepidoptera, mostly moths, are preserved in dry state by a process of blowing. In India this perhaps is the only collection where collection of blown larvae is present. It is stored in two cabinet.

e) Collection of slide mounted material

Small insects are mounted on slides; NFIC has a large collection of these slides

Small insects belonging to various orders like Coleoptera, Hymenoptera, Hemiptera, Collembola, Siphonaptera, Thysanoptera, and types of many Hymenoptera etc are slide mounted in Canada balsam. Total slide number is around 5000. And stored in 15 slide cabinets.

f) Duplicate Collection

A large number of duplicate specimens are stored in about 1500 wooden boxes. These are used for teaching and other analytical purposes like replacing the displayed material. Duplicate collection is stored in about 1500 boxes each of size (13 x 17 x 3 in.).

ii. Qualitative description: As given under point 5.

iii. Quantitative details and accession lists:

A) **Entomological Collection:** Entomological collection has **2847 registered** exhibits showing damage by insect to different wood species. Apart from wood samples, beneficial insects, general forest insect fauna, and displays of insect management practices are displayed in the following:

a) 38 almirah show cases
b) 18 Horizontal show cases,
c) 2 cuboidal showcases,
d) 4 circular show cases,
e) 3 boards for displaying photographs
f) 18 window showcases for line drawings

B) **Zoological Collection:** Similarly Zoological collection has **577** registered preserved exhibits (skins of tiger (2), skins of bear (2), Trophies (105), Snake collection (in 138 jars), fish collection (30 jars), amphibian collection (15 jars), invertebrates (45 jars) mammal embryos (8 jars) and birds (trophies, eggs and nests) displayed in the gallery at first floor of the museum. All these exhibits are displayed in following:

a) Walls of the Gallery
b) 10 horizontal show cases
c) 4 glass cabinets
d) Almirah type double sided showcases
e) 10 tables

C. National Forest Insect Collection:

a) **General collection** is stored in 157 wooden cabinets, each with 20 drawers of 18 x 18 x 2.5 in size.

b) **Type material** is stored in 4 wooden cabinets, each with 20 drawers of 18 x 18 x 2.5 in size.

c) **Wet Collection** of larvae of the order Lepidoptera, Coleoptera, Isoptera and other soft bodies insects. Larval collection is stored species wise in small tubes which in turn are kept immersed in bigger jars filled with alcohol. About two thousand species of larvae are kept in 5118 glass tubes There are about 148, 5liter cap jars.. Similarly termite collection has 855 species stored in alcohol. jars.

d) **Collection of blown larvae** is stored in 2 wooden cabinets, each with 20 drawers of 18 x 18 x 2.5 in size. Collection of slide mounted material Small insects belonging to various orders like Coleoptera, Hymenoptera, Hemiptera, Collembola, Siphonaptera, Thysanoptera, and

types of many Hymenoptera etc are slide mounted in Canada balsam. Total slide number is around 5000. Which are stored in 15 slide storing cabinets

e) **Duplicate Collection** A large number of duplicate specimens are stored in about 1500 wooden boxes.

iv. **Antiquity, authenticity and registration:** It is a part of Entomology division in FRI since a century and has been collected or preserved by the Staff of entomology division. Most of the collection was collected during the year 1920-1940, but some specimens are as old as 1858. In Zoological collection trophies and skins were purchased during 1951. All the species in NFIC, wood samples and zoological collection are authentic, rare and accessioned.

v. **Tentative value of collection and insurance:** NA

vi. **State of preservation, storage arrangements:** The exhibits are well preserved and treated with recommended preservatives from time to time by engaging local professionals, mostly retired personnel of the division.

vii. **Display- status, potential and constraints**: It appears more of a depository rather than a proper museum as all the display spaces are jam packed with valuable exhibits. There is need to decongest and display them in presentable form with proper spot lighting and audio-visual information. Only the representative exhibits of general public interest need to be displayed. Major part of the collection should be stored in an area created exclusively for it and should be made accessible to the students and researchers with entomological interest.

This entomological part of the collection is unique and is not seen anywhere in the world especially of this magnitude. Therefore, the collection has great potential to be displayed in better and informative way for the benefit of general public. Use of touch screens, personalized audio-visual systems and LED illuminated exhibits and photographs will tremendously add to the aesthetic and educational appeal of the gallery. All the displays need to remounted on suitable and attractive blocks and relabeled.

Finance has been fore most constraint in modernly developing this gallery.

(D) Forest Pathology Gallery:

The composition of the collection:

The gallery has 13 double sided almirahs, 6 single sided display almirahs, 7 display boxes/ racks, 9 tables with displayed boxes, 6 display boards, 27 framed water colour paintings (25 frames having 4 paintings each and 2 with single paintings) by legendry artists who won prestigious award for their work. It has collection of sporophores, disease affected plant

parts, models, posters showing disease etiology, testing techniques etc. The following exhibits, paintings and models are displayed in the gallery: -

Heart rot disease exhibits: - This contains heart rot wood samples sporophores and related posters of numerous forestry species such as teak, sal, pine and many other forest tree species of India.

Root rot disease exhibits: - It contains numerous diseased root and collar region exhibits of different forest species along with the sporophores and posters explaining important principles of disease management such as in root rot of *Acacia catechu*, *Shorea robusta* etc.

Wilt diseases: Shisham is a valuable timber. It is cultivated throughout the greater parts of India. The disease samples showing vascular wilt have been displayed along with good quality photographs showing symptomatology in detail along with microphotograph of causal organism which has wiped out many plantations in northern India.

Seed Pathology and Nursery Diseases: - Several diseases in forest nurseries including damping off and other foliar diseases in good quality photographs have been displaced. The

defective seed lot infected with fungal species and its treatment etc. has also been shown in different photographs/posters.

Foliar diseases: - Specimen and photos of foliar diseases have also been displayed e.g. different specimens of Sandal spike disease have been prominently displayed. This is a very serious disease caused by phytoplasma which has wiped out many plantations in southern India.

Mycorrhizae: Several ectomycorrhizal roots along with detailed poster have been displayed. The sporophores of mycorrhizal fungi has also been displayed. These are very important good fungi improving nutritional uptake of the host tree and thus increasing its survival.

Edible and medicinal fungi: - Several edible and medicinal fungi specimens have been housed in form of specimens, posters etc. To name few are *Ganoderma lucidum, Ophiocordyceps sinensis*, *Morchella esculenta*, *Pleurotus* sp. etc.

Saprophytic fungi: - Fungi are major nutrient cycler with unique ability to degrade lignin quickly. Several saprophytic fungi has been displayed which are of extreme ecological significance.

Techniques / kits: Several mushroom growing techniques, wood testing techniques and Diagnostic kits have been displayed for easy understanding of principles e.g. natural decay resistance test, grave yard test, species specific diagnostic kit for *Cylindrocladiun quinqueseptatum* etc.

Painting: 27 framed water colour paintings (25 frames having 4 paintings each and 2 frames with single paintings) by legendry artists such as Rai Bahadur Ganga Singh, Mr. P.N. Sharma and Mr. M.N. Dhoundiyal are displayed in the Forest Pathology Gallery. Two of the paintings of Mr. M.N. Dhoundiyal were displayed and appreciated in 8th International Exhibition of Botanical Art and Illustrations (Nov. 13, 1995 to Feb. 29, 1996) held at Hunt Institute for Botanical Documentation Carnegie, Mellon University, Pittsburg, Pennsylvania, USA.

Fungarium: The Fungarium houses nearly 12000 specimens of forest diseases and fungi which are preserved and maintained. The specimens of diseases of forest plants and fungi have been maintained after pressing, drying and mounting on herbarium/ specimens sheets with details of the collection written on the sheets such as name of the disease, its causal organism, and host name, locality of collection, date of collection and name of the collector. It is only third such repository in the world next to Forest Pathology Herbarium at Canadian Forest Services, Pacific Forestry Centre and Mycology Research Herbarium, US Forest service.

i. **Qualitative description:** As given in point i.

ii. **Quantitative details and accession lists:**

Sl No.	Museum exhibits/ models / specimens	Accession no.
1.	Brown cuboidal rot	FPDM 1.001
2.	White fibrous rot	FPDM 1.002
3.	*Pholiota adiposa*	FPDM 1.003
4.	White pocket rot	FPDM 1.004
5.	*Phellinus lamaensis*	FPDM 1.005
6.	Display natural decay resistance properties of timbers	FPDM 2.001
7.	*Pseudomerulius aureus* (sphorophores and rot)	FPDM 2.002
8.	Display specimens of related to mistletoes and dwarf mistletoes	FPDM 2.003
9.	Root rot due to *Ganoderma lucidum*	FPDM 3.001

10.	*Aurificaria* shoreae	FPDM 3.002
11.	Needle rust of chir pine showing stem rust (preserved specimen)	FPDM 4.001
12.	(Dry specimens in jar) Cronartium himalayense on chir pine	FPDM 4.002
13.	Swertia showing uredial and telial stage of chir pine rust under dry Condition	FPDM 4.003
14.	Witches broom in chir pine	FPDM 4.004
15.	Blue pine needle rust	FPDM 4.005
16.	Galls	FPDM 4.006
17.	*Cronartium himalayense* (chir pine)	FPDM 4.007
18.	Stem gall specimens of Pinus kesiya (Cronartium quercuum)	FPDM 4.008
19.	*Cronartium ribicola* on Blue pine	FPDM 4.009
20.	*Chryosomyxa himalense* (broom rust)	FPDM 4.010
21.	Specimen of Bul on sal	FPDM 4.011
22.	Poplar rotted specimens	FPDM 4.012
23.	Sandal rot due to *Trametes palustris*	FPDM 5.001
24.	Photographs of spike disease in sandal	FPDM 5.002
25.	Sandal spike disease specimens (3x2 framed)	FPDM 5.003
26.	Sandal rot- 2	FPDM 5.004
27.	Thread blight-4	FPDM 5.005
28.	Stem rot due to *Earliella scabrosa*	FPDM 6.001
29.	*Ganoderma lucidum*	FPDM 6.002
30.	*Serpula lacrymans*	FPDM 6.003
31.	*Poria sp.*	FPDM 6.004
32.	Rotted wood specimens	FPDM 6.001
33.	Brown rot due to Trametes sp.	FPDM 7.001
34.	*Merulius sp.*	FPDM 7.002
35.	*Earliella scabrosa*	FPDM 7.003
36.	*Trichaptum abietnum*	FPDM 7.004
37.	*Trichaptum abietnum* heart rot	FPDM 7.005
38.	*Trametes hirsuta*	FPDM 7.006
39.	Stem rot *Gleophyllum straiatum*	FPDM 7.007
40.	*Fomitopsis dochmius*	FPDM 7.008
41.	Tramelia and Poria sp. broad leaved and conifers	FPDM 7.009
42.	*Phellinus pini*	FPDM 7.010
43.	Stem and heart rot fungal fruiting bodies of *Phellinus caryophylli*	FPDM 8.001
44.	*Phellinus gilvus*	FPDM 8.002
45.	*Datronia caperata*	
46.	*Phellinus fastuosus*	FPDM 8.003
47.	*Inonotus* glomeratus	FPDM 8.004
48.	*Spongipellia* obtusus	FPDM 8.005
49.	*Phellinus pachyphloeus*	FPDM 8.006
50.	*Fomitopsis dochmius*	FPDM 8.007
51.	Witches broom disease of Bamboo laminated specimens	FPDM 9.001
52.	Rotted specimens of bamboo-26 due to *Daedalia flavida*	FPDM 9.002
53.	*Phellinus pectinatus*	FPDM 9.003
54.	*Rigidoporus lineatus*	FPDM 9.004
55.	Specimens of rotted wood sowing different decaying pattern.	FPDM 10.001
56.	*Oxyporus ravidus*	FPDM 10.002
57.	*Phellinus caryophylli*	FPDM 10.003
58.	*Hymenochaete rubiginosa*	FPDM 10.004
59.	*Trametes versicolor*	FPDM 10.005
60.	*Panellus rupicola*	FPDM 10.006
61.	*Trichaptum abietnum*	FPDM 10.007
62.	*Gloeophyllum subferruginea*	FPDM 10.008
63.	*Serpula lacrymans*	FPDM 10.009
64.	*Phellinus senex*	FPDM 10.010

65.	*Laetiporus sulphureus*	FPDM 10.011
66.	*Rhodonia placenta*	FPDM 10.012
67.	White stringy rot	FPDM 10.013
68.	Specimens of rotted wood and fungal fruiting bodies	FPDM 11.001
69.	*Phellinus dependens*	FPDM 11.002
70.	*Nigroporus vinosus*	FPDM 11.003
71.	*Aurificaria shoreae*	FPDM 11.004
72.	*Daedalia sulcata*	FPDM 11.005
73.	*Phellinus rimosus*	FPDM 11.006
74.	Datronia caperata	FPDM 11.007
75.	Poria sp.	FPDM 11.008
76.	Stem canker- broad leaved tree due to -----	FPDM 12.001
77.	*Monochaetia unicornis*	FPDM 12.002
78.	*Trichosporium vesiculosum*	FPDM 12.003
79.	*Cytospora*	FPDM 12.004
80	*Fusarium semitectum*	FPDM 12.005
81.	*Endothia parasitica*	FPDM 12.006
82.	*Frost canker*	FPDM 12.007
83.	Sun scald	FPDM 12.008
84.	Heart rot on broad leaved tree sp.	FPDM 12.009
85.	*Trichaptum sprucei*	FPDM 12.010
86.	*Phellinus caryophylli*	FPDM 12.011
87.	*Fomitopsis sinicola*	FPDM 12.012
88.	*Hymenochaete rubiginosa*	FPDM 12.013
89.	Heart rot on broad leaved tree sp.	FPDM 12.014
90.	*Rigidoporus lineatus*	FPDM 12.015
91.	*Oxyporus populinus*	FPDM 12.016
92.	*Fomes fomentarius*	FPDM 12.017
93.	Stem and heart rot, Root, Butt, Stain (white rot and brown rot)	FPDM 13.001
94.	*Fusarium solani*	FPDM 13.002
95.	*Peniophora sp.*	FPDM 13.003
96.	*Heteriobasidion annosum*	FPDM 13.004
97.	*Stereum lobatum*	FPDM 13.005
98.	*Stereum percome*	FPDM 13.006
99.	*Stereum hirsutum*	FPDM 13.007
100.	*Serpula lacrymans*	FPDM 13.008
101.	*Trametes sp.*	FPDM 13.009
102.	*Daedalia cubensis*	FPDM 13.010
103.	*Daedalia dickinsii*	FPDM 13.011
104.	*Phellinus gilvus*	FPDM 13.012
105.	Heart rot, Pocket rot, Butt rot, Punk knot	FPDM 14.001
106.	*Armillaria mellea*	FPDM 14.002
107.	*Phellinus pini*	FPDM 14.003
108.	*Phellinus caryophyllii*	FPDM 14.004
109.	*Heterobasidion annosus*	FPDM 14.005
110.	Heart rot, Stem rot, White rot, brown rot	FPDM 15.001
111.	4 Photographs *Phenillus badius*, coppicing of teak, heart rot	FPDM 15.002
112.	*Loweporus tephroporus*	FPDM 15.003
113.	*Phellinus pini*	FPDM 15.004
114.	*Phellinus badius*	FPDM 15.005
115.	Fruiting bodies of different heart rot and stem rot of broad leaved and conifers	FPDM 16.001
116.	*Daedalea flavida*	FPDM 16.002
117.	*Fomitopsis rubida*	FPDM 16.003
118.	*Ganoderma weberianum*	FPDM 16.004
119.	*Xylobolus princeps*	FPDM 16.005

120.	*Antrodia serialis*	FPDM 16.006
121.	*Mereulius tremellosus*	FPDM 16.007
122.	*Heterobasidion annosum*	FPDM 16.008
123.	White and brown rotting fungi with fruiting body	FPDM 17.001
124.	*Fomiotipsis pinicola*	FPDM 17.002
125.	*Fomes fomentarius*	FPDM 17.003
126.	*Fomiotipsis officinalis*	FPDM 17.004
127.	*Phellianus conchatus*	FPDM 17.005
128.	*Trametes sp.*	FPDM 17.006
129.	Saprophytic and parasitic fruiting bodies	FPDM 17.007
130.	*Pycnoporus sanguineus*	FPDM 17.008
131.	*Phellianus linteus*	FPDM 17.009
132.	*Phenillus pachyphloeus*	FPDM 17.010
133.	*Lentinus polychrous*	FPDM 17.011
134.	*Nigrofomes melanoporus*	FPDM 17.012
135.	*Phellianus lamaensis*	FPDM 17.013
136.	*Poria sp.*	FPDM 17.014
137.	*Inocutis tamaricis*	FPDM 17.015
138.	*Loweporous tephroporus*	FPDM 17.016
139.	*Xylobolus*	FPDM 17.017
140.	*Daedalea flavida*	FPDM 17.018
141.	*Fomitopsis rubida*	FPDM 17.019
142.	*Rigidoporus ulmarius*	FPDM 17.020
143.	*Lenzites betulina*	FPDM 17.021
144.	*Phellinus senex*	FPDM 17.022
145.	*Inonotus tabacinus*	FPDM 17.023
146.	*Daedalea dickinsii*	FPDM 17.024
147.	Fruiting bodies of parasitic and saprophytic fungi causing white and brown rot on broad leaved and conifers.	FPDM 18.001
148.	*Nigrofomes melanoporus*	FPDM 18.002
149.	*Trametes cotonea*	FPDM 18.003
150.	*Fomitopsis pinicola*	FPDM 18.004
151.	*Fomitopsis dochimus*	FPDM 18.005
152.	*Daedalea flavida*	FPDM 18.006
153.	*Pyrotomes tricolor*	FPDM 18.007
154.	*Loweporus tephroporus*	FPDM 18.008
155.	*Fomes fomentarius*	FPDM 18.009
156.	*Phellinus lamaensis*	FPDM 18.010
157.	*Lentinus polychrous*	FPDM 18.011
158.	*Microporus xanthopus*	FPDM 18.012
159.	Different types of rot with fruiting bodies causing white rot and brown rot	FPDM 19.001
160.	*Inonotus cuticularis*	FPDM 19.002
161.	*Fomitopsis rubidus*	FPDM 19.003
162.	*Phellinus gilvus*	FPDM 19.004
163.	*Ganoderma applanatum*	FPDM 19.005
164.	*Gloeophyllum sepiarium*	FPDM 19.006
165.	*Lenzites japonica*	FPDM 19.007
166.	*Phaeolus schweinitzii*	FPDM 19.008
167.	Heart rot, white rot, brown rot in Jar	FPDM 20.001
168.	*Peniophora rhizomorpha*	FPDM 20.002
169.	*Fomes fomentarius*	FPDM 20.003
170.	*Rigidoporus lineatus*	FPDM 20.004
171.	*Trichaptum sprucei*	FPDM 20.005
T	Edible Mushrooms Preserved fungal fruiting bodies of different edible mushrooms and Laminated photographs	FPDM 21.001
173.	Oyster Mushroom A B C D	FPDM 21.002

174.	A-*Pleurotus sajor- caju*	FPDM 21.003
175.	*Pleurotus fossulatus*	FPDM 21.004
176.	*Pleurotus eryngii*	FPDM 21.005
177.	*Pleurotus eous*	FPDM 21.006
178.	*Pleurotus ostreatus*	FPDM 21.007
179.	*Morchella delica*	FPDM 21.008
180.	AB- Cultivated *Lentinula edodes*	FPDM 21.009
181.	*Agaricus bisporus*	FPDM 21.010
182.	C- Natural *Ramaria sp.*	FPDM 21.011
183.	*Laetiporus sulphureus*	FPDM 21.012
184.	*Morchella esculanta*	FPDM 21.013
185.	*Morchella conica*	FPDM 21.014
186.	Fungi with Commercial and medicinal importance	FPDM 22.001
187.	*Ophiocordyceps sinensis*	FPDM 22.002
188.	*Ganoderma lucidum*	FPDM 22.003
189.	*Aquilaria agallocha* wood	FPDM 22.004
190.	Symbiolic relationship of Fungi with plants	FPDM 23.001
191.	A-Mycorrhizal roots of different tree species	FPDM 23.002
192.	Root specimens preserved in FAA.	FPDM 23.003
193.	Symbiotic relationship of fungi with plants 9 No. of specimens preserved in F.A.A and remaining as dry specimens	FPDM 24.001
194.	Fruiting bodies of Ectomycorrhizal fungi Three preserved in F.A.A and remaining kept as dry specimen.	FPDM 25.001
195.	Fruiting bodies of Ectomycorrhizal fungi	FPDM 25.002
196.	*Ganoderma lucidum*	FPDM 25.003
197.	*Aquilaria agallocha wood*	FPDM 25.004
198.	Symbiotic relationship of Fungi with plants	FPDM 26.001
199.	A-Mycorrhizal roots of different tree species	FPDM 26.002
200.	Root specimens preserved in FAA.	FPDM 26.003
201.	Symbiotic relationship of fungi with plants 9 No. of specimens preserved in F.A.A and remaining as dry specimens	FPDM 27.001
202.	Fruiting bodies of Ectomycorrhizal fungi Three preserved in F.A.A and remaining kept as dry specimen.	FPDM 28.001

13 double sided almirahs

6 single sided display almirahs

7 display boxes/ racks

9 tables with displayed boxes

6 display boards

27 framed water colour paintings (25 frames having 4 paintings each and 2 with single paintings)

44 almirahs (Wooden / Steel) in the Fungarium housing 12000 fungal specimens

iv. **Antiquity, authenticity and registration:** It is a part of Forest Pathology Division in FRI since a century and has been collected or preserved by the legendry Forest Pathologists. The displays/ specimens/model are antique and authentic.

v. **Tentative value of collection and insurance:** NA

vi. **State of preservation, storage arrangements:** The displays/specimens/models and paintings are preserved from time to time with utilization of local resources and professionals.

vii. **Display- status, potential and constraints:** The displays/ specimens/models require to be upgraded keeping in view the development of new technologies in the field of forestry. Today, they remain as important collections representing many diseases and concepts of pathology, but providing very little communication to educate and enlighten the visiting public. The displays/ specimens/models currently are not interactive. The displays also require upgrading and refurnishing. Newer poster, models and displays also needs to be created. Currently only professional forest scientists are able to understand the displays/ specimens/models. A total reorganization of the exhibits is required due to change of forestry practices over a long period of time to bring the Forest Pathology Gallery to international standards and to make it a dynamic center of public education and for the promotion of mass awareness on forestry and conservation of forest resources. A lot of potential is available for making the models more interactive for the general public by application of displays of touch screens and scrollers. The up-gradation will be done predominantly by utilizing the existing old models. Newer posters, displays and models will also be created.

(E) Botany Division's Gallery:

I. Herbarium

i. **The composition of the collection:** The DD Herbarium has 200 specially constructed wooden almirahs in which Ca. 3,30,000 herbarium specimens are being stored. The arrangement of herbarium specimens are according to well known Banthem and Hooker system of classification. Within the family genera and species are arranged on the bases of *Genera planatarum* and *Flora of British India*. They are also arranged on the bases of locality/ place of collection viz., North west and central India, Bengal Assam and Burma, South India, Asia east of India, Asia north of India, Asia west of India, Europe, America, Africa, Australia. To protect these herbarium sheets from mold, fungi and insects etc. 2% solution of mercuric chloride (which is highly poisonous) is currently being used. Moth balls, Naphthalene flakes are placed in herbarium shelves.

The Carpological gallery developed as an adjunct to the herbarium is represented by over 500 different types of forest fruits/seeds which are useful in identification of plants without recourse to any other parts. The herbarium also houses collections of over 200 original paintings of plants made by world famous plant artists, Rai Sahib Thakur Ganga Singh, Lady Catherine Brandis and P. N. Sharma are delight to the eyes of thousands.

The following are the notable contributions to the collections of the DD Herbarium: -

- **James Sykes Gamble** an ardent botanist and collector, was responsible for building up the Forest School Herbarium at Dehra Dun. His collections of exotic garden plants which are so frequently neglected by collectors, can be seen in the herbarium and many of these have been of considerable interests as showing the date of introduction and source in many cases of the bamboos and other plants cultivated in the Arboretum which he started in the Forest Park and grounds of the Forest School.
- **J.F. Duthie** contributed largely to the Forest School Herbarium and a good local collection of trees and shrubs was obtained by Instructors and students especially **U. N. Kanjilal**. Several private herbaria made by forest officers appear to have been presented, viz., by **Smythies, Gustav Mann** (Assam collection) and **J. C. McDonnell** from Kashmir and others. By exchange a number of **Australian plants** were received from **Baron Von Mueller**.
- Among the collections added to the Herbarium may be mentioned those of **Lace, Haines, Parker, Parkinson, Bor, Stewart, Mooney, Raizada** and many sent by forest officers and others from all parts of India and Burma.
- The Herbarium has been headed by a succession of eminent botanists who have played a notable part in the development of Indian Forest Botany. Mr. **H. H. Haines** was the first Forest Botanist appointed in1906. He spent his time mainly on systematic botany and is known for his *Botany of Bihar and Orissa*.
- Mr. **R.S. Hole** succeeded Haines in 1907 and in 1906 the Saharanpur Herbarium was amalgamated with the Herbarium of the Forest Research Institute. Hole did a considerable amount of work on forest grasses.
- **R.N. Parker** took over from Hole in 1922 and held this post till 1932. Soon after his appointment he set about the proper arranging, naming and mounting the material received from the old Botanical Department of Northern India formerly at Saharanpur. He toured and collected plants in the Kali Valley (Kumaon), Tavoy, Mergui and Tenasserium (Burma), Bashahr and Kullu, Etawah, and Northern Bengal from where he brought

extensive and interesting collections containing several new genera and many new species most of which he described after studying them at Dehra Dun, Calcutta or Kew. Several articles on the flora of Burma which appeared in the Kew Bulletin are based mainly on the collections made by Parker.

- In 1929 a Botanical party under **B.L. Gupta** was sent to Nepal and collected plants of the region during the expedition. He revised *Forest Flora of the Siwalik and Jaunsar Forest Division, U.P.* 1928 based on the herbarium collection, originally published by Rai Bahadur Upendranath Kanjilal in 1901 and 1909.
- In 1924 Parker revised the first edition of his *Fora of the Punjab with Hazara and Delhi* and also published a popular illustrated booklet *Forty Trees common in India*.
- **C.E. Parkinson**, formerly Forest Botanist, Burma, succeeded Parker in 1932. He brought with him a large number of specimens from Burma and incorporated in the herbarium.
- **N.L. Bor** succeeded Parkinson in 1937. Bor conducted surveys of the timber resources of the evergreen forests of Bombay and Madras and made extensive collections from there as well from Lahaul, Assam, Sikkim, Manipur and Tibet and considerably enriched the herbarium collections. Bor was a recognized authority on Indian Gramineae, published a large number of papers describing several new genera and species. Bor trained **Kirat Ram** as his collector and most of their sheets bear the name, Bor and Kirat Ram.
- He published the *Flora of Assam*, Vol. V, dealing with Gramineae and the *Handbook on the Common Grasses of the United Provinces*. he published his lifetime's work *"Grasses of Burma, Ceylon, India and Pakistan"* besides his *Manual of Indian Forest Botany.*
- **M.B. Raizada** succeeded Bor in 1942 and his prime interest lied in the systematic botany, nomenclature and taxonomy of grasses. He made notable contributions to the flora of the Upper Gangetic plains.
- After independence expeditions sent out from this herbarium have explored tracts of India that were wholly or partly *terra incognita*. In 1952 M.B. Raizada from this Herbarium, in collaboration with the Andamans Forest Department, participated in an expedition to the Great Nicobar Islands. Previous to this expedition very little was known about the forest wealth. The island abounds in matchwood and plywood timbers. Valuable data of forestry, geographical and anthropological interest was collected. Botanical expedition was undertaken to the Gir Forests of Saurashtra in collaboration with Rev. H. Santapau of Blatter Herbarium, Bombay, Panch Chulli area close to the Nepal-Tibtet border and to Tehri Garhwal.

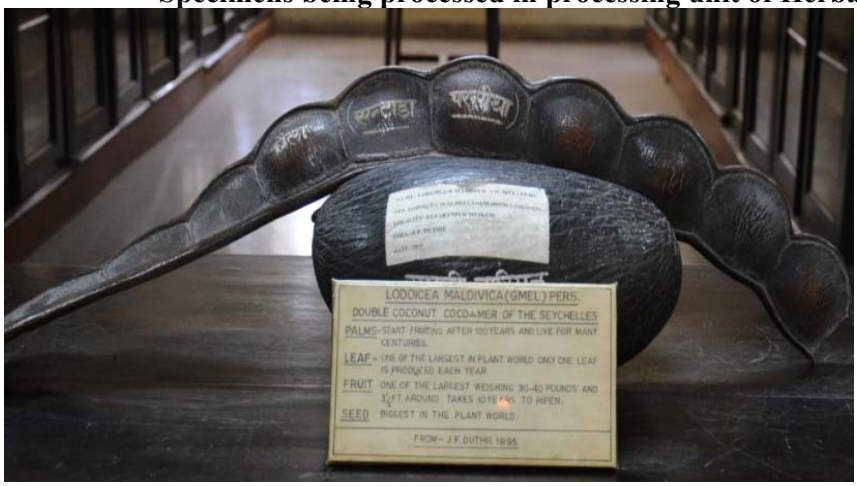
- After Raizada's retirement in 1963, **K.C. Sahni** took over as Forest Botanist and the herbarium was vastly enriched with collections from various under-explored regions like the Union Territory of Goa, Daman and Diu, Arunachal Pradesh, Ladakh, etc..
- K.M. Vaid succeeded Sahni in 1979. He extensively toured the Jammu & Kashmir region. After his sudden demise in 1981 **K.N. Bahadur** took over as Officer-in-charge. He published the world monograph on the genus *Toona*. He has also worked on Indian Bamboos. **S.S. Jain** has explored Kameng, Subansiri and Tarajuli Districts of Arunachal Pradesh during 1979 and 1984.
- The following works which were partly or wholly prepared at Dehra Dun are based on Identifications made at Dehra Dun

DD Herbarium and Carpological Museum of Forest Research Institute

- Herbarium:- Parkinson's *Flora of the Andaman's, Forests Flora of Pilibhit*, *Oudh, Gorakhpur and Bundelkhand* by P.C. Kanjilal, *Flora of Assam* by Kanjilal and Das, *Flora of Assam* (Gramineae, Vol. V) by N.L. Bor, *Handbook on the common grasses of United Provinces* by N.L.Bor. *Supplement to Duthie's Flora of the Upper Gangetic Plain* by M.B. Raizada, *Supplement to the Botany of Bihar and Orissa* by H.F. Mooney, *Beautiful Indian Climbers and Shrubs* by N.L. Bor and M.B. Raizada and *Manual of Indian Forest Botany* by N.L. Bor. Revision of family Meliaceae for the Flora of India of the Botanical Survey of India S.S jain and SSR Bennet. The collections in the herbarium have been used as the basis of the study for the preparation of *Forest Flora of Punjab*, *Forest Flora of Kumaon*, *Forest Flora of Chakrata, Dehradun and Saharanpur* and for the completion of the *flora of the Upper Gangetic Plain*.

People consulting Herbarium specimens and valuable Type specimens (placed in separate almirahs) in DD Herbarium

Specimens being processed in processing unit of Herbarium



Display of double coconut (*Lodocea maldivica*) and longest pod of (*Entada persica*) in DD Herbarium of FRI

Type Herbarium Specimen

Display of original paintings in DD Herbarium and Carpological Museum of FRI

viii. **Qualitative description:** As given in point i.

ii. **Qualitative description:** As given in point i

iii. **Quantitative details and accession lists:**

- *Ca.* 3,30,000 herbarium specimens,
- *1300* invaluable type specimens,
- *Ca.* 500 different types of forest fruits/seeds,
- *Ca.* 200 original old paintings of plants by Rai Sahib Thakur Ganga Singh, Lady Catherine Brandis and P. N. Sharma
- Floral iconies/ archives and exhibits (Double coconut of *lodoicea maldivica* and longest pod of *Entada persica* and some plants of botanical curiosity like pitcher plant *Nepenthes khasiana*)

iv. **Antiquity, authenticity and registration:** It is a part of Botany division in FRI since a century and has been collected or preserved by the legendry foresters and scientists. The herbarium specimens are authentic and each specimen is provided with accession number.

v. **Tentative value of collection and insurance:** NA

vi. **State of preservation, storage arrangements:** The herbarium specimens are preserved from time to time following standard herbarium specimens preservation methods.

vii. **Display- status, potential and constraints:** DD Herbarium originally designed for lesser number of specimens is now over burdened with more than 0.3 million specimen sheets which are fitted within old storage system. The storage density required to reinforce and up gradation of Herbarium is required to facilitate the additional incorporation of specimens in the Herbarium. Currently the specimens are placed in wooden almirahs, Incorporation of mobile compactors may prove useful as these are termite proof and movable and hence, lesser space will be needed. The present Herbarium hall has limited space with no scope of expansion and is located on the first floor of the building and incorporation of much heavier steel mobile compactors would be difficult and out of the carrying capacity of the building. Therefore, a separate building may be constructed with more space and modern storage facility. There is a constraint of funds for their up-gradation from the limited fund available at the institute.

II. Xylarium:

i. **The composition of the collection:**

Xylarium-I: It has 31 almirahs of about 12 ft height 10 and almirahs of 6ft height, which display one set of authentic wood samples both from India and other countries. It has collection of unique woods of India depicting wood biodiversity of the country like lightest wood, heaviest wood, most sweet smelling wood, most foul smelling wood, smoothest wood, streaked wood variegated wood, different colours of wood etc. The following woods are displayed in the Xylarium: -

- CITES woods (woods banned from export)
- Unique woods of India like-
- Lightest wood
- Heaviest wood,
- Different colour woods (from almost creamy white to jet-black through varying shades of yellow, pink, red, green, brown & purple)
- Most sweet smelling wood
- Most foul smelling wood
- Smooth textured wood
- Coarse textured wood

- Marine woods
- Fossil woods

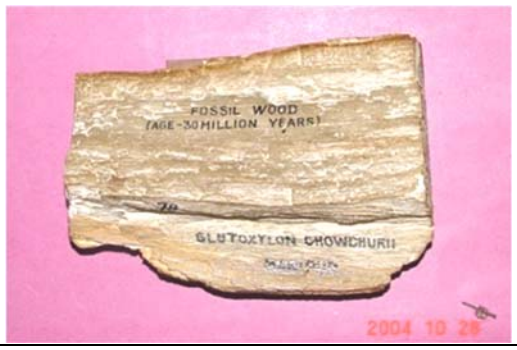
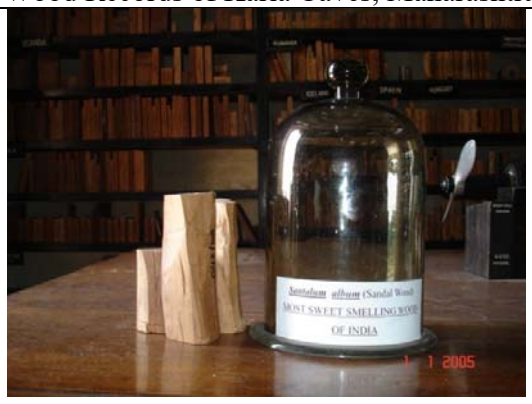
XYLARIUM-I

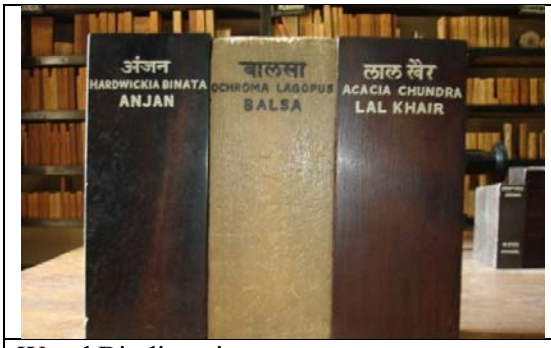
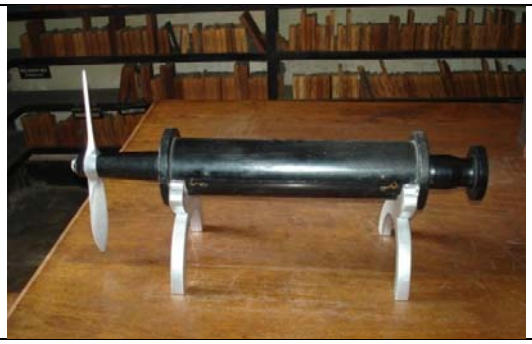
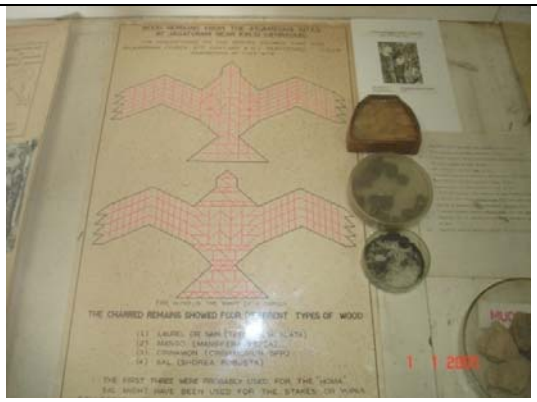
FRI XYLARIUM-I (Indian woods)

FRI XYLARIUM-I (Foreign Woods)

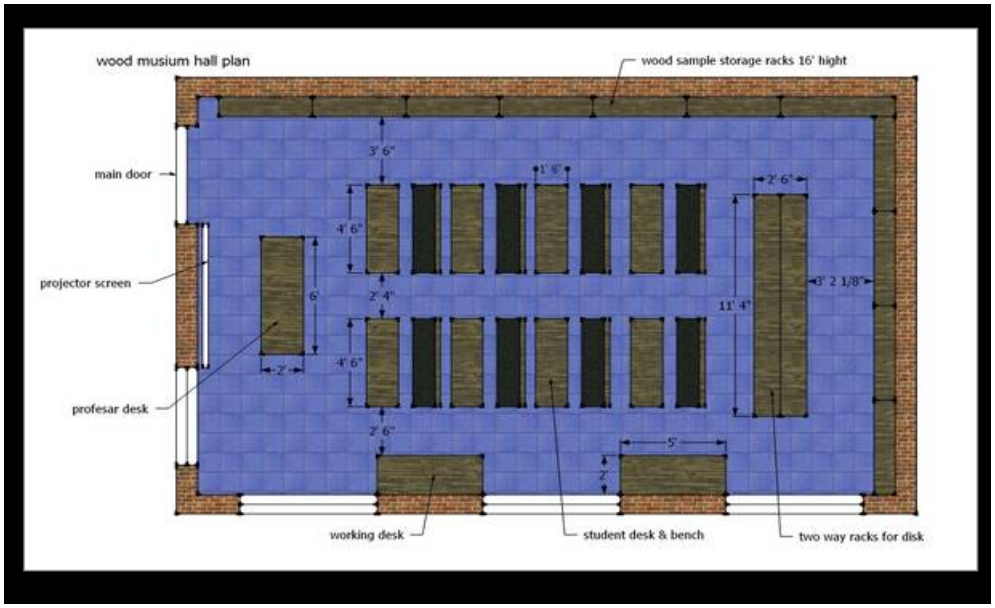
MICRO SLIDE COLLECTION

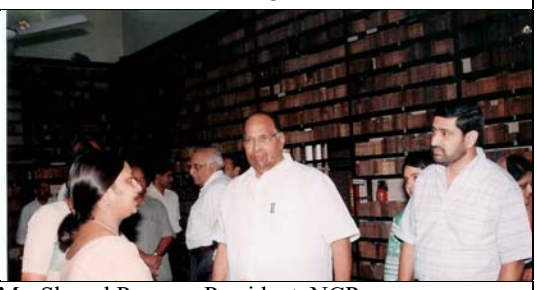
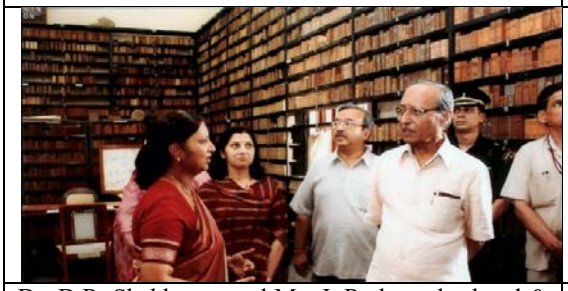
XYLARIUM Exhibits

	
Fossil wood- 30 thousand years old	Fossil wood- 30 million years old.
	
Oldest Record of Rice Cultivation In India - 2300BC	Wood Coffin from Harappa- 2000BC
	
Wood Fossil Records Of Burzahom, Kashmir	Wood Records of Karla Caves, Maharashtra
	
Most Foul Smelling Wood of India	Most Sweet Smelling Wood of India

	
Wood Biodiversity	Model Of Wooden Propeller Shaft Of Ship
	
Wood Charcoal from Kalsi-3rd Century AD	Endemic woods of India

- Proposed Plan for XYLARIUM-II



HIGH PROFILE VISITORS OF XYLARIUM	
	Prince Charles, United Kingdom
	
Mr.L.K.Advani, President, Bhartiya Janta Party	Mr. Sharad Panwar, President, NCP.
	
A foreign delegate of Ambassadors	World bank team
	
Dr. D.R. Shekhawat and Ms. J. Rathore, husband & daughter of Smt. Pratibha Patil, President of India.	Mr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission.
	
Ms. Shabhana Azmi during a visit of Joint Parliament Committee	Dr. T. Chatterjee, Secretary, Ministry of Environment & Forests.

Archaeological Exhibits of Indus Valley Civilization period and other historical sites.
Oldest record of Rice cultivation from India.
Xylarium-II: It has 29 almirahs of about 6 ft height which display another set authentic wood samples from India. It has collection of unique wood cross sectional discs depicting variation in sapwood and heartwood colour. The following wood collections are displayed in the Xylarium-II: -

One set of authentic wood samples
Authentic wood samples for exchange with other Xylaria of the world
Wood samples for teaching and training
Wood samples for sale
Wood exhibits like Rifle butts, shuttles for weaving looms, fancy objects etc.
Woods seized by Customs, Port Trust of India etc.

Other exhibits in the halls include wood cross sections (wooden Discs) and a large number of wooden objects and equipments presented in a disjointed manner.

ii. **Qualitative description:** As given in point- **i**.

iii. **Quantitative details and accession lists:**

XYLARIUM-_I

- 31 almirahs of about 12 ft height
- 10 almirahs of 6ft height
- 8x4 ft table for display of wooden exhibits.
- Glass tables for display of Archaeological exhibits

XYLARIUM-II: Presently there are 29 almirahs that are proposed to be replaced through fixed almirahs.

iv. **Antiquity, authenticity and registration:** It is a part of Botany Division of FRI since a century and has been collected or preserved by the legendry foresters and scientists. The display is antique and authentic.

v. **Tentative value of collection and insurance:** The collection is priceless and never be recreated

vi. **State of preservation, storage arrangements:** The woods are preserved through regular fumigation to avoid ang attack by pathogen/insect.

vii. **Display- status, potential and constraints:** The Xylarium require to be upgraded keeping in view the threat from natural calamities to the priceless wood collection of India and abroad. The collection is extremely important for forestry and wood science research and education. The present displays require upgrading and refurnishing. Currently only professionals and forestry scientists are able to understand the displays of wooden exhibits.

A total reorganization of the wood samples is required to sustain them over a long period of time. The wood collection is already of international standard but its presentation requires upliftment. The exhibits can be made dynamic and a center of public education and for the promotion of mass awareness on forestry and conservation of forest resources. A lot of potential is available for making the exhibits more interactive for the general public by application of modern display systems. The up-gradation will be done predominantly by utilizing the existing exhibits. Presently, there is a constraint of funds for their up-gradation from the limited fund available at the institute. Exhibits need to be made self explanatory to visitors by effective electronic communication systems.

c. Extension Division's Gallery:

i. Composition of the collection the gallery:

- Social forestry for the management and protection of forests and afforestation on barren lands with the purpose of helping in the environmental, social and rural development.
- Planting trees on all ***waste, degraded and fallow land*** along railway lines, roadside, river and canal banks were carried out. They were planted also in village common land, Government wasteland and Panchayat land.
- The museum attracts the visitors through photographs and models of social forestry, agro forestry, soil and land management practices.
- Exhibits display role of trees in meeting the economic needs of the people.
- Other exhibits include display of disastrous consequences that follow deforestation viz, soil erosion, floods and famine.
- Social Forestry implies active collaboration of rural masses in trees planting programmes.
- It advocates tree planting with agriculture fields, vacant lands in the villages and wastelands which are available in our country.


SOIL EROSION


STRIP PLANTING
ROAD SIDE

ii. **Qualitative description:** This gallery will be constructed and modified again keeping in view of modernization of models.

iii. **Quantitative details:** New models will be developed.

iv. **Antiquity, authenticity and registration:** It is a part of Extension division in FRI since a century and has been collected or preserved by the legendry foresters and scientists. The display/model is antique and authentic.

v. **Tentative value of collection and insurance:** NA

vi. **State of preservation, storage arrangements:** NA

vii. **Display- status, potential and constraints:** Since the mason work of the gallery has already been completed it is to be redesigned and as per the requirement the electronic display of the items having scrollers and LED screens will be installed. This will be gateway of the Institute having an audiovisual room with a sitting capacity of 40 persons where films pertaining to the institute activities including FRI museum will be screened and it is proposed that since a number of technologies in the field of Agroforestry, Forest products, Chemistry, Ecology & Environment and Pathology Division has been developed. Various short term training programmes has been developed and villagers including NGO's and farmers has already been trained. There will be display of the technologies of the different divisions of institute.

There will be more interaction with the people visiting the institute.

viii. **Acquisition policy:** The gallery is acquired by FRI and is a property of Govt. of India held through an autonomous organization.

ix. **Uniqueness of the collection, if any:** The collection of paintings and photographs attract visitors in knowing about protection and improvement of forests, about important forestry species, seeds and vegetation of various important forestry species and gaining knowledge of endangered wild animals. These are unique collection; the only one of its kind in the whole country with emphasis on transitions and accomplishments in scientific forestry.

The Proposal

(A) Silviculture Gallery: Forest Research Institute is one of the prestigious scientific institutions in the country located in the sylvan surroundings of Doon Valley and housed in one of the most magnificent grandiose buildings that the country is proud of. Forest Research Institute has a museum of unique set of six galleries, very rich in their collections and of exceptional educational value. These galleries of the musem are the oldest of the institute. Silviculture has been an important area of forestry research at the FRI. It has and is playing an important role in Indian forestry. It gives an idea to the forester about the art and science of cultivation and management of forests of the country. The forest management includes various Silvicultural techniques which have evolved over many years of field experimentations. The silviculture has rendered yeoman services to the development of the forestry and forest management, introduction of exotic species, methods of seed testing, nursery and planting techniques, development of improved tools for the various forest operations, setting of gene banks etc. there are number of dioramas depicting various process of silviculture. Pains stacking efforts and scientific inputs have gone into the creation of exhibits in Silviculture gallery, when these were created several decades age, bringing a novel approach to presenting silviculture practices in visually pleasing manner. The fact, that diorama techniques, were in their formative stages at that time is evident from the fact that square and rectangular show cases were used and the merging of fore and background is poorly accomplished.

(B) Entomological Gallery is one of the oldest galleries of the institute. Forest entomology has been an important area of forestry research at the FRI. It has and is playing an important role in Indian forestry. It gives an idea to the general public and foresters about the science of entomology and management of forests in light of damaging and ecological role played by them.

(C) Forest Pathology Gallery and Fungarium is one of the oldest galleries of the institute. Forest Pathology has been an important area of forestry research. Studies on Mycology and Forest Pathology in India can be dated back to 1905 when Butler first reported wilt disease in Casuarina. Before that McCarthy reported sandal spike disease in 1898. Work on Forest Mycology was started with the appointment of Dr. K.D. Bagchee in the Mycology section in

1927, which was then part of Botany Branch. Later the section was elevated to the full-fledged branch in 1950. The branch was renamed as Forest Pathology Branch in 1957 and it had the distinction of being headed by Dr. B.K. Bakshi a renowned forest pathologist from 1955 to 1977. A strong school on the subject later developed which included P.S. Rehill, M.A. Rama Reddy and Sujan Singh who were assisted by P.C. Pandey, Balwant Singh, R.K.Tewary and S.N. Mukerji Since the inception of the this discipline, pioneering studies were carried out on many disease problems relating to seed, nurseries, plantations, natural forests and timber pathology. Detailed studies were carried out on the diseases and fungi since its inception. Bagchee (1929) reported a new species of Cronartium from Himalayas causing stem rust of Chir pine and worked out its detailed life cycle. He also widely surveyed the Indian forests and identified their mycological and pathological problems. Dr. B.K. Bakshi joined as Research Officer in 1943 and in depth studies were carried out on the problems of heart rot in Sal, pink disease of Eucalyptus, wilt disease of Shisham, root rot in Khair and wilt disease of Casuarina equisetifolia. Bakshi and Sujan Singh (1966) published studies on rusts of important forest trees. Work was also conducted on mycorrhiza, decay resistance tests of some timber species, identification of Polyporaceae and the diseases and deterioration they cause in the forests. Diseases and insect pests of poplar were worked out by Pratap Singh and Sujan Singh (1986). Work on seed pathology initiated in eighties included control of *Fusarium semitectum*, an internally seed borne fungus of *Leucaena leucocephala*. The fungus caused seedling blight and gummosis in grown up plants. Treatment of pods of *Dalbergia sissoo* and the seeds of *Acacia catechu*, *Dendrocalamus strictus*, *Eucalyptus* sp and *Leucaena leucocephala* with fungicides reduced the percentage of infection of seeds in storage. Research on the alternatives of fungicides have also been investigated in the botanics using water, alcohol and ether extracts of *Ricinus communis* for managing the seed- borne mycoflora of *Acacia catechu*. The constituents of Triphala (emblic, beleric and chebulic myrobalans) were observed to be infected with the mycotoxin producing fungi and aflatoxins were measured at levels injurious to human health. In forest nurseries, soil borne fungi like Rhizoctonia, Fusarium and Pythium were detected as the cause of pre-emergence and post –emergence damping-off and root rot in the conifers and hardwood species. Survey of pine nurseries in the hills of Uttar Pradesh, Himachal Pradesh, Orissa and West Bengal exhibited high incidence of the disease resulting in heavy mortality of seedlings of exotic pines. Effective control of the disease was worked out through cultural practices and by the use of chemicals as prophylactants. Some of the other nursery diseases studied were *Cylindrocladium* leaf and twig blight of eucalypts; *Bipolaris* leaf blight,

Melampsora rust and *Rosellinia* root-rot of poplars; *Maravalia* leaf and twig rust of shisham, and *Pseudocercospora* needle blight of pines. Chemical control of these nursery diseases was successfully worked out in late 60's and early 70's. Leaf web blight caused by *Rhizoctonia solan*i has appeared as a highly destructive disease of several broad-leaved species particularly Acacia, Albizia and Melia azederach, in the nurseries, which caused premature defoliation to the extent of 60-100 per cent at the peak growing season. More than 150 fungi causing diseases and decays of both hardwood and softwood species were studied and an account of some of the noteworthy diseases and decay fungi was published in prestigious journals like Nature, Mycologia, Canadian Journal of Botany, Forest Pathology and Mycological Research among others. In plantation diseases the cause of mortality and failure of *Casuarina equisetifolia* in coastal plantations was attributed to a wilt fungus *Trichosporium vesiculosum.* The mode of spread of the disease in the plantation through root contact and root grafting was established. Control of the disease was achieved through sanitation and isolation trenching. Another wilt fungus studied was *Fusarium solani* causing mortality in *Dalbergia sissoo* in plantations raised on unsuitable sites. Positive correlation was established between disease incidence and heavy soil texture with poor drainage in the areas planted. The finding helped in avoiding unsuitable sites for future sissoo planting. The cause of failure of Eucalyptus plantations in the southern stares was attributed to pink disease caused by *Corticium salmonicolor*. Field resistance trials conducted with 15 species and provenances revealed that *E. torelliana* and *E. deglupta* were resistant to the disease. Resistant and susceptible clones of *Dalbergia sissoo* against *Ganoderma lucidum* root rot have been identified in the field trials. Similar work has also been done in eucalypts. During the above mentioned researches, huge number of rare and precious samples were collected and kept in museum and fungarium after preservation employing prescribed techniques. Pain stacking efforts and scientific inputs has gone into the creation of exhibits. The displays were made decades ago and since then in want of funds they cannot be upgraded on modern lines.

(D) Extension Division's Gallery played a major role in the recent past in the development of wastelands such as deserts, salty lands, revives and gully affected areas and areas affected by water and wind erosion. Development agencies have rehabilitated Salt affected soils particularly the Village Community lands, Governments lands, Desert areas, Lands along road sides, Canals and railway tracks. Seeing the large Scale success of these technologies at the grass root level, is the real Social Forestry. In Social Forestry, the optimal use of trees planted on government and agricultural fields. Aid in supplementing fodder, fruit, fuelwood

and timber needs of the Society. The income of the people especially middle class and poor people in rainfed areas (about 80%) can also be enhanced by appropriate social forestry programmes. The models/photographs displayed in the gallery exhibit farm forestry, community forestry, extension forestry and agroforestry besides road side, railway side or canal side plantations.

(E) Botany Division's Gallery: Forest Research Institute has a **Herbarium** of esteemed repute, known internationally as the DEHRA DUN HERBARIUM is the second biggest herbarium and the largest Forest Herbarium in the country. Correct identification of plants is a prime necessity especially in a country like India whose forests possesses a large floral diversity. This is the main function of the Botany Division which has a herbarium of an ever growing collection of authentic specimens, one of the best in the East for the purpose.

The collections housed in this herbarium have been of inestimable value to specialists of different groups/families/genera engaged in revisionary/ monographic work all over the world in having a better understanding of the groups they study. Within India, especially for the northern parts this herbarium serves as a centre for correct identification, development of herbarium and taxonomic database on forest plant species diversity etc. Further, it is of great significant value for many in different fields such as in getting phenological, ethno-botanical data and the exact localities, for the collection of materials at the appropriate period for various kinds of scientific research and also for commercial purposes like pharmaceutical and other plant based industry, etc. The herbarium serves as a ready reference in collecting information on rare and threatened plant diversity and their habitats.

(F) Non Wood Forest Products Gallery is one of the oldest galleries of the institute. NWFP has been an important area of forestry research at the FRI. It has and is playing an important role in Indian forestry. It gives an idea to the forester about the art and science of cultivation and management of forests of the country. NWFP division has been rendering services to various stakeholders including farmers and common masses through R&D efforts directed at cultivation, conservation and value addition besides setting of ex-situ gene banks / conservatories etc. There are a large number of exhibits (~2000) showcasing the diversity of NWFPs being collected by primary collectors, traded and used for self consumption. Some of these exhibits date back to early 19^{th} century and majority of them are of 20^{th} century collections.

Years of neglect and lack of maintenance has made exhibits unimpressive and outdated. Yet it is felt that these exhibits constitute an important legacy from the past and

every effort should be made to retain them with necessary renovation and improvement. Use of new technique available for the merging of foreground and background, highlighting important elements of the display through light animations and introduction of the system Guide-O-Phones for commentary could improve the presentation value and communication efficiency of these dioramas.

Other remarkable set exhibits in the form of large paintings, available in the gallery, but not utilized.

There are number of dioramas, photographs and paintings depicting various forestry in different forest types as a part of forest management. The museums were created century ago, which was not subjected to professional maintenance and updating. It is also an accepted fact that diorama techniques were in their formative stages at that time. Today, they remain as important collections representing many fields of forestry, but providing very little communication to education and enlighten the visiting public. A total reorganization of the exhibits is required to bring the museums to international standards and to make them dynamic center of public education and for the promotion of the mass awareness on forestry and conservation of forest resources. The utilization of space, circulation pattern, thematic sequence, labeling etc. need a thorough re-organizations to ensure that visitors are introduced to Silviculture, forest management, forest protection, utilization and conservation issues and the contribution of FRI in these areas in a systematic interesting, and easy to understand manner in keeping with modern museum techniques.

Considering the status of Forest Research Institute as a premier institution of study, research and education in forestry sciences, the institution attracts the students, scholars and visitors both from India and abroad.

FRI is situated in Dehradun where National Institute for the Visually Handicapped (NIVH) is also located. The NIVH undertakes research and developmental activities contributing number of useful tools and enabling technologies for equal participation by visually impaired visitors in different walks of life. FRI will take help from the NIVH for preparation of display methods through Braille technique for the interaction of visually impaired visitors enabling better interpretation of various forestry models of the museum. The need to renovate and update the galleries of the museum on modern lines is therefore imperative and long overdue. The galleries of FRI museum form the public face of the institution, reflecting its mission achievements and its role in public education and enlightment. The entire work of renovation of museum can be categorized into four components:

Part I: Civil work

Part II: Electrical works

Part III: Interior Works &

Part IV: Furniture

Part I Civil work:

In any museum the basic structure like flooring, walls, ceiling etc and interior designing and display of exhibits play an important role in creating atmosphere that leave an indelible impression in the minds of the visitors. The museum of FRI was set up more than eighty years ago and their physical features have gone through a lot of wear and tear. Therefore, their rejuvenation to attract the minds of visitors is essentially required and through following course of action:

a) Ply board roofing of models

b) Renovation of false ceiling

c) Reinforcement of the existing space with RCC framework and roofing for protection of collection against earthquakes.

d) Waterproofing treatment of roof and walls

e) Painting of walls with plastic paint, spray painting of display cabinets

f) Repairing and fitting locks in wooden cabinets

g) Creation of rooms for Audio-visual presentation in the Museums for visitors

h) Fixing of glass window's panels along with opaque sun films after cleaning of glass.

i) Minor repairing works when required.

Part II Electrical work:

a) Conceal the exposed wiring on the walls and fixing of new conduit wiring as well as fixing of new switches with boards, bulbs, lights and tubes to facilitate the new design.

b) Installation of CCTV cameras fans and exhausts fans.

c) Installation of electronic display systems in models/dioramas, panels etc.

d) Minor repair wherever required.

e) LED based illumination of the hall

f) Installation of LED spot lights

g) Installation of fire alarm system and fire extinguishing appliances

Part III Interior Works: It is proposed to renovate/modify the exhibit presentation and display systems of the museum based on the following criteria:

a) Making of visitors interactive display techniques, graphics, paintings, participatory exhibits by means of animation techniques/touch screens with the help of museum experts.

b) Development of display interactive techniques for visually impaired visitors by using Braille technique.

c) Preparation of labels, write-ups and information retrieval systems.

d) Synthetically pleasing atmosphere to be achieved through appropriate colour schemes, lighting and other display elements.

Part IV Furniture: Chairs and tables for museum attendant and for the visitors.

Action Plan: Action plan given in table below includes time frame for each activity.

Part	Activity	Time Frame							
		Ist Year				IInd Year			
		Quarters				Quarters			
		I	II	III	IV	I	II	III	IV
I	**CIVIL WORKS**								
	Making of false ceiling of models with ply boards. Ceiling painting the same way as the case of the walls with minor repairing of hair cracks and other damages.	√	√	√					
	Fixing of glass window's panels along with opaque sun films after cleaning of glass.			√	√	√			
	Painting, polishing and white wash				√	√	√	√	
	Construction of audio-visual and store rooms.	√	√	√					
	Minor repairing works when required.		√	√	√	√			
II	**ELECTRICAL WORKS**				√	√	√		
	Conceal the exposed wiring on the walls and fixing of new conduit wiring as well as fixing of new switches with boards, bulbs, lights and tubes to facilitate the new design.			√	√	√	√	√	
	Installation of CCTV cameras fans and exhausts fans.					√	√		
	Installation of electronic display systems in models/dioramas, panels etc			√	√	√	√	√	
	Minor repair wherever required.					√	√	√	
III	**INTERIOR WORKS**								
	Making of visitors interactive display techniques of the models including Braille			√	√	√	√	√	√

	technique, graphics, paintings, participatory exhibits by means of animation techniques/touch screens with the help of museum experts.								
	Preparation of labels, write-ups and information retrieval systems.							√	√
	Synthetically pleasing atmosphere to be achieved through appropriate color schemes, lighting and other display elements.					√	√	√	√
IV	**FURNITURES** Arrangement of furniture for visitors and museum attendance.							√	√

i. **Facilities required:** Renovation of galleries of the museum and display of the exhibits need specialized expertise, which is not available in FRI. Hence, it is proposed to give this job to experts in the respective field on contract basis. National Museum of Natural History, New Delhi is a Govt. organization, which has done this type of modern museum work. A transparent procedure of awarding job contracts to specialized people in the field of museology will be adopted. No extra staff, no new land or building etc. is proposed for this project excepting the civil works to be carried out in the existing galleries.

ii. **Development of infrastructure if the state Government Museums in the North East States including Sikkim:** NA

iii. **Storage/ Modernization of the Reserve collection:**

1. **Original Dioramas:** The dioramas on the all sides in the galleries on various forestry themes needs to be renovated and upgraded to provide them with more realistic touch and to highlight the messages that are to be conveyed through each of them.
2. **Store Rooms:** A store has been provided in one of the corners of the galleries, where exhibits that are not to be used for public display can be kept, then properly.
3. **Audio- Visual Rooms:** On the other corner, an audio-visual room with a seating capacity for 20-30 visitors is recommended in the galleries. This space can be used to screen audio-visual films relevant to Forestry Extension, Silviculture, Pathology, Entomology and related subject, for the benefits of the visitors.
4. **Photo- display:** The wall spaces of the store and the audio-visual rooms could be used effectively for a large size panel display of photographs related to different aspects of forestry.
5. **Central Exhibits:** Two display structures can be provided in the center of the galleries. These may be used for displaying a selected number of other exhibits from the galleries to be grouped thematically for better interaction and a continued story.

Some space for a table and a chair for the Educational Assistant who will be the recourse person to the visitors in these galleries are also to be provided at the entrance area.

iv. **Publication:** It is proposed to publish a guidebook as well as leaflets of the museum to be brought out for the benefits of the visiting public. Special publication such as sheets for school children, take home labels etc. may also be brought out to promote the educational role of the museum.

v. **Setting up, expansion, upgradation of conservation laboratories:** NA

vi. **Museum Library:** Not required.

vii. **Purchase if equipments:**

a. **General:**

Electronic audio-visual display along with software.

b. **Equipments for security system:** Web Cameras installation, Fire extinguishers etc.

viii. **Documentation:** NA.

Project Period: Two years from the sanction order.

Sustenance and growth

i. **Present scenario:** Every year about 80-90 thousands visitors from abroad and India visit the FRI museum. Some amount is also generated annually through sale of museum's tickets. A part of the amount is deposited in museum revolving fund for regular maintenance and meeting salaries of contract persons engaged as museum attendants while rest of the amount is being deposited in revenue fund. There is a constraint of funds for their up-gradation from the limited fund available.

ii. **Initiatives for increase in footfalls:** A lot of potential is available for making the models more interactive for the general public by application of displays of touch screens and modern communication systems. The up-gradation will be done predominantly by utilizing the existing old models. The modernization of FRI museum would increase the number of visitors and it would also increase the revenue position for better maintenance of the museum.

iii. **Other initiatives for improved revenue generation:** Through advertisement in media, forestry journals, news papers and publication of intercalary publications and pamphlets.

iv. **Projected scenario:** The modernization and renovation of museum will increase revenue amount of FRI by attracting more number of visitors and lead to better interpretation and information dissemination.

Conclusions

(The conclusions should clearly bring out the anticipated impact of the proposal both in terms of preservation and promotion of its collection and its service to the Society.)

Increase of global temperature due to green house emissions attracts attention of the public of the country to grow trees in all vacant lands in urban as well as in rural areas. Forestry deals with art and science of growing trees, production of timber, management of forests and NTFPs, their conservation, protection and harvesting. People gain knowledge of cultivating trees and their management after understanding Silviculture. The museum of FRI, is historical museum shows various models of forestry practices of different forest types of India and forestry management interventions. People interact with various forestry activities through this museum. Every year, lakhs of visitors visit in the museum, but they do not understand and appreciate the models which display forestry practices due to old display method until and unless they are guided by technical experts. Visitor participation is an effective means of communication and has found place in many modern museums of natural history in India and world over. This ranges from simple participation of pushing a button to animate an exhibit to such experiences as walking through a diorama and being in the midst of forest. Interactive exhibits add interesting dimension to visitor participation. Currently, the museum is only interactive for the technical personnel in the field of forestry or for the exceptionally research and education oriented visitor who understands the concept of forestry. It is, therefore, necessary to implement the latest developments in museum display and communication to make the museum, an effective center of educational benefits for the visitors and students.