GLOBAL ENVIRONMENT FACILITY

THE COUNTRY DIRECTOR'S RECOMMENDATION

TO THE

REGIONAL VICE PRESIDENT

OF THE

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

GLOBAL ENVIRONMENT TRUST FUND GRANT

IN AN AMOUNT EQUIVALENT TO US$4.5 MILLION

TO THE

REPUBLIC OF POLAND

FOR A

FOREST BIODIVERSITY PROTECTION PROGRAM

PART II: TECHNICAL REPORT

January 8, 1992

Agriculture and Water Supply Operations Division
Central Europe Department
Europe and Central Asia Region

WEIGHTS AND MEASURES

The metric system is used throughout this report.

EXCHANGE RATE

Polish Zloty 11,025 = US$ 1

FISCAL YEAR

January 1 to December 31

GLOSSARY OF ABBREVIATIONS

BNP	-	Bialowieza National Park
BPF	-	Bialowieza Primeval Forest
ECU	-	European Currency Unit
EEC	-	European Community
ETP	-	Economic Transformation Program
GEF	-	Global Environmental Facility
GIS	-	Geographic Information System
GDP	-	Gross Domestic Product
GDSF	-	General Directorate of State Forests
IBL	-	Forestry Research Institute
IBRD	-	International Bank for Reconstruction and Development
ICB	-	International Competitive Bidding
IMF	-	International Monetary Fund
LCB	-	Local Competitive Bidding
MaB	-	Man in the Biosphere
MAFE	-	Ministry of Agriculture and the Food Economy
MENRF	-	Ministry of Environment Protection, Natural Resources and Forestry
PMU	-	Project Management Unit
SOE	-	Statement of Expenditure
TA	-	Technical Assistance
ZL	-	Polish Zloty

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

Grant and Project Summary

Grantee: Global Environmental Facility

Beneficiary: Ministry of Environment Protection, Natural Resources and Forestry

Amount: US$4.5 million

Terms: Grant from Global Environmental Facility

Onlending: Not applicable

Financing Plan:

Source	Local	Foreign	Total
	(US$ Million)		
GEF Grant	1.5	3.0	4.5
Committed Bilateral Grants	0.0	0.3	0.3
Government	1.0	0.4	1.4
TOTAL	2.5	3.7	6.2

Economic Rate of Return: Not calculated, though substantial economic and environmental benefits.

Staff Technical Report: Report No. P-5675-POL dated January 8, 1992

Maps: IBRD 23379R
IBRD 23380R

MEMORANDUM AND RECOMMENDATION OF THE DIRECTOR
OF THE CENTRAL EUROPE DEPARTMENT
OF THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
TO THE REGIONAL VICE PRESIDENT
ON A GRANT FROM THE GLOBAL ENVIRONMENTAL FACILITY
TO THE MINISTRY OF ENVIRONMENT PROTECTION, NATURAL RESOURCES
AND FORESTRY OF THE REPUBLIC OF POLAND
FOR A FOREST BIODIVERSITY PROTECTION PROGRAM

Background

1. The forests of Poland are among the most important and unique in Europe.[1] The montane forests of the southwest and the last remnant of the vast lowland European forest now found only at Bialowieza are the most important of these disappearing biological treasures. These areas remain because of the protection afforded their fauna by regal hunters since the tenth century. However, this rationale has disappeared with the royalty to be replaced by a broader appreciation of the values of such rare resources:

- they offer a glimpse at the environmental "baseline" in which European civilization was forged;
- they house threatened and endangered species and system processes found nowhere else;
- they are at the margins of distribution for several commercially important forest species such as Norway spruce, and can clarify questions of adaptability important to their management;
- they are the only sites of some genetic material of importance (e.g. the best adapted trees, the healthiest soil fauna and flora) to renewable resource management, and the restoration of polluted natural systems;
- they are still of a viable size and can therefore offer the best opportunities to explore the preservation and management of natural forests in Europe;
- they are a recognized priority of the Government and people of Poland, as well as of international conservation organizations such as the WWF (a "Green Lung of Europe",) and UNESCO (as a designated "Man and the Biosphere" site);
- they can serve as models for the planning and management of shared international resource systems. The initiative recently taken by a local joint bilateral (Poland and Republic of Belarus) technical group can constitute a model which is of benefit to other such protected areas.

2. If such areas are to be protected, even reclaimed, several issues which have lead to their current status will need to be addressed. These issues make the GEF Project particularly timely and useful. Pollution is one problem. Inefficient and inappropriate land uses have resulted in accelerating human-related incursions and transformations threatening natural areas here. More benign land uses which are compatible with the natural resource base need to be encouraged, even as the tendency to high-grade for short term gain becomes increasingly evident with the dislocations of the transition to modern market economies. A mix of such appropriate land uses will shield the *sanctum sanctorum*—areas under strict protection. This Project is particularly timely for Polish foresters and ecologists who will benefit

1/ These forests have become a major source of germplasm for the afforestation of the rest of Europe.

enormously from some of the modern approaches to biodiversity conservation and management emerging throughout the world.

3. An additional program to widen the protection program for the Bialowieza Primeval Forest was also identified. This program, whose estimated cost is $1 million would support a biodiversity management program to protect the forest ecosystem on the abutting 87,000 ha, located in the Republic of Belarus (see Map 2). The specific investments and technical services to be supported under this program would be developed in the quarterly meetings of the Joint Scientific Committee (Poland and the Republic of Belarus) to improve the management of the full area on both sides of the border. A separate Grant Agreement would be developed with officials in the Republic of Belarus (see Annex 8).

Rationale for GEF Involvement

4. This project supports the environmental policy framework. An environmental strategy [2] for Poland was completed by the World Bank in August, 1991. The document suggested that relatively untouched and unpolluted areas as the Bialowieza would constitute cost effective foci for conserving living natural resources. Also, applied research efforts to re-establish the forest zones (with understory) in the higher elevations of the Sudety Mountains were also recommended. This Project is also consistent with the goals of the Ministry as confirmed during the Appraisal. The southwestern Sudety Mountain area and the Bialowieza forests of Eastern Poland are important zones of ecological biodiversity. These key endangered forests are sites *of international importance being among Europe's largest expanse of remaining natural forests and areas of high endemism.*[3]

5. The GEF project has been accorded high priority by Government and is being linked with a possible Bank financed Forestry Development Project now being identified and prepared. However, funds are not available from government sources to carry out the work proposed here and the government does not want to borrow external resources for it at market rates of interest. The GEF project would provide the Government with urgently needed support to assess the environmental damage to Poland's forests and to support urgently needed biodiversity protection in the Sudety Mountains encompassing the Karkonosze National Park in southwestern Poland and in the Bialowieza (BPF) border area with the USSR.

6. There is a global environmental benefit. Both the Sudety and the Bialowieza contain rare, endemic species found nowhere else. Of particular significance as a model for many similar areas around the world is the attempt to treat in an integrated fashion, four major levels of biodiversity—at the molecular level with *ex-situ* genome conservation (e.g., gene bank), at the species level (e.g., research to delineate the seasonal ranges of species such as the European bison and lynx), at the habitat or community level with the identification and incorporation of currently unprotected forest associations, and at the landscape level with the buffer zone land use planning. The activation of the MAB will integrate this Project with activities at other MAB sites around the world. Both the Karkonosze and the Bialowieza are shared transboundary ecosystems, and the models developed for their integrated management will be of

---

2/ See also: Ministry of Environment Protection, National Resources and Forestry. Natural Environmental Policy of Poland. (1991, Warsaw, 21 pp).

3/ Endemism means that the population of a plant or an animal species which is isolated to some extent has formed a common gene pool by the interaction of the ecological factors with the genetic structure of the population during evolution. The result is an indigenous population being highly adapted to the site and containing genetic structures different from populations within the range where gene flow is frequent. An area of high endemism in an area, in which many populations of plant or animal species occur showing this mode of evolution and adaption.

international utility. The global significance of the two areas initially selected is confirmed and supported by their designations by UNESCO and the World Wildlife Fund (International) (being identified among the "existing ecological bricks" of Europe).

7. This Project will constitute a contribution to the GEF Portfolio. In its efforts to preserve global biodiversity, the GEF will encounter more of the transnational issues being addressed in this Project. It will also frequently encounter the need to balance *in-situ* and *ex-situ* preservation with innovative techniques. It will, in particular, face the conflicting demands of a resident population which can be a force either for further eroding biodiversity or a potent ally in its preservation. In these ways, the progress of this Project will be germane to ongoing activities of the GEF and have utility as a test bed. These will not be a one-off or eccentric set of activities.

Project Objective

8. The proposed GEF project will initiate programs to conserve the biodiversity of key endangered forests and will provide institutional support to the Ministry of Environment, Natural Resources and Forestry to undertake biodiversity conservation management activities, including the establishment of a forestry gene bank.

9. The Project would start with an ecological perspective and would investigate both *in-situ* and *ex-situ* options to conserve biodiversity. This would entail a program approach involving scientific study of the flora and fauna of the selected key endangered forests, including threats to their viability from human pressures and detailing options to ensure the conservation of species considered at risk.

Project Description

10. The GEF operation would support Poland's effort to protect its forest ecosystems. Selection of the parks, reserves and zones under the proposed project are based on agreed conservation priorities. Project investments include:

(i) institutional support to the Ministry of Environment, Natural Resources, and Forestry to enable it to carry out its biodiversity conservation management activities including the establishment of facilities for *ex-situ* conservation of genetic material in the Sudety forests of southwest Poland and for a biodiversity protection program for Bialowieza Primeval Forest ecosystem of Eastern Poland; and

(ii) investment in programs to preserve endangered forest ecosystems for biodiversity conservation through provision of funding for pilot investments in air and soil monitoring equipment, a forest genebank and related archival nursery equipment, land planning (GIS) equipment, air and soil monitoring equipment (fixed and mobile), protected area planning, financial support for a program for supporting transition to ecological agriculture for farmers operating within the BPF, and professional development, training and consulting services.

Agreed Actions

11. During negotiations on the Grant Agreement, assurances were obtained as follows:

a) **Gene Bank.** Prior to disbursement on the gene bank component of the Project, detailed final designs for the civil works and a final list of equipment would be submitted to the Bank for approval. Supervision of the construction and management of the gene bank would be undertaken by the State Board of Forests. Assurances would also be sought that the annual operating costs for the proposed gene bank, estimated at $100,000 annually would be provided by MENRF.

b) **Joint Scientific Committee.** The MENRF shall establish a Joint Scientific Committee no later than February 28, 1992.

c) **Grant Effectiveness.** The Grant would be declared effective upon submission of documentation satisfactory to the Bank that the Project Manager has been appointed and a separate account, subject to internationally accepted auditing standards, has been established.

d) **Accounts.** A separate account would be established in a commercial bank for the MENRF prior to disbursement of the grant. This account would be audited annually by an auditing firm acceptable to the Bank.

e) **Project Management.** A Project Management Unit (PMU) would be established in MENRF, at the level of the GDSF, prior to disbursement of the grant. The PMU would be under the supervision of the Project Manager, appointed by the Minister, and be acceptable to the Bank. The PMU would be responsible for the management of the Project Account, for coordinating Project operations and expenditures and for submitting quarterly progress reports to the Bank.

Benefits

12. The principal benefits are to protect two zones of substantial ecological international importance. The Bialowieza Primeval Forest is unique in Europe and a source of endemic biodiversity. The Sudety Mountain Forests, while badly impacted by air pollution, still retains significant international sources of forest and understory biodiversity. The Project would undertake a number of integrated programs to further protect the biodiversity in both areas, providing a rich resource of plant material for future generations.

13. Innovation is fostered by the integration of the various levels of biological diversity to address issues in conservation planning (as described above), by the unique (for Poland) collaboration of groups from a variety of interests in addition to foresters in issues of forest planning and management, for the balancing of *ex-situ* with *in-situ* approaches to biodiversity conservation, and by the use of consultation at the local level in the identification of viable land uses compatible with the preservation of endangered natural systems. Technically, the Project will break new ground in the development of the preservation of genetic material and in the applications of GIS and simplified methods of digital processing.

14. The Project is designed for sustainability. The long-term viability is achieved through the building of institutions within the Ministry, including some which are relatively disenfranchised but

important to biodiversity such as the Department of National Parks. Another facet which is designed to ensure a Project legacy are the training and professional development components. The goal of sustainable revenue generation activities based on consultation with residents who would engage in these activities is another way of ensuring longevity of interventions. These activities are premised on their compatibility with the preservation of biodiversity. They include nature and culture-based tourism, the selling of minor forest products, harvesting game, balancing uneven-aged, small-scale forest production with natural regeneration, and other economically sound and environmentally compatible activities.

15. There is a demonstration value and replicability through the use of integrated planning, of new technologies, of bilateral organizational structures which foster international resource management approaches, this GEF Project is going to be evolving solutions for conserving biodiversity. As a test of this approach to regional issues in biodiversity, the Project can have significant demonstration value.

Risks

16. The major risks are primarily technical and managerial, technical in that the basic approach to biodiversity protection in the Sudety Mountains and the Bialowieza Primeval Forest be further delayed, resulting in continuing biodiversity degradation of the two ecosystems, and managerial in that Government salaries are extremely low resulting in the top scientists and technicians expected to manage and implement the project leaving Government and Institute service. The project would mitigate these risks by implementing this project in 1992 and 1993 to initiate this protection program and by providing funding to support the work of the key scientists and technicians working on the project.

Environmental Assessment

17. The Project has been reviewed by the Regional Environment Division and it has been placed in the environment screening category "B". Monitoring and evaluation are built into the terms of reference for the Project Management who will be reporting on a quarterly basis. Another node of Quality Assessment and Control is the proposed small secretariat at Bialowieza to foster its UNESCO designation as a "Man and the Biosphere" Reserve (MaB). There are built-in quality control and monitoring elements because of the research which will be published in peer-reviewed journals of international quality. The international Joint Scientific Review Committee will review the Project and its progress on a semi-annual basis.

Attachments

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT
COST ESTIMATES
(Current US$ Thousands)

	US$ in Thousands		
	Local	Foreign	Total
A. Bialowieza			
1. Conservation of Biological Diversity	68	330	398
2. BPF Protection and Management	144	335	480
3. Geographical Information System (GIS)	0	192	193
4. Ecological Farming in Buffer Zone	98	109	207
5. Pollution Monitoring & Mitigation	88	113	200
6. Coordination w/ Republic of Belarus	25	0	25
7. Professional Development & Training	0	50	50
8. Establishment of a Bialowieza Foundation	0	25	25
Sub-Total	**423**	**1,154**	**1,578**
B. Sudety			
1. Assessment and Seed Collection	240	175	415
2. Genebank	1,425	1725	3150
3. Pollution Monitoring	0	250	250
4. Professional Development & Training	0	30	30
5. Joint Czech/Polish Committee	0	25	25
Sub-Total	**1,665**	**2,205**	**3,870**
C. Project Management Unit	**100**	**10**	**110**
D. Joint Scientific Review Committee	**0**	**30**	**30**
Total BASELINE COSTS	**2188**	**3399**	**5588**
Physical Contingency	103	149	252
Price Contingencies	339	35	373
Total PROJECT COSTS	**2,630**	**3,583**	**6,213**

SCHEDULE B

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT
ESTIMATED SCHEDULE OF DISBURSEMENTS OF GEF GRANT

PROCUREMENT METHOD
(US$ Thousands)

	Items	Procurement Method			
		LCB[1]	IS & DP[2]	Other[3]	Total
(1)	Civil Works (genebank)	1580	—	—	1580
		(460)	—	—	(460)
(2)	GIS, Air Monitoring and Supporting Equipment, including equipment for genebank	—	3000	—	3000
		—	(2400)	—	(2400)
(3)	Technical Assistance	—	—	1240	1240
		—	—	(1240)	(1240)
(4)	Salaries, Operations and Maintenance	—	—	400	400
		—	—	(400)	(400)
	TOTAL	**1580**	**3000**	**1640**	**6220**
		(460)	**(2400)**	**(1640)**	**(4500)**

NOTE: FIGURES IN PARENTHESIS ARE GEF GRANT
1/ Local Competitive Bidding for civil works for gene bank.
2/ International Shopping and Direct Purchase.
3/ Includes services procured under Bank's consultant guidelines.

DISBURSEMENT

	Items	Disbursement	
		Amount (US$ million)	% Financing
(1)	Civil Works	.46	30 % of Total Expenditure
(2)	Goods and Equipment	2.2	100 %
(3)	Technical Assistance	1.1	100 %
(4)	Salaries, Operations & Maintenance	.37	100 %
(5)	Unallocated	.37	
	TOTAL	4.5	

SCHEDULE B
(continued)

ESTIMATED IBRD DISBURSEMENTS

	IBRD FISCAL YEAR		
	1992	1993	1994
Annual	1.0	2.0	1.5
Cumulative	1.0	3.0	4.5

Closing Date: October 31, 1994

SCHEDULE C

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT
TIMETABLE OF KEY PROJECT PROCESSING EVENTS

(a) Time Taken to Prepare ..... 5 months

(b) Prepared by ..... Ministry of Environment with Bank Assistance

(c) First Bank Mission ..... April 1991

(d) Appraisal Mission Departure ..... October 1991

(e) Negotiations ..... December 10 - 12, 1991

(f) Planned Date of Effectiveness: ..... January 1992

(g) List of Relevant PCRs and PPARS ..... None

POLAND

FORESTRY BIODIVERSITY PROTECTION PROJECT

Table of Contents

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

TECHNICAL REPORT

I. INTRODUCTION

1.01 The project is the first phase of Poland's long term effort to protect its endangered forest ecosystems. It will initiate programs to conserve the biodiversity of key endangered forests (Sudety and Bialowieza Primeval Forest) and will provide institutional support to the Ministry of Environment Protection, Natural Resources and Forestry to undertake biodiversity conservation management activities, including the establishment of a gene bank and supporting archive nurseries.

1.02 The forests of Poland are among the most important and unique in Europe.[1] The montane forests of the southwest, and the last remnant of the vast lowland European forest now found only at Bialowieza are the most important of these disappearing biological treasures. These areas remain because of the protection afforded their fauna by regal hunters since the tenth century. However, this rationale has disappeared with the royalty, to be replaced by a broader appreciation of the values of such rare resources:

- they offer a glimpse at the environmental "baseline" in which European civilization was forged;
- they house threatened and endangered species and system processes found nowhere else;
- they are at the margins of distribution for several commercially important forest species such as Norway spruce, and can clarify questions of adaptability important to their management;
- they are the only sites of some genetic material of importance (e.g. the best adapted trees, the healthiest soil fauna and flora) to renewable resource management, and the restoration of polluted natural systems;
- they are still of a viable size and can therefore offer the best opportunities to explore the preservation and management of natural forests in Europe;
- they are a recognized priority of the Government and people of Poland, as well as of international conservation organizations such as the WWF (a "Green Lung of Europe",) and UNESCO (as a designated "Man and the Biosphere" site);
- they can serve as models for the planning and management of shared international resource systems. The initiative recently taken by a local joint bilateral (Poland and the Republic of Belarus) technical group can constitute a model which is of benefit to other such protected areas.

1.03 If such areas are to be protected, even reclaimed, several issues which have lead to their current status will need to be addressed. These issues make the GEF Project particularly timely and

---

1/ These forests have become a major source of germplasm for the afforestation of the rest of Europe.

useful. Pollution is one problem. Inefficient and inappropriate land uses have resulted in accelerating human-related incursions and transformations threatening natural areas here. More benign land uses which are compatible with the natural resource base need to be encouraged, even as the tendency to high-grade for short term gain becomes increasingly evident with the dislocations of the transition to modern market economies. A mix of such appropriate land uses will shield the *sanctum sanctorum*—areas under strict protection. This Project is particularly timely for Polish foresters and ecologists who will benefit enormously from some of the modern approaches to biodiversity conservation and management emerging throughout the world.

1.04 In some parts of southwestern Poland, close to the so called "Black Triangle", severe damage has already occurred at the higher elevations and losses are spreading. Still, the losses are not irreversible. These forest resources are vital to the quality of life in Poland. The Government and the people of Poland and many in the world community are concerned at the potential loss of critical flora and fauna in parts of Poland's forests. As a result, the Government turned for assistance from the Global Environmental Facility to assist in the identification, development and financing of key biodiversity protection and management measures. Even though there is a sense of urgency to start this project, there is still time to be effective in protecting the majority of the biological systems now being threatened.

1.05 The Project would investigate both *in-situ* and *ex-situ* options to conserve biodiversity. This would support a program approach of scientific study of the flora and fauna of the selected key endangered forests, including threats to their viability from human pressures and detailing options to ensure the conservation of species considered at risk.

1.06 The project has been accorded high priority by Government. It is being linked with a possible Bank financed Forestry and the Environment Project now being prepared for Bank consideration in FY93. This initial GEF operation is expected to be the first phase of a longer term World Bank and donor agency involvement with the forestry sector of Poland. However, sufficient funds are not available from government sources to carry out the urgent biodiversity protection work proposed here. The government does not want to borrow external resources for it at market rates of interest. This GEF project would provide the Government with urgently needed additional finance to develop a program to protect the biodiversity of plants and forests in the Sudety Region of Southwestern Poland and the Bialowieza Primeval Forest and its buffer zones in Eastern Poland (see Map 1).

1.07 An additional program to widen the protection program for the Bialowieza Primeval Forest was also identified. This program, whose estimated cost is $1 million, would support a biodiversity management program to protect the forest ecosystem on the adjoining 87,000 ha located in the Republic of Belarus (see Map 2). The specific investments and technical services to be supported under this program would be developed in the quarterly Bialowieza meetings of the Joint Scientific Committee (Poland and the Republic of Belarus) to improve the management of the entire Bialowieza area on both sides of the border. A separate GEF Grant Agreement would be developed with officials in the Republic of Belarus no later than July, 1993. Details are provided in Annex 7.

II. THE FORESTRY SECTOR AND THE ENVIRONMENT

A. Forest Resources

2.01 The Polish forests cover an area of 8.7 million ha, corresponding to 28 percent of the national territory. The dominating species are pine and larch (69 percent), spruce (6 percent), fir (3 percent), beech (4 percent), oak (4 percent), and other broadleaves (14 percent). The forest area is scattered over the country. The state forest areas are reasonably consolidated from the management point of view, but the average size of private forests is only one hectare. The overall age structure of the forests is skewed, with a scarcity of young and old ages, if present rotations are maintained. The dominating species, pine, spruce, oak, and beech, are well suited to enable Poland to expand its position as a producer of high quality, high value wood and wood products.

2.02 The bulk of the forests in Poland (83 percent) are publicly owned. Of the total forest area, 79 percent is state forest under the management of the General Directorate of State Forests. The remaining public forest area is national or municipal park land. Privately owned forests comprise 17 percent, owned almost entirely by individuals. The fact that one organization controls the nationwide forests could be a positive factor for the strategic planning of forestry.

2.03 The basic law on state forest management (1949), together with laws enacted on game management (1959), the management of private forests (1973) and the protection of forest lands (1980 and 1982) provide the legal instruments for forest policy and management in Poland until very recently. On August 30, 1991, a new, consolidated forest law was passed. It legislates protection, preservation, and expansion of forest areas. This new law will be effective on January 1, 1992.

2.04 The General Directorate of State Forests (GDSF), located in the Ministry of Environment Protection, Natural Resources and Forestry, is responsible for the management of the forestry resources of Poland. Before January, 1990, the forest resource was managed by the Ministry of Agriculture, Forestry, and Food Economy. Wood processing industries are, since 1985, handled by the Ministry of Industry, when the Ministry of Forestry and Woodworking Industries were dissolved and the two responsibilities were split between the Ministries of Agriculture and Industry.

2.05 The GDSF manages all state forests and supervises private forests. Seventeen regional District Boards of State Forests, comprising 402 forest Superintendencies, are self-financing, legal entities. The District Boards are responsible for the operations in the state forests, including maintenance of the forestry, harvesting, transport, the establishment of nurseries, road and building construction, and other investments, as well as the supervision of private forests. Revenues earned by the sale of wood and other related services are partly retained by the District Boards. The District Boards allocate ten percent of their revenues for central administration. In addition, there are free-standing enterprises in the GDSF for the manufacture and repair of forest machinery.

2.06 The Government is reformulating its national forest management plans. Currently, there are 17 national parks (mostly in forest), a total of 985 nature reserves totalling 117,000 ha, and 2.3 million ha in protective forests, managed specifically to protect the environment, watersheds and wildlife. The balance, 6.2 million ha, is managed for wood production. A Rockefeller Foundation study reports that "at least one-half and perhaps up to three-fourths of all Polish forests show symptoms of decline or pollution damage".

B. Environmental Impact and Stress

2.07 The most serious threat to Polish forests is the heavy air pollution and the secondary pests to which the weakened trees are exposed. The main sources of environmental pollution are the complexes of the energy, steel and chemical industries. Polish emission levels are about 4.2 million tons/year of SO_2 and 1.5 million tons of NO_x emissions. The impact of pollution from neighboring countries is about equal to that of domestic sources.

2.08 In the 1980s, forests began dying in Poland, as well as in Czechoslovakia and Germany. During the period 1983-1988, the sanitation fellings [2] constituted 69 million cum, and there are still 12 million cum of dead trees requiring sanitation harvesting. In addition, a number of forest regions in Poland are suffering from excessive depositions of sulfur and nitrogen. A slight decline in foliage is observed in 54 percent of the forests, moderate decline in 18 percent, and severe decline in 2 percent of the forests of Poland.

2.09 Forests in Southwestern Poland are particularly effected. In this area, 26,000 ha of forests are dead. The Karkonosze area of the Sudety Mountains, located in this area, is included in the World Wildlife International (Austria) listing of "Ecological Bricks for our Common House of Europe" (1990). The southwestern Sudety Mountain area is an important zone of ecological biodiversity. Much of the forest in the rest of the country is also beginning to show stress from local air and water polluting industries.

C. Forest Biodiversity

2.10 In this destructive climate, concern is rising for the maintenance and conservation of biological diversity. Once considered an academic subject, there is now a realization that the maintenance of biological diversity influences and impacts the quality of life, productivity and stability of society.

2.11 There are many definitions for biodiversity but they all have the following common elements: biological diversity includes all living elements and their processes in some spatial arrangement; a plot, valley, a mountain or a country. Biological diversity is assessed at the genetic, species and community level. More recently, the landscape level has become the fourth feature. Biological diversity also has some additional general features. These are living systems and as such are dynamic and ever changing. They are not static in their composition nor development over time. Biological diversity refers to both natural and man-made biological systems. In referring to biological diversity, one must consider more than mere numbers of individual components, but must consider intra-and interrelationships, interactions and processes. Natural events such as floods, droughts and natural fire all shape, impact and change the dynamics of natural diversity, but rarely shift the stability of natural system for very long periods of time. In contrast, man's influence directly or indirectly can alter permanently the stability of natural diversity.

2.12 In central Europe, including Poland, the natural systems are subjected to a series of ecological risks including excessive inputs of toxic pollutants, pesticides and nutrients. Direct physical destruction of biological systems are taking place by land clearing, compaction, poor harvesting procedures and

---

2/ Sanitation fellings are the harvesting of tress which are dead or whose growth is so stunted by pollution or disease that cutting is necessary so that the remaining trees have room in which to grow.

industrial waste. All of these activities are drastically shifting the composition and structure of biological systems to an unstable condition. For example, the forests of Poland are currently receiving approximately five tons of pure sulphur per km^2 of forest.[3] In the mountain soils of the Sudety, this has contributed to a lowering of the PH from 3.2 to 2.6 since 1980. This has resulted in a major shift in available nutrients, soil structure, micro-organisms and the ultimate rapid decline of forest ecosystems on some 20,000 ha in the Sudety region which totals 234,000 ha.

2.13 As bad as the situation appears, the declining forest health situation is not uniformly distributed across Poland. As classified by the Polish National Program, 24.3 percent of state forest districts are situated in areas of ecological hazard. In the extreme cases, such regions as Wroclaw (60.5 percent), Katowice (33.3 percent) and Lublin (30.8 percent) have areas of high ecological risk. By contrast, Bialystok, Pila and Olsztyn are situated outside the most serious areas of ecological risk. Current assessments suggest that 24.4 percent of coniferous forests are essentially undamaged compared to 46.6 percent of broad leaved forests. Even in the damaged forests, there are still ample opportunities to protect the remaining biological resource. There is, however, a real sense of urgency since in high hazard areas, individual plant populations are disappearing or being rapidly reduced. This includes the dominant woody plants as well as other flowering plants.

2.14 There are a number of strategies for the conservation and protection of biodiversity. The choice of strategy or strategies will depend on the nature of the biological system to be protected. In Poland, there is an array of conditions that must be dealt with. As noted, some systems are seriously impacted and others are not. In addition, in the forested regions, there are both natural and man made forests. Some form of forest management has been practiced for approximately 200 years in Poland. An element of this management has been the movement by man of tree seeds from one region to another. Thus conservation programs for both natural and highly managed systems would be considered in this program.

2.15 There are two basic forest conservation systems: *in-situ* (conservation in place) and *ex-situ* (conservation done outside the target area). Whenever possible, *in-situ* management is the most desired. But as noted with the high hazards, especially air borne toxins in some regions of Poland, this *in-situ* practice is neither feasible nor desirable, especially in the Sudety. Yet, where possible, *in-situ* strategies will be applied in this project. In this way, both major and minor elements of the various biological systems can be protected as a unit. There will be less chance of unintentional loss of essential biodiversity with this practice.

2.16 When *in-situ* practices cannot be applied, then the Project will support two strategies of *ex-situ* conservation. These include the establishment of plantings of plant material to be conserved in areas of little or no hazard and the storage of seeds or plant parts in a long-term storage facility (gene bank).

D. Priority Areas for Protection.

2.17 Polish forestry and environmental specialists have identified two priority forest areas for immediate attention under the proposed biodiversity protection program. In east-central Poland (See Map 1), the internationally significant Bialowieza Primeval Forest would be further protected. The Sudety

---

3/ Lonkiewiez et. al, 1990. *National Report on Forestry in Poland for 10th World Forestry Congress*

Mountains in southwestern Poland (where the biodiversity is threatened with extinction from air pollution) would be included in the project.

2.18 **The "Bialowieza" Primeval forest area** on the Polish/Russian border covers some 145,000 ha., one of the last remaining natural assemblages of biodiversity in central and eastern Europe containing unique species of native plants, forests, and animals. Of the 145,000 ha, 58,000 is in Poland and 87,000 ha in the Republic of Belarus. The area is a UNESCO designated "Biosphere Reserve" and was placed on the World Heritage List in 1979. Some unusual and spectacular species which represent relict and endemic fauna and flora include the European bison, lynx, wolf, moose, masked shrew and numerous varieties of orchids and other flora.

2.19 This forest is also of unusual ecological value because it lies at the distributional limits of several important species. The adaptive tolerance and ecological amplitude of species are often studied at the extremes of their range. Such variability is also expressed in the genome of each species. This is a critical consideration for species such as Norway spruce and oak which are experiencing extreme environmental stress and require study and experimentation. The Bialowieza Forest is a significant "natural" laboratory waiting to be used in the development of packages of restoration and mitigation activities in other regions of Poland. However,the Bialowieza Primeval Forest ecosystem in eastern Poland is also beginning to show stress from local air (particles from area coal burning industries, apartments and homes) and local water polluting industries. This endangered forest is a site *of international importance being among Europe's largest expanse of remaining natural forests and areas of high endemism.* Its protection has considerable international importance.

2.20 The international nature of the forest and the importance of coordinated management also renders the Bialowieza forest a useful "model" for developing coordination mechanisms essential to the survival of such transnational resources. For example, Poland shares extraordinary pockets of forest biodiversity with the Ukraine and Czechoslovakia in the Bieszcady region. The movement of animals, propagules, pollutants and other important management variables does not recognize the political boundaries, and would benefit from coordinated management of, for example, seasonal ranges. In such a way, the large size of the system can be capitalized upon in protecting it, as well as managing its conservation. Currently, little is known about conditions on the Belarus side (See also Annex 7).

2.21 **The Sudety Mountains.** Poland's mountain forests [4] are located along the Czechoslovakian border, in the Sudety, Bieszcady and Carpathian mountain regions in the southwestern, south and southeastern parts of Poland. In the Sudety mountain region is the Karkonosze National Park, numerous "health spas" and a rare mix of recreational opportunities. The forests in this zone in the past consisted at one time of extensive stands of both native and introduced Norway spruce, larch and Scots pine at the lower elevations with a rich mixture of broadleaved species. Some 26,000 ha of the forest ecosystems on the highest areas of this area have now been destroyed by air pollution, impacting watershed management, recreation, and wildlife.

2.22 The region where Poland, Czechoslovakia and Germany come together is known in environmental circles as the **"Black Triangle"**. Here, in a relatively small area, are 16 large coal burning

---

4/ Here the *mountain forests* are meant. *High forests* is a technical term and means forest consisting of tress grown from seed (e.g., natural regeneration or from artificial plantings. The opposite term is *coppiced forest*, that is forest consisting of trees, which have grown from re-sprouts of the stumps after felling. The latter ones are often crooked and slow growing.

power plants and smelters. It is also the region of the highest industrial pollution in Poland. There is evidence that air pollution has influenced directly the tree mortality and increased the presence and spread of insect pests and fungal diseases. For example, larch bud moth which appeared in large numbers in 1977, damaged an area of approximately 30 km^2 and certainly was a major contributor to the complete deforestation of some of the mountain regions. Root and stem diseases have also played a role in killing weakened trees. The result has been essentially total deforestation in the higher elevations, extensive deforestation at mid-elevations and weakened stands at lower elevations.

2.23 Recently, an agreement was reached between Germany, Poland, Czechoslovakia and the EC to undertake an urgent program to reduce pollution in this Triangle. Protection of the forest resource and forest biodiversity in this zone has featured importantly in the initial working discussions of the participants. The proposed GEF project component in the Sudety would contribute significantly to the biodiversity protection and more generally to the scientific understanding of the pollution impact on the forests of the Triangle.

2.24 The forest destruction in the Sudety is both intensive and serious, yet not entirely hopeless. Scattered throughout the Sudety Mountains are still some remaining forest stands of Norway spruce, larch, Scots pine and silver fir in various stages of decline. Both native and planted stands can still be found scattered at mostly mid and lower elevations.

E. Proposed Protection Strategy

2.25 The Government has designed a program to cover the biodiversity protection needs in both Bialowieza and the Sudety which will be supported by the proposed project. At Bialowieza, however, there would be added scientific advantages in extending the program to cover the part of the Bialowieza Primeval Forest which lies in the Republic of Belarus. A relatively small (US$1M) but scientifically important follow-up component covering this area has, therefore, also been identified for subsequent implementation should circumstance permit the GEF to fund such an activity on the Belarus side of the border. The implementation of the component is not essential for the success of project appraised in this respect, but it is recognized that there would be considerable scientific advantage of its implementation. The program has thus two phases:

1) **The Proposed Project** which has been appraised in detail and would support investments (including consulting services) to the Polish Ministry of Environment Protection, Natural Resources and Forestry to carry out its biodiversity conservation management activities in Poland. The project would include the establishment of facilities for conservation of endangered genetic material from the Sudety forests of southwest Poland and for further biodiversity protection of the Bialowieza Primeval Forest area of eastern Poland. Specific investments to be funded include a gene bank, greenhouse and nursery equipment, seed and vegetative collection equipment, air and soil monitoring equipment (fixed and mobile), a program for ecological farming in the project zone of Bialowieza, land use planning equipment (GIS), buffer zone protection and professional development, training, and consulting services.

2) **A separate GEF operation** ($1 million) was identified during appraisal. It would support a biodiversity management program to protect the 87,000 ha of the Bialowieza Primeval Forest which is in the Republic of Belarus. A detailed investment program to suggest air

and water monitoring, buffer zone planning and establishment, wild game management, and visitor transport is being identified by the recently established Joint Polish/Belarus Scientific Committee on the Bialowieza Primeval Forest and finalized by officials in the Republic of Belarus. The final details of this Belarus investment program and the organization for the investment of the funds, as well as the legal arrangements of this component, would be submitted to the GEF for final review and approval prior to actual disbursement.

2.26 It is noted that another biodiversity project covering the needs of the Czech and Slovak Republic is currently being designed and should this proceed, a useful interface with the Sudety activities on the Polish side could be achieved.

III. THE PROJECT

A. Summary Description

3.01 The GEF operation would be the first phase of support to Poland's longer term effort to protect forest ecosystems. Selection of the parks and reserves under the proposed project are based on agreed conservation priorities. The project would:

- **Conserve the Biological Diversity of the Forest Ecosystems of the Bialowieza Primeval Forest (BPF)** by stabilizing and improving the natural regeneration, by the development of a protection and management program, by designing a program for mitigating local air and water pollution, by fostering ecological agriculture on farms operating within the BPF, and by furthering cooperation with the Belarus management of the abutting forest ecosystem, and

- **Foster the protection of the remaining biodiversity in the Sudety Mountain forest ecosystems** by identifying and collecting endangered seed and vegetative materials, for storing the collected seeds and vegetative materials in a genebank and related archival nurseries (*ex situ*), undertaking intensified air and water pollution monitoring of the ecosystem and finally by mapping (using GIS) the zone for establishing the criteria for seed collection in light of the results of the expanded air pollution monitoring.

B. Detailed Project Description

1. Conservation of Biological Diversity of the Forest Ecosystems of the Bialowieza Primeval Forest

3.02 **Introduction.** The BPF represents the largest natural remnant of the vast lowland forests which covered the greater part of the European continent. Despite human activity since Neolithic times, it has maintained in parts its basic primeval conditions. The current natural richness and variation of the flora of BPF provides a unique opportunity to strengthen the existing protected core area of 4,747 ha of the BPF by better game management, protection from local pollution and an expansion of the protected area.

3.03 Immediate needs includes a more in depth analysis of the scale of pollution or related biotic or abiotic hazards to communities and individual plant species. This may be especially needed for the dominant keystone tree species such as oak, ash, and Norway spruce as well as sensitive plant communities. Early pollution detection is essential before losses become permanent. *In-situ* conservation of a number of natural plant communities is well underway in the BPF. However, such is not the case for areas outside the protected core of the BNP (see Map 2). Even within the BNP, some individual tree species or even individual trees as well as selected understory plants and associated fauna are threatened. To maintain the threatened individuals, both *in-situ* and *ex-situ* conservation strategies are proposed. For the dominant woody species, individual trees 200 years or older will be the highest priority for collection and preservation of genetic material. When *in-situ* methods are not available nor appropriate, then a series of *ex-situ* methods including clone collections from trees 200 years or older will be initiated. Seed production orchards from these clones for each natural site in the forest will be established. Seed production orchards from seedlings will be established to ensure future sources of natural material for the various sites. Long term storage of seed and pollen will be also conducted.

3.04 Where there is adequate knowledge, a similar program would be initiated to maintain herbaceous plant material. Every effort will made to maintain natural communities. This will ensure that the trees selected for protection are part of the natural population. The major tree species that compose the overstory include Scots pine, Norway spruce, European white oak, Sessile oak, European ash, and three native elm species. In addition, the initial sample will also include 11 species of woody shrubs and appropriate other flowering plants that are elements of natural communities.

3.05 **Enhancement of Natural Regeneration in the Bialowieza Primeval Forest.** ($430,000) To accomplish the objectives of protecting existing natural plant communities in the Forest and to strengthen the natural biodiversity in the Park, the following activities would be supported under the GEF project:

Risk assessment of Pollution Load on Individual Sites. ($165,000)

In order to determine the pollution load on individual plant communities both in the BPF and the buffer zone, a mobile automatic air and soil monitoring station is required. To determine the impact of pollution on individual woody and herbaceous plants reproductive systems, a non-destructive x-ray sampling machine is needed. To manage and process the data from the risk assessment activity, a high powered personal computer with cartographic plotter is necessary.

Seed and Plant Parts Collection and Storage. ($85,000)

To ensure that only native trees are employed in both maintenance and restoration in BPF and BNP, specialized sampling, collection, and small-scale extraction equipment is required. In the case of forest trees, only very large trees 200 years or older will be sampled (to ensure their native character). To ensure that this material is viable at some future date, long term low temperature storage is required for seeds, pollen, and plant parts.

***In-Situ* Conservation of Native Populations.** ($10,000)

Conservation of native populations will be maintained in part by the establishment of common gardens in their native sites in order to procure seeds for future restoration activities. A 1.2 ha clonal seed production stand will be developed for maintaining the progeny from 200 year old or older Scots pines.

Determination of Genetic Diversity. ($50,000)

It is now feasible to determine the genetic structure and diversity of selected individual plants, as well as populations by means of iso-enzyme scanning and separation equipment. Working closely with associated Universities in Poland, various plant populations will be individually identified through these methods.

Technical Equipment Support for Field and Laboratory Activities. ($100,000)

An array of field data including temperature, moisture, irradiation, and wind instruments are required on a routine basis to complete field measurements. In order to protect sensitive lab equipment and ensure quality laboratory data, electric power stabilization equipment is necessary.

Professional Development and Training. ($20,000)

To ensure that current concepts of biodiversity are applied and equipment is properly employed, additional professional and staff training is required. Such activities include on-site training, seminars, and attendance at professional meetings inside Poland and externally.

3.06 **Primeval Forest Protection and Management.** To ensure, to the degree possible, the protection of a viable and complete primeval forest at Bialowieza, five activities would be supported under the GEF Project (details given in Annex 2):

The Expansion of Protected Areas to Include Remaining Natural Associations. ($22,000)

The viability of such a small area needs to be further protected. More than the current 35 percent of the natural forest associations needs formal protection. The Project funds will support an inventory and the costs of the inter-Ministerial transfer (from the Forest Service to the National Parks Department of the Ministry of Environment Protection, Natural Resources, and Forestry) of remaining parcels of rare forest systems (See Map 2).

Conservation Planning. ($112,000)

The BPF will function to insulate the strictly protected areas of remnant natural forest ecosystems from incompatible land uses and accidental introduction of exotic species. It will also permit the continued existence of native species, such as bison, wolf, and some birds whose ranges exceed the area (4,747 ha) under strict protection (Map 2). In keeping with the Man and Biosphere designation, uses which do not compromise the natural forest ecosystem, but which afford residents of the area economically attractive activities will be carefully planned and zoned. Project funds will support an inventory of public knowledge, desires, capabilities and needs, the development of supporting data and descriptions of candidate land uses, zoning and mapping, and a training/education component.

Computer Assisted Mapping (GIS). ($205,000)

Because the changes and impact on species and communities are uneven and to various degrees of significance in terms of stability of the system involved, there is an urgent need to remap the BPF in terms of hazard assessment. Because of the complexity of the potential data base for such an assessment, a GIS (Geographic

Information System) would be included for data management under the project (see Annex 6).

Supporting Applied Research. ($224,000)

Because of the urgency of protecting the biodiversity of the BPF and the considerable information from three decades of research in the area, the identification of areas for protection can be made. However, not enough is known about the BPF ecosystem pattern and process to permit the designation of keystone species and other management elements important to the Conservation Plan, expansion of Protected Areas, and the projection of land use-related impacts. For example, a "protected area net" needs to embrace the seasonal ranges of important wildlife species. Knowledge of nutrient and chemical cycles will enable the natural restoration of abandoned marginal farmland. To achieve the biodiversity goals of the GEF project, some initial applied research has been designed in three topical areas of concern to support the other elements of the Project: social and economic studies of the demographic characteristics of residents, their attitudes and decision processes, and their uses of the natural resource base; forest pattern studies of ecosystem composition, distribution and structure; and studies of forest ecosystem processes which define the forest and will enable management and rehabilitation in the buffer.

The Application of Environmental Impact Evaluations. ($84,000)

Adapting existing protocols for the conduct of environmental (including social) impact evaluations will insure that appropriate uses are fostered in the buffer zone. Many of the problems which plague the BPF could have been avoided or mitigated with such procedures. A training element is included.

"Man and the Biosphere" Secretariat at Bialoweiza. ($52,000)

The Bialowieza Primeval Forest has been designated a "Man and the Biosphere" Reserve. The existing designation needs to be activated to provide the oversight, coordination, brokering and information dissemination activities which the innovations of this integrated approach to biodiversity protection require. An important element is the active participation of local NGO's. A very modest MaB Secretariat at Bialowieza will be started and supported through the GEF project.

End-of-Phase I Meeting and Transition. ($42,000)

The results of research, the public review of the Conservation Plan, and opportunity to incorporate results and reactions in an updated Plan will be achieved during a review/plenary meeting marking the termination of Phase I of BPF activities. This meeting is expected to be held in late 1993. The resulting plan will be the product of all parties of concern. It will constitute the basis of a package of future additional investments for the land uses compatible with biodiversity goals of the BPF.

3.07 **Pollution Monitoring and Mitigation in the Project Area.** ($232,000) The Bialowieza project area is impacted by both air and water pollution. Air and water monitoring within the project area would be carried out with project support and sources of both air and water pollution within and abutting the project area would be identified. Once these sources are located and identified, project funds would support the detailed engineering and designs for the installation of mitigation equipment to eliminate local

pollution impact on the project area (details are provided in Annex 2 (c)). One possible idea would be the conversion of coal-burning steam generation plants to wood-burning operation.

3.08 **Ecological Agriculture.** ($241,000) An estimated 450 small farmers, mostly part-time, operate farms within the Bialowieza Primeval Forest. Primary production focuses on basic grains (wheat, rye), forage crops, and potatoes. Dairy and pork production are the primary cash producers of most of the farmers, many who work as loggers in the abutting forest. In a small portion of the southern portion of the BPF, the use of chemical fertilizer and pesticides is forbidden. This project component would foster expansion of ecological farming practices and provide technical assistance and cash incentives as necessary to farmers to shift from chemicals to ecological agriculture. Funds from the project would support technical analysis of the impact in the Bialowieza Primeval Forest of changing from conventional farming methods to ecological chemical-free farming methods on small family farms on (a) farm yields, farm income, and farm employment; (b) soil, water, and product quality; and, (c) would estimate and compare the costs of these two farming systems on farms in the Bialowieza Primeval Forest (details given in Annex 5).

3.9 **Scientific Cooperation at Bialowieza with the Republic of Belarus in Forest Management.** ($25,000) Some 60 percent of the area of the Bialowieza Primeval Forest is in the Republic of Belarus. Regular meetings of local scientists from Bialowieza (Poland) and Belarus have begun to explore joint efforts in scientific forest protection and management as well as the exchange of scientific data on pollution sources, wildlife populations and foraging impacts, and mapping of possible future abutting protected reserves (Map 2). These scientific contacts would be encouraged under the Project with funds provided to support quarterly local scientific meetings at the Bialowieza Station. This initial work should contribute substantially to the proposed investment and technical support to be prepared for the Belarus zone of the Bialoweiza Forest ecosystem for which $1 million has been reserved for a separate, but complementary GEF project (see Annex 7).

3.10 **Bialowieza Primeval Forest Foundation.** ($25,000) To sustain the biodiversity protection program for the foreseeable future, a Bialowieza Primeval Forest Protection Foundation is proposed. The GEF would organize the legal and financial structure of such a Foundation and encourage contributions from eco-debt conversion resources and from bilateral and international (EC, Foundations, etc.) donors. Some $25,000 would be expended from the initial GEF Core Grant to develop the legal and financial underpinnings for the foundation, operating procedures and the terms of reference for its operation.

2. Sudety Mountains Biodiversity Protection Program

3.11 This area has been described in Chapter 2 above. Here it is both urgent and essential that seeds and plant parts be collected from the remaining stands in order to permit future restoration of these forests in a rational manner. The following strategy are would be supported under the GEF project:

a) **GIS Systems Mapping for Risk Assessment.** ($127,000) Employing both remote sensing, ground control and standard plots, cartographic displays will be prepared of the location and size of risk hazards to individual species and their populations. These displays will be developed utilizing GIS systems procured under the Project and located in the Project area. This analysis will contribute to establishing collection priorities.

b) **Development of Plans for Biodiversity Conservation.** ($48,000) The development of detailed plans and programs for the conservation of the major forest species, associated woody shrubs and herbaceous species are needed in order to identify priority needs.

c) **Seed Collection.** ($256,000) From as many of the stands that appear to be native, seeds will be collected. In some regions of the Sudety, non-native, but adaptive stands will be the source of the seed. Stands will need to be located in each of the major ecological zones. Mapping and seed collection criteria for these work have been developed by the Forest Service and are satisfactory. In addition to the dominant woody plants, seed collections of woody shrubs and herbaceous plants would be collected, stored and archived in order to be able to restore these plant communities over time.

d) **Vegetative Propagation.** ($47,000) Trees in declining stages of health will not normally produce seeds and if produced, the seeds often will be of lower vigor. In such a case, clonal material,i.e. branch tips will be collected and protected.

e) **Gene Bank.** ($3.5 million) It would be desirable to grow tree populations from the collected material in the appropriate Sudety regions in order to minimize selection pressure. However, because of the level of pollution both already in the soil, and still being produced in the air of the region, the seeds will need to be stored in the proposed gene bank (see Annex 2). Clonal material will need to be rooted and grown outside of the areas impacted by pollution. It is very unlikely that sufficient seeds can be collected from the high hazard areas for future use. Seed collections will be made in adjacent regions of lower hazard in the Sudety from each of the major ecological zones in order to have future material when there are gaps in natural plant material.

This material will also be stored in a proposed project gene bank for future restoration of the impacted Sudety forest zone. Using this clonal material, both rooted cutting and grafted seed production orchards will need to be established. These should be established in areas of low hazard in the appropriate ecological zone in the Sudety Mountain region. Funds for these seed production centers are provided under the project. The genebank facility will be combined with a commercial seed extractory and storage, and some of the physical plant will be shared. The portion of the costs associated with the commercial seed extractory will be financed by Government (detailed description in Annex 3). During negotiations assurances would be sought that the annual operating costs of this gene bank, estimated at $100,000 would be provided by MENRF.

f) **Air Pollution Monitoring.** ($250,000) These proposed biodiversity protection programs in the Sudety are based on the assumption that pollution will be reduced over time as plants are cloned or modified. In addition, there is indication that the pollution load is not evenly distributed over the whole region. In order to further the understanding of the pollution load, its distribution and composition, the pollution monitoring capabilities in the Sudety Mountains will be expanded by an international team from Holland, Norway and Sweden. The technical support and equipment for this work (approximating some $250,000) will be provided from bilateral sources in those

three countries. An agreement to provide this monitoring equipment was signed in October, 1991 between Poland, Holland, Norway and Sweden.

g) **Proposed Czechoslovakian/Polish Joint Scientific Sudety Mountains Committee** ($25,000) The need for a Joint Scientific Committee reflects the commonality of issues in the Sudety Mountains which is shared by the forest service authorities of both nations. A small sum is included in the project to cover the travel, subsistence, honorariums, and organizational and meeting costs for semi-annual meetings and necessary follow-up costs for work emanating from the work of the committee.

3. Professional Development and Training

3.12 The Project would provide for intensive professional development and training, both within Poland and externally. Key areas of focus would be on gene bank management, buffer zone protection, GIS mapping techniques, wildlife control and management in natural reserves, and ecological agricultural techniques.

4. Project Management Unit

3.13 A small unit would be organized in the GDSF, consisting of a project manager, and one assistant. The project manager would be responsible for the management of project funds, coordinating project operations and for the preparation of quarterly progress reports. To assist this unit, two part-time scientific advisers would be appointed to assist in the drafting of research contracts, and planning and reviewing research. Start up costs plus the operating costs of this unit ($110,000) would be supported for the first two years of the project.

5. Joint Scientific Review Committee

3.14 A Joint Scientific Technical Committee of six scientists, three internationally selected (forest geneticist, forest ecologist and land use specialist) and three from Poland in related disciplines would be established no later than February 28, 1992. The qualifications and experience of the members of this Committee would be acceptable to the Bank. The Chairman would be designated by the Ministry of Environment Protection, Natural Resources, and Forestry. The Committee would meet semi-annually to advise on the scientific progress under the Project. Expenses (travel, subsistence and honoraria for both Polish and external) would be supported from the Project ($30,000).

C. Proposed Project Costs and Financing

3.15 Estimated project costs are as follows (detailed project costs are given in Annex 1):

Table 3.1 PROJECT COST SUMMARY

	US$ in Thousands			Percentage Total	
	Local	Foreign	Total	Foreign Exchange	Base Costs
A. Bialowieza					
1. Conservation of Biological Diversity	68	330	398	83	7
2. BPF Protection and Management	144	335	480	70	9
3. Geographical Information System (GIS)	0	192	193	100	3
4. Ecological Farming in the BPF	98	109	207	53	4
5. Pollution Monitoring & Mitigation	88	113	200	56	4
6. Coordination w/ Republic of Belarus	25	0	25	0	0
7. Professional Development & Training	0	50	50	100	1
8. Establishment of a Bialowieza Foundation	0	25	25	100	0
Sub-Total	**423**	**1,154**	**1,578**	**73**	**28**
B. Sudety					
1. Assessment and Seed Collection	240	175	415	42	7
2. Genebank	1,425	1725	3150	55	56
3. Pollution Monitoring	0	250	250	100	4
4. Professional Development & Training	0	30	30	100	1
5. Joint Czech/Polish Committee	0	25	25	100	0
Sub-Total	**1,665**	**2,205**	**3,870**	**57**	**69**
C. Project Management Unit	**100**	**10**	**110**	**9**	**2**
D. Joint Scientific Review Committee	**0**	**30**	**30**	**100**	**1**
Total BASELINE COSTS	**2188**	**3399**	**5588**	**61**	**100**
Physical Contingency	103	149	252	59	5
Price Contingencies	339	35	373	9	7
Total PROJECT COSTS	**2,630**	**3,583**	**6,213**	**58**	**111**

Project Financing Estimated project financing plan is as follows:

Table 3.2 PROJECT FINANCING PLAN
(US$ Thousands)

	GEF Core Program		Government or Other Bilateral		Committed Bilateral Grants		Total			
	Amount	%	Amount	%	Amount	%	Amount	%	Foreign Exchange	Local
A. Bialowieza										
1. Conservation of Biological Diversity	430	100	0	0	0	0	430	7	350	80
2. BPF Protection and Management	537	100	0	0	0	0	537	8	358	179
3. Geographical Information	0	0	205	100	0	0	205	3	204	0
4. Ecological Farming	241	100	0	0	0	0	241	4	116	125
5. Pollution Mon. & Mit.	232	100	0	0	0	0	232	4	120	112
6. Coordination w/ Republic of Belarus	25	100	0	0	0	0	25	0	0	25
7. Professional Dev. & Training	50	100	0	0	0	0	50	1	50	0
8. Establishment of Foundation	25	100	0	0	0	0	25	0	25	0
B. Sudety										
1. Assessment & Collection	361	74	127	26	0	0	489	8	185	303
2. Gene Bank	2,403	68	1,132	32	0	0	3,534	57	1,829	1705
3. Pollution Monitoring	0	0	0	0	250	100	250	4	250	0
4. Professional Dev. & Training	30	100	0	0	0	0	30	0	30	0
5. Joint Czech/Polish Committee	25	100	0	0	0	0	25	0	25	0
C. Project Management Unit	110	100	0	0	0	0	110	2	10	100
D. Joint Scientific Review	30	100	0	0	0	0	30	0	30	0
Total Disbursement	**4,500**	**72**	**1,464**	**24**	**250**	**4**	**6,213**	**100**	**3,583**	**2,630**

3.16 Core financing for this project would be provided by the GEF ($4.5 million) and by the Government of Poland. Additional grant funds would support the provision of geographic information system capability (GIS) to provide computerized mapping support to analyze the existing biodiversity in the two project areas and to assist in planning conservation activities. There may be other important investments that would could attract cofinancing partners which would be identified. Civil works and equipment connected with the seed extraction and storage facility for production forestry, which will also be included in the same facility as the gene bank site, will be financed by the Government.

D. Procurement

3.17 Goods and equipment listed in Annex 1 would be carried out through international shopping with a minimum of three quotations from two different countries. Domestic civil works for the gene bank facility would be carried by local competitive bidding under procedures acceptable to the Bank. Bidding documents would be reviewed to ensure that they are satisfactory to the Bank. Consultant services would be obtained in accordance with the World Bank guidelines on the use of consultants. The estimated procurement plan is as follows:

Table 3.3 PROCUREMENT METHOD
(US$ Thousands)

	Items	Procurement Method			
		LCB[1]	IS & DP[2]	Other[3]	Total
(1)	Civil Works (gene bank)	1580 (460)	— —	— —	1580 (460)
(2)	GIS, Air Monitoring and Supporting Equipment (including equipment for gene bank)	— —	3000 (2400)	— —	3000 (2400)
(3)	Technical Assistance	— —	— —	1240 (1240)	1240 (1240)
(4)	Salaries, Operations and Maintenance	— —	— —	400 (400)	400 (400)
	TOTAL	**1580** **(460)**	**3000** **(2400)**	**1640** **(1640)**	**6220** **(4500)**

NOTE: FIGURES IN PARENTHESIS ARE GEF GRANT
1/ Local Competitive Bidding for civil works for gene bank.
2/ International Shopping and Direct Purchase.
3/ Includes services procured under Bank's consultant guidelines.

E. Disbursement

3.18 A special account would be established in the Polish Development Bank for the Project Unit in the Ministry of Environment Protection, Natural Resources and Forestry. An initial deposit of $450,000 would be made into this account by the World Bank. All categories of expenditure (listed in table below) would be eligible for disbursement from the special account. For each payment made out of the account, project management would furnish to the World Bank such documents and other evidence showing that such payment was made exclusively for eligible expenditures. The account would be replenished upon submission of this documentation. The Disbursement Plan for GEF grant funds is as follows:

Table 3.4 DISBURSEMENT PLAN

	Items	Disbursement	
		Amount (US$ million)	% Financing
(1)	Civil Works	.46	30 % of Total Expenditure
(2)	Goods and Equipment	2.2	100 %
(3)	Technical Assistance	1.1	100 %
(4)	Salaries, Operations & Maintenance	.37	100 %
(5)	Unallocated	.37	
	TOTAL	4.5	

F. Accounting, Reporting and Auditing

3.19 The project accounts would be audited annually by a firm whose qualifications are acceptable to the World Bank. A quarterly report on Project progress and statements on project expenditures would be submitted to the World Bank by the Project Manager.

IV. PROJECT IMPLEMENTATION

4.01 The Ministry of the Environment, Natural Resources, and Forestry (MENRF) would be responsible for the overall implementation of the project. A list of project institutional responsibilities is given in Annex 6. Within the Ministry, the following Departments would have specific implementation responsibilities:

The State Board of Forests would have principal authority for designing, constructing and managing the gene bank supported under the Project at Jarocin. The revised civil works designs and equipment specifications would be subject to scientific review by scientists from the IBL and would be reviewed and approved in the World Bank prior to release for domestic bidding (civil works) and international quotations (equipment). The General Board of State Forests would carry out seed collection and *in-situ* conservation, in cooperation with IBL.

The Forestry Research Institute (IBL) would advise on the scientific aspects of the collection and characterization of genetic materials, applied research, pollution monitoring, and environmental impact assessment in both project areas.

4.02 **Project Management Unit (PMU).** This independent unit would be established in the MENRF, located at the level of the GDSF prior to the initial grant disbursement. One full time Project Manager, a full time Assistant Manager and one assistant would be provided. The Project Manager (acceptable to the GEF) would be appointed by the Ministry of the Environment Protection, Natural Resources, and Forestry and would be responsible for coordinating project operations and expenditures and for submitting quarterly progress reports to the Bank. The operating costs of this unit would be supported under the project for a period of two years.

4.03 To assist the PMU, two part-time scientific advisers would be appointed to assist the Unit's manager in designing and drafting applied research contracts, planning and reviewing research and technical assistance. Honoria and per diem costs of these advisors would be provided under the Project.

4.04 A number of additional organizations would be sub-contracted to carry out specific activities (Annex G). The proposed PMU, assisted by its scientific advisors, will design, contract out, and supervise the agreed program. These additional institutions will carry out activities under the direction of the PMU. Among the additional organizations that would be contracted to carry out project activities under the Project are:

The Man and Biosphere Secretariat, which will be constituted under the project, will be specifically responsible for conservation and transition planning at Bialowieza Primeval Forest.

Agricultural University in Poznan and the Jagiellonian University in Krakow would be hired to manage the applied research under the buffer zone component in BPF.

Pollution Monitoring and Mitigation at the BPF will be carried out by a private sector engineering/environmental firm to be selected under World Bank procedures.

Warsaw Agricultural Institute would carry out the ecological agriculture component at BPF.

Polish Academy of Sciences will host the joint scientific review committee and coordinate joint scientific work with Belarus.

V. NEGOTIATIONS, EFFECTIVENESS AND DATED COVENANTS IN THE GRANT AGREEMENT

5.01 During negotiations on the Grant Agreement, assurances were obtained as follows:

a) **Gene Bank.** Prior to disbursement on the gene bank component of the Project, detailed final designs for the civil works and a final list of equipment would be submitted to the Bank for approval (para. 4.01). Supervision of the construction and management of the gene bank would be undertaken by the State Board of Forests. Assurances would also be sought that the annual operating costs for the proposed gene bank, estimated at $100,000 annually would be provided by MENRF (para. 3.11(e)).

b) **Joint Scientific Committee.** The MENRF shall establish a Joint Scientific Committee no later than February 28, 1992 (para. 3.14).

c) **Grant Effectiveness.** The Grant would be declared effective upon submission of documentation satisfactory to the Bank that the Project Manager, whose qualifications and experience are satisfactory to the Bank, has been appointed and a separate account, subject to internationally accepted auditing standards, has been established.

d) **Accounts.** A separate account would be established in the Polish Development Bank for MENRF prior to disbursement of the grant. This account would be audited annually by an auditing firm acceptable to the Bank (para. 3.18 and 3.19).

e) **Project Management.** A Project Management Unit (PMU) would be established in MENRF, at the level of the GDSF, prior to disbursement of the grant. The PMU would be under the supervision of the Project Manager, appointed by the Minister, and be acceptable to the Bank. The PMU would be responsible for the management of the

Project Account, for coordinating Project operations and expenditures and for submitting quarterly progress reports to the Bank (para. 4.02).

VI. PROJECT BENEFITS TO BIODIVERSITY IN POLAND

6.01 The southwestern Polish mountain forests(especially in the Sudety region) of Poland are rich in their natural biodiversity and their value to the quality of life in Poland is without measure. This biological resource is unique in Europe. This project as outlined would initially maintain the keystone genetic resource, i.e. forest trees, woody shrubs and selected non woody plants. Although it is not possible to protect all of the genetic resources now being threatened, it is possible to protect reasonable representations of the various populations.

6.02 These mountain forests are threatened by the direct actions of man and by anthropogenic factors. Both of these activities can be reversed by appropriate administrative activities. To reverse the damage done will require time. However this project will enable the Government to initiate and carry out an ecosystem restoration project in the long term. By maintaining adequate biological populations of the appropriate ecological zones, it will be feasible to a certain degree to re-establish "natural" systems, as well as managed forests. Thus, it will be feasible to re-introduce wildlife into areas once lost. Overtime, by managing ecological succession, an essentially natural condition can be restored.

6.03 The Bialowieza Primeval Forest protection program in eastern Poland is directed to protect the last remains of a unique low level forest ecosystem. By expanding its buffer zone, by linking protected reserves in the Forest, and by initiating natural restoration within the Forest, it is both possible and feasible to essentially restore a wide range of natural ecological processes that in a relatively short period of time can heal the wounds caused by man's inappropriate practices.

6.04 The forests of Poland are important to the overall economy of the country. By inappropriate management practices and by environmental abuse, their value and contribution to society has been reduced. This current project offers a unique opportunity to restore the genetic variability of these forests and as such productivity in the fullest sense can also be restored. In essence, the project would permit genetic sustainability to occur and as such the forests would be in a far better position to withstand natural as well as unplanned changes, i.e. global climate change possibilities.

6.05 The Project's specific benefits would:

- greatly reduce the genetic erosion and losses of genetic resources which are part of the heritage of nature. In the Bialowieza, this program of genetic conservation addressed the 113 known forest associations, two-thirds of which are not yet protected. This GEF Project strategy is important in assuring the maintenance of the forest fauna as well as flora. The endangered bison, for example, are known to consume 350 species of forage plants, thereby requiring a comprehensive representative of these forest ecosystems.

- enable man to restore ecosystems destroyed by either natural or anthropogenic factors by re-introducing populations into their natural or equivalent habitats after having reduced the influence of the most striking destroying factors;

- stabilize ecosystems by maintaining a high level of genetic variability within species. Thus the species can adapt themselves to the site, even if the site conditions are changing to a certain extent; and

- increase the forest economy at a long term by being able to use the full amplitude of genetic variability available, e.g., by replacement of not adapted species by better adapted ones and tree improvement programs.

GLOSSARY

Afforestation: Establishing trees on ground where they have not previously grown.

Biological Diversity (biodiversity): The variety and variability among living organisms and the ecological complexes in which they occur.

Biosphere Reserve: A unique category of protected areas combining both conservation and sustainable use of natural resources. Each biosphere reserve conserves example of characteristic ecosystems of one of the world's natural regions.

Buffer Zone: An area surrounding a conservation or protected are which is extensive enough to insulate the protected core from the dispersion of exotic genetic material. Land uses in a buffer zone must be compatible with its primary function of maintaining the core.

Clone: Group of genetically identical plants produced by vegetatively propagating a single plant over one or more vegetative generations.

Coppiced Forest: A forest of trees grown from re-sprouts of the stumps following harvesting.

Ecosystem: A community of organisms interacting with one another and the environment in which they are found. Ecosystem boundaries are often physical (such as watersheds, fields, or lakes).

Ex-situ: The management of planted stands of trees outside of their natural range; the conservation or preservation of trees as seed, pollen, tissue culture or excised plant parts.

Gene bank: An institution or center that participates in the management of genetic resources, in particularly, maintaining *ex-situ* or *in-situ* collections.

Genome: Sum total of an organism's genetic information i.e. all hereditary traits.

Geochemical Cycling: The movement of mineral elements and organic nutrients in an ecosystem.

Geographic Information System (GIS): Employs an array of spatial information (maps) and displays such data as themes (forest cover, pollution damage, habitats, etc.) to overlay, spread or otherwise objectively analyze and display the solution to a land management problem.

Germplasm: Living reproductive material including pollen, seeds and plants and their parts.

Germplasm collection: A collection of many different varieties, species or subspecies representing a diverse collection of genetic material.

High Forest: Forest consisting of trees grown from seed.

In-situ: The managing of organisms in their natural state or within their normal range.

Keystone species: A plant or animal species which largely determines the stability of an ecosystem through its functions in key processes such as reproduction or nutrient cycling.

Man and the Biosphere: A conservation, scientific and management program of the United Nations Educational, Scientific and Cultural Organization.

Provenance: Origin or source for trees, an identifiable region in the natural habitat of a species from where the seed of the trees originally came.

Reforestation: The introduction of trees on land from which they had previously been removed.

Seed Production Orchard (Seed Orchard): A collection of selected trees planted and managed for the purpose of producing seeds.

POLAND
Forest Biodiversity Protection Project
Table 101. Bialowieza
Enhancement of Natural Regeneration
Detailed Cost Table
Th. USD

	Quantity			B.C. in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. In Situ Conservation										
Est. and Prep. of Site <7>	1	0	1	8	0	8	0	9	0	9
B. Scientific Equipment										
Tabletop X-Ray machine	1	0	1	10	0	10	11	0	0	11
Personal Computer <2>	1	0	1	5	0	5	5	0	0	5
Cartographic Plotter	1	0	1	10	0	10	11	0	0	11
Sampling & Collection Eqp	1	0	1	12	0	12	13	0	0	13
Misc. Scientific Equip. <3>	1	0	1	20	0	20	21	0	0	21
Refrigerating Equip. <4>	1	0	1	70	0	70	74	0	0	74
Extractory Chambers <5>	1	0	1	3	0	3	3	0	0	3
Instruments and Gauges	1	0	1	15	0	15	16	0	0	16
Elect. Power Stabilizer	1	0	1	25	0	25	26	0	0	26
Mobile Monitoring Equip. <1>	1	0	1	140	0	140	148	0	0	148
Sub-Total				310	0	310	328	0	0	328
C. Professional Support	1	1	2	10	10	20	21	0	0	21
Total INVESTMENT COSTS				328	10	338	350	9	0	359
II. RECURRENT COSTS										
A. Operation and Maintenance	1	0	1	60	0	60	0	71	0	71
Total RECURRENT COSTS				60	0	60	0	71	0	71
Total				388	10	398	350	80	0	430

<1> Mobile Automatic station for air and soil monitoring
<2> IBM 386/486 or similar.
<3> Chemicals and support materials.
<4> Low temp refrig. container of 2000 l capacity for seeds.
<5> Small chambers and devices for extracting/cleaning seeds from samples.
<6> Including Seminars and meetings.
<7> Establishment of 1.2 ha. clonal seed production area.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 102. Bialowieza
Protection Program
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Protected Area Enhance. <1>										
Labor	1	0	1	14	0	14	0	17	0	17
Equipment	1	0	1	5	0	5	5	0	0	5
Sub-Total				19	0	19	5	17	0	22
B. Conservation Plan <2>										
Labor	1	1	1	9	9	18	10	12	0	21
Consultants	1	1	1	23	23	45	24	29	0	53
Equipment	1	1	1	4	4	7	4	4	0	8
Travel and Perdiem	1	1	1	13	13	25	13	16	0	29
Sub-Total				48	48	95	51	61	0	112
C. Socionomic Research										
Labor	1	0	1	4	0	4	0	5	0	5
Consultants	1	0	1	30	0	30	32	0	0	32
Travel and perdiem	1	0	1	58	0	58	61	0	0	61
Sub-Total				92	0	92	93	5	0	98
D. Forest Pattern Research										
labor	1	1	1	4	4	8	0	10	0	10
Equipment	1	1	1	1	1	1	0	1	0	1
Sub-Total				4	4	8	0	11	0	11
E. Forest Process Research										
Labor	1	1	1	8	8	15	0	19	0	19
Consultants	1	1	1	23	23	45	48	0	0	48
Equipment	1	1	1	10	10	20	21	0	0	21
Travel and perdiem	1	1	1	13	13	25	27	0	0	27
Sub-Total				53	53	105	96	19	0	115
F. Environmental Impact Anal										
Labor	1	1	1	5	5	10	0	13	0	13
Consultant	1	1	1	8	8	15	16	0	0	16
Travel and perdiem	1	1	1	26	26	52	56	0	0	56
Sub-Total				38	38	77	72	13	0	84
G. Man in the Biosphere										
Labor	1	0	1	12	0	12	0	14	0	14
Office	1	0	1	10	0	10	0	12	0	12
Travel and perdiem	1	0	1	22	0	22	0	26	0	26
Sub-Total				44	0	44	0	52	0	52
H. End of phase meeting										
Expenses	0	1	1	0	1	1	0	1	0	1
Consultants	0	1	1	0	15	15	16	0	0	16
Travel and perdiem	0	1	1	0	23	23	25	0	0	25
Sub-Total				0	39	39	41	1	0	42
Total INVESTMENT COSTS				298	182	480	358	179	0	537
Total				298	182	480	358	179	0	537

<1> Vehicles, Mapping Software, Printing Equip., and Supplies.
<2> Specialists in ecosystem, mapping, land use, and related skills.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 103. Bialowieza
Ecological Farming
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Vehicles and Equipment										
4WD Pickup	1	0	1	17	0	17	18	0	0	18
Personal Computer&Printer	1	0	1	4	0	4	4	0	0	4
Sub-Total				21	0	21	22	0	0	22
B. Tech. Advisory Panel <1>	1	1	2	8	8	15	16	0	0	16
C. External Specialists <2>										
Fees	23	11	34	23	11	34	36	0	0	36
Per Diem	12	6	18	12	6	18	19	0	0	19
Travel	12	9	21	12	9	21	22	0	0	22
Sub-Total				47	26	73	78	0	0	78
D. Local Experts <3>										
Salary Supplements/ Fees	1	1	2	16	16	33	0	42	0	42
Perdiem	1	1	2	5	5	10	0	13	0	13
Travel	1	1	2	2	2	4	0	5	0	5
Sub-Total				23	23	47	0	60	0	60
Total INVESTMENT COSTS				99	57	156	116	60	0	176
II. RECURRENT COSTS										
A. Vehicle Maintenance	1	1	2	3	3	6	0	8	0	8
B. Enumerators <4>	1	1	2	3	3	5	0	6	0	6
C. Analysis of Samples <5>	1	1	2	15	15	30	0	38	0	38
D. Sundries	2	1	3	2	1	3	0	4	0	4
E. Report Prod/Translation	4	3	7	4	3	7	0	9	0	9
Total RECURRENT COSTS				26	24	51	0	65	0	65
Total				125	81	207	116	125	0	241

<1> Three external advisors: Agric. Economist, Soil Chemist, and Sociologist
<2> Mkt. Econ. (yr1-2 months, yr2-2 mo.), agronomist (yr1-1 mo., yr2-1mo)
<3> a500/month x 6 months x 4 persons, $250/month x 6 months x 3 persons
<4> Five enumerators (Farm Economic Survey).
<5> Soil, Water and Plant sampling team (contract).
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 106. Bialowieza
Geographic Information System
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Initial Inventory <1>										
Forest Research Institute	2	0	2	0	0	0	0	0	0	0
B. Consultants										
Forest Ecologist/ LUP	1	0	1	13	0	13	14	0	0	14
GIS Specialist	2	0	2	26	0	26	28	0	0	28
Travel and Perdiem <5>	-	-	-	18	18	35	37	0	0	37
Sub-Total				56	18	74	79	0	0	79
C. Computer Hardware										
Personal Computer <2>	2	0	2	14	0	14	15	0	0	15
Hi-Res Color Monitor	2	0	2	3	0	3	3	0	0	3
Internal Backup Tape Dev.	1	0	1	2	0	2	2	0	0	2
Digitizing Tablet <3>	1	0	1	5	0	5	5	0	0	5
Color Plotter <4>	1	0	1	5	0	5	5	0	0	5
Laser Printer	1	0	1	3	0	3	3	0	0	3
Uninterruptable Power Sup	2	0	2	2	0	2	2	0	0	2
Misc. Computer Supplies	-	-	-	5	5	10	11	0	0	11
Sub-Total				37	5	42	45	0	0	45
D. Imagery,Decoding,Merging										
TM Imagery Data	2	0	2	9	0	9	9	0	0	9
TM Geocoding	2	0	2	2	0	2	2	0	0	2
SPOT Imagery Data	3	0	3	7	0	7	8	0	0	8
SPOT Special Acquisition	3	0	3	2	0	2	2	0	0	2
Spot Digital Mosaic	3	0	3	2	0	2	2	0	0	2
SPOT Geocoding	3	0	3	3	0	3	3	0	0	3
TM/SPOT Merge	1	0	1	3	0	3	3	0	0	3
Sub-Total				27	0	27	29	0	0	29
E. Change Detection										
Digital Change Detection	1	0	1	2	0	2	2	0	0	2
GIS Data Conversion	1	0	1	0	0	0	0	0	0	0
Sub-Total				2	0	2	2	0	0	2
F. Photo. Prints & Process.										
TM	2	0	2	5	0	5	5	0	0	5
TM/Spot Merge 1:50,000	5	0	5	6	0	6	6	0	0	6
Land Cover Classification	3	0	3	5	0	5	5	0	0	5
Sub-Total				15	0	15	16	0	0	16
G. Computer Software										
Arc/Info GIS	1	0	1	6	0	6	6	0	0	6
H. System Training	2	0	2	26	0	26	28	0	0	28
Total INVESTMENT COSTS				170	23	193	204	0	0	205
Total				170	23	193	204	0	0	205

<1> Initial inventory of Maps, Mapping Activities, and GIS Cap. in Poland.
<2> 386 or 486 with VGA Graphics Card, dual disk drive, 300MB HD, math cop.
<3> 36x48 inch with electric pedestal
<4> Eight pen, 36 inch width
<5> Assumes two int'l trips and 75 days combined.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 105. Bialowieza
Pollution Monitoring and Mitigation
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Pollution Mitigation <2>	1	2	25	50	40	16	0	56
B. Engineering Services <3>	1	2	75	150	80	96	0	176
Total INVESTMENT COSTS			100	200	120	112	0	232
Total			100	200	120	112	0	232

<1> Mobile Automatic station for air and soil monitoring.
<2> Supporting equipment to complete detailed engineering design.
<3> Consulting services for detailed engineering designs.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 106. Bialowieza
Coordination with Bielorussia
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Meetings, Conferences	1	2	13	25	0	25	0	25
Total INVESTMENT COSTS			13	25	0	25	0	25
Total			13	25	0	25	0	25

Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 107. Bialowieza
Professional Development and Training
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Professional Development <1>	1	2	20	40	40	0	0	40
B. Training	1	2	5	10	10	0	0	10
Total INVESTMENT COSTS			25	50	50	0	0	50
Total			25	50	50	0	0	50

<1> Including Seminars and Meetings
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 108. Bialowieza
Establishment of Bialowieza Foundation
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Est. of Legal Framework	1	0	1	25	0	25	25	0	0	25
Total INVESTMENT COSTS				25	0	25	25	0	0	25
Total				25	0	25	25	0	0	25

Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 201. Sudety
Assessment, Planning, Collection, and Propogation
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Mapping for Risk Assess. <1>	1	0	1	120	0	120	127	0	0	127
B. Dev. of Plans for Conserv <2>	1	0	1	45	0	45	48	0	0	48
C. Seed Collection <5>	1	1	2	100	100	200	0	256	0	256
D. Vegetative Propogation <3>	1	0	1	40	0	40	0	47	0	47
E. Est. of Plantations <4>	1	0	1	10	0	10	11	0	0	11
Total INVESTMENT COSTS				315	100	415	185	303	0	489
Total				315	100	415	185	303	0	489

<1> Prepare cartographic displays of risk hazards to species & populations.
<2> Coll. of Data, conferences & workshops to dev. plans for conservation.
<3> Modernization of greenhouses in Sekocin for veg. multiplic. of species.
<4> Est. of plantations and gardens for plants to increase approp. species.
<5> Collection of seed from each of the major ecological zones.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:23

POLAND
Forest Biodiversity Protection Project
Table 202. Gene Bank
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Civil Works										
Site Preparation	1	0	1	300	0	300	0	354	0	354
Civil Works - Govt.	1	0	1	658	0	658	0	777	0	777
Civil Works - GEF	1	0	1	142	0	142	0	168	0	168
Greenhouse	1	0	1	200	0	200	0	236	0	236
Sub-Total				1300	0	1300	0	1536	0	1536
B. Extraction/Cleaning <1>	1	0	1	650	0	650	689	0	0	689
C. Testing & Eval Equip. <2>	1	0	1	300	0	300	318	0	0	318
D. Low Temp. Storage Equip. <3>	1	0	1	650	0	650	689	0	0	689
E. Supplies <4>	1	1	2	50	50	100	107	0	0	107
Total INVESTMENT COSTS				2950	50	3000	1802	1536	0	3338
II. RECURRENT COSTS										
A. Training & Prof. Dev. <5>	1	1	2	25	25	50	27	32	0	59
B. Salaries and Op. Costs	0	1	1	0	100	100	0	138	0	138
Total RECURRENT COSTS				25	125	150	27	170	0	197
Total				2975	175	3150	1829	1705	0	3534

<1> Defruiting, dewinging, drying, cleaning equipment.
<2> Microscopes, Moisture sensing equipment, etc.
<3> Compressors, Temp. Controls, Backup Generator, Panelling, Vacuum Cont.
<4> Chemicals, Containers, Glassware, etc.
<5> Seminars, courses, conferences in advanced seed testing and storage.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND
Forest Biodiversity Protection Project
Table 203. Sudety <1>
Air Pollution Monitoring
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Monitoring Equipment <2>	1	2	125	250	250	0	0	250
Total INVESTMENT COSTS			125	250	250	0	0	250
Total			125	250	250	0	0	250

<1> To be financed from Bilateral Sources.
<2> Expansion of monitoring capabilities by an international team.
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND
Forest Biodiversity Protection Project
Table 204. Sudety
Professional Development and Training
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Professional Development <1>	1	2	10	20	20	0	0	20
B. Training	1	2	5	10	10	0	0	10
Total INVESTMENT COSTS			15	30	30	0	0	30
Total			15	30	30	0	0	30

<1> Including Seminars and Meetings
Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND
Forest Biodiversity Protection Project
Table 205. Czechoslovakian/Polish Joint Scientific
Sudety Mountains Committee
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Travel, Meetings	1	2	13	25	25	0	0	25
Total INVESTMENT COSTS			13	25	25	0	0	25
Total			13	25	25	0	0	25

Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND
Forest Biodiversity Protection Project
Table 301. Project Management Unit
Detailed Cost Table
Th. USD

	Quantity			Base Costs in Th. USD			Breakdown of Totals Incl.Cont. Th. USD			
	1992	1993	Total	1992	1993	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS										
A. Computers and Equip.	1	0	1	10	0	10	10	0	0	10
Total INVESTMENT COSTS				10	0	10	10	0	0	10
II. RECURRENT COSTS										
A. Inc. Salaries & PerDiem	1	1	2	50	50	100	0	100	0	100
Total RECURRENT COSTS				50	50	100	0	100	0	100
Total				60	50	110	10	100	0	110

Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND
Forest Biodiversity Protection Project
Table 401. Joint Scientific Review Committee
Detailed Cost Table
Th. USD

	Quantity		Base Costs in Th. USD		Breakdown of Totals Incl.Cont. Th. USD			
	92-93	Total	1992-93	Total	F.Exch	Local	Taxes	Total
I. INVESTMENT COSTS								
A. Travel, Honoraria	1	2	15	30	30	0	0	30
Total INVESTMENT COSTS			15	30	30	0	0	30
Total			15	30	30	0	0	30

Unit Costs Scaled by 1000.0 - Values scaled by 1000.0 11/14/1991 11:24

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

PROPOSED ECOSYSTEM PROTECTION PROGRAM FOR THE BIALOWIEZA FOREST

I. OBJECTIVES

The Bialowieza Primeval Forest is the last example of the vast continental lowland forest that once covered Europe. Because of its position as a threatened, unique Global Biosphere Reserve, the broad goal of the Polish Biodiversity Protection Project at Bialowieza is to insure, to the degree still possible, the stability of this primeval forest ecosystem.

The Forest is currently preserved in a number of protected patches which total about 58 km² (22 sq mi), an area which is so small that it is vulnerable. By comparison, the Yellowstone National Park of America, which does not represent the last remnant of an endangered ecosystem, is about 9600 km² (3500 sq mi), nearly 200 times the size of the Bialowieza protected areas.

This is significant not just because the small size of the Bialowieza Forest ecosystem renders the area vulnerable due to a surface-area-to-volume type of phenomenon, but because a representation of the types of forest associations and communities (which define the forest) is not currently embraced by the gazetted protected areas. Although much larger, Yellowstone, like Bialowieza, is not a complete ecosystem, with serious threats to its integrity and the management problems associated with such incomplete ecosystems. Much of Yellowstone is being transformed through overuse by elk (*Cervus elaphus canadensis,* a close relative of the red deer of Bialowieza) who previously migrated to winter foraging grounds now in ranchlands outside of the Park. As the Bialowieza protected area is threatened, such management issues and risks to the entire Bialowieza ecosystem are magnified.

II. PROPOSED STRATEGY

To achieve the goal of preserving the maximum feasible representation of the Bialowieza Primeval Forest, five related activities would be supported under the Project.

- the expansion of protected areas to include all remaining critical natural associations;
- land-use planning for management of the forest which is interspersed with the protected area network;
- applied research supportive of both protected area expansion and land-use planning;
- an assessment of the impact of any suggested land allocations which emerge during the course of this Project;
- consultation with concerned agencies, individuals, Ministries, legislative bodies at local and national levels, to review draft land-use plans, and the convening of a meeting of these parties to agree to implementation activities and responsibilities, i.e., "Scoping".

The vehicle for tying the activities and plans together will employ the existing Man and Biosphere designation for the BPF as well as some innovative uses of this facility in the coordination of activities.

Two phases are envisioned. The first will be dominated by the conduct of research required to make informed decisions, the immediate acquisition of missing forest associations and corridors between them for complete protection, the development of a planning and analysis capability with a GIS, the initiation of land use planning activities, and the strengthening of a MaB Board and Secretariat. The first phase will culminate in a plenary meeting to approve the draft of an integrated regional land use plan for the Bialowieza.

The plan will detail the policy implications and regulatory, legislative, and organizational support required. The second phase will continue to pursue the initial four activities, but emphasis will shift to implementation activities. These may include, for example, accelerated conversion of marginal farmlands to forest, tourism infrastructure development, training programs in specific skills such as hospitality management, coal to gas conversion, etc. This Project will terminate after the Phase I - Phase II transition assistance period.

Protecting "Relict" Forest Communities. The old watchsmith's dictum of "keeping all of the bits and pieces in case they are needed to reconstruct a useful mechanism" is a compelling rationale (but by no means the only one) for doing as much as one can to retain the intact remnants of the Bialowieza Primeval Forest (BFP). The wisdom of this guidance is being demonstrated today in the attempts of local foresters to evaluate the characteristics of ancient, locally adapted timber species so that they can replace the less adapted, more vulnerable old plantings of these species which used genetic material from elsewhere. Much of the existing forest, both protected and managed, has been inventoried and mapped (Map 2).

The vegetation of the National Park is known in detail. Vegetation maps of 1:10,000 are used at the FRI/B field station. Ocolow (1987) states that 40 of 113 plant associations (35 percent) are protected. We understand that no recent changes to this figure have occurred. Surveys (ecological and cadastral) and selection of priority areas for strict protection designation (e.g., National Park) should be initiated as soon as the annual work plan for this Project is approved. The legal requirements to be met for a reclassification can be arranged within the MENRF. The elements of a proactive, aggressive program of assembling a more complete and secure representative BPF are incomplete but adequate.

For example, although considerable data exist on plants and large ungulate hervivory, nothing is known of the seasonal movements and densities of animal populations. We realize that complete knowledge will never exist. However, enough information is available to initiate an informed expansion effort now. The missing elements will emerge as the data from the research tasks (below) emerge. The Project is structured so that information from this Project can be used up through the planning meeting at the end of the first Phase.

Conservation Planning. The BPF is not so much a geometrically distinct area surrounding the protected core, but is the aggregate area of minimally modified parcels which interdigitate with protected areas. If the program to transfer the classification of relict and rare forest associations to that of strictly protected areas and corridors is successful, a clearer buffer zone for the multiple uses of forest wildlands will emerge.

The purposes of such an area include the filtering of exotic living material to reduce potentially catastrophic impacts to the protected areas. Furthermore, the buffer can provide economically attractive and sustainable land uses consonant with the overarching goal of maintenance of the pattern and processes occurring only in the unmodified primeval forest. It is very important to engage the local farming population in uses which are acceptable, profitable yet do not negatively impact the forest ecosystem.

A major enforcement effort aimed at a resident population of Robin Hoods is not an effective, efficient, or equitable goal for natural forest maintenance. The local enjoyment of BPF-centered uses is an important product of the land use planning which is suggested in this section. The old conflict between protection and conservation (defined here as "wise use") can and will be avoided with creative land use planning. Not only will the financial picture of residents contribute to an appreciation of the BPF, but an environmental education program will be targeted to them. The product of planning for an appropriate mix of land use in the buffer zone will be a prioritization of development in optimal use zones.

The zones will reflect the uses which will have minimal impact on the BPF while having positive impacts on the residents who need to make a living in these areas. This product will be called a Conservation Plan, distinguishing it from Land Use Plans which are not so constrained in development options.

As data from the inventories and research come in, the GIS will be employed to assist in the determination of the "region-of-influence" of the BPF. An initial determination which employs these data and the GIS will be available for drafting the land use plan which will be evaluated at the end of the first phase of work. Initially however , the buffer zone can be considered to include all of the area subsumed by connecting the outermost points plus one kilometer of relict natural forests associations.

A review of forest-community buffer zone activities will reveal the plausible uses of this particular landscape. The socioeconomic research suggested below will also be employed to indicate some of the possible uses. The types of uses expected can fit the following taxonomy. Note that this list is not exhaustive. Also, the categories can be debated, i.e., the assumption that the development of tourism infrastructure is environmentally inert implies that no currently unmodified areas will be used. Similarly for low-input ecological agriculture.

Resource-based Consumptive	Resource-based Non-consumptive	Inert
sport hunting production forestry minor forest products	nature/culture tourism forest-related arts/crafts environmental education research reclamation	think-tank cultural tourism sales infrastructure waste treatment

Each of these potential activities can occur in the BPF without compromising the goals of protecting the biological diversity. Each will have to be developed in theory and on-site. The use of the GIS will greatly assist in developing these activities. Separate Annexes discuss the potential, scale, and development of the low impact ecological agriculture, hunting, and pollution control activities.

Supporting Applied Research. The initial research supportive of the goals of the GEF-supported Project will focus on three areas of concern: the social and economic environment and trends, forest biology, and the effects of air and water pollution.

The social and economic investigations are designed to:

- inform the land use plan with details of local uses or historic uses of the forest;
- establish the most acceptable types of conservation-related vocational changes;
- determine the degree of decision flexibility and trainibility in distinct segments of the population;
- define tenurial patterns and constraints; and
- define the relevant markets for the plausible products of a regional Conservation Plan.

The studies of forest biology will clarify the patterns and processes which define this particular forest ecosystem. Armed with this information, an objective assessment of the impacts of land uses and their mitigation in the BPF can be developed—a requirement of both the land use planning (above) and the impact assessment activities (below). Furthermore, initiation of the transformation of marginal agricultural lands to natural forest will require such information.

The type of studies of forest pattern (e.g., species composition, distribution, structure) include:

- an inventory of forest associations and their distribution along forest gradients (e.g., microclimate);
- an identification of "guilds" of plants and animals and their seasonal uses of habitats;
- the phenology and seasonal quality of forage and other plants;
- an inventory of forest soils;

The studies of process will reveal the determinants and rates of important processes which define the forest as much as the species which are found. No rehabilitation can be planned without some of this knowledge. The list is not explained in great detail, however in most cases the utility of the suggested study for the goals of the Project are fairly evident. For example, the studies of geochemical cycling will constitute a baseline for evaluating the impacts of pollution and forest treatments (e.g., the current practice of 6 ha clearcuts). The characterization of trophic position, herbivory, and habitat use can be used to rationalize the selection of "keystone" species on which most of the studies can be focussed. Some such rational parsimony must be imposed since each species or phenomenon cannot be studied. Again, this list is notional and illustrative, not exhaustive:

- the site-specific successional patterns can be experimentally and historically studied. Various forest interventions need such information. For example, hunting often manages for successional stages;
- studies of herbivory and the co-evolution of plants and animals;
- trophic efficiency and characterization of energy flows through various levels of the forest ecosystem;

- a geochemical cycling (inputs/output);
- the population dynamics of selected plant and animal species; and
- dead/dying material, their decomposition and fate.

Studies of pollution do not characterize the natural system. However, given the present threat, even in this relatively clean area, such studies serve as important baselines and early warning systems. These studies will be described in the section treating pollution monitoring and mitigation.

The Impact of Various Land Uses. A protocol for projecting environmental (including social) impacts has developed over the past 20 years. The basic approach follows the experience accumulated in complying with the National Environmental Policy Act (NEPA) of the United States. NEPA provides the longest record of impact assessment and the broadest development of analytic tools applied to the particular requirements of impact assessment. Just as many countries are now developing adaptive, indigenous approaches to the use and conduct of an EIA, Poland will undoubtedly have particular needs which will yield a local approach. These will emerge during Scoping. The elements of a successful effort which transcend borders are:

- early pro-active use in planning an intervention rather than as a mitigative bandaid;
- a predictive capability which employs some objective methods of prognostication;
- an integrated, interdisciplinary approach;
- use as a technically sound disclosure document rather than as a political decision document;
- demonstrably supportive of development rather than antagonistic to development; and
- staged in tiers of complexity so that a relatively simple screening process (an Initial Environmental Examination (IEE)) can eliminate most need for a detailed EIA, but which is powerful enough to reveal potentially serious impacts and trigger a more complete EIA.

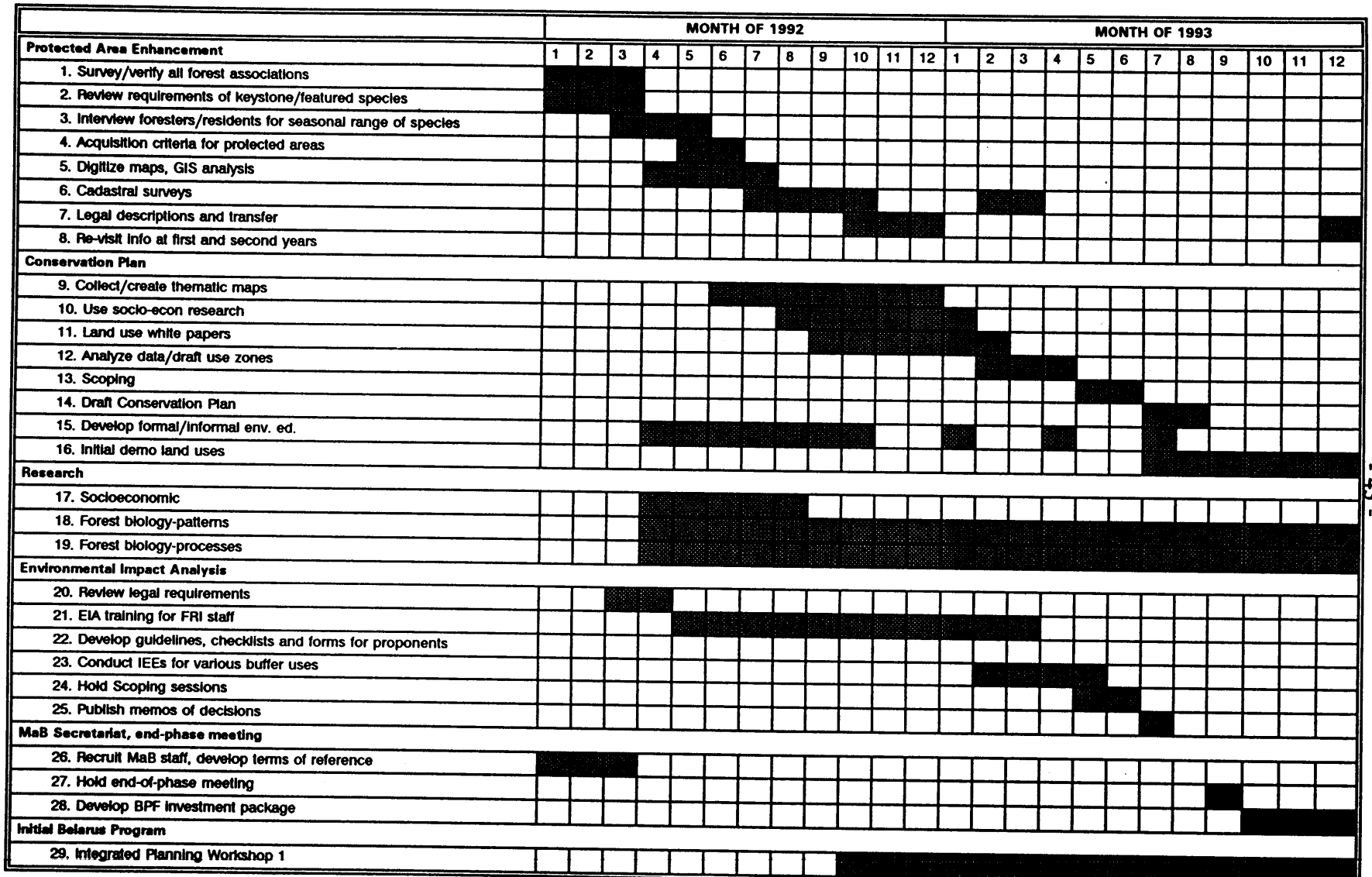
The generic approach involves:

1) the identification of all legal requirements at the site and for the EIA process - timing, required products and milestones such as Scoping, cumulative effects analysis, a mitigation plan;
2) the submission of a description of project actions and alternatives by the proponent to the responsible lead agency;
3) an initial environmental evaluation which employs off-the-shelf data, interviews, and a site reconnaissance to rapidly score a checklist of attributes;
4) the determination of the need for a full EIA; and
5) the holding of Scoping hearings on the proposed actions and the IEE determination.

The Project will do an IEE for all uses suggested by the Conservation Plan. Any further EIA work will be the responsibility of the lead Agency and proponent in accordance with regulation.

The final set of activities include support for the constitution of a MaB Secretariat, an end-of-phase one meeting, and the development of a package of investments during the transition period after the meeting. These investments will be informed by the research and the Conservation Plan, and will have been evaluated for their environmental impacts. The MaB Secretariat will act as a broker for coordinating research and information exchange, communication with UNESCO, and facilitating the investments.

BPF WORK PLAN



POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

THE GENE BANK COMPONENT

I. OBJECTIVES

The proposed gene bank for Forest Genetic Resources will meet two objectives:

(1) to preserve the genetic resources of Polish forest ecosystems, principally of forest tree species, woody shrub species and associated herbaceous species that are components of the ecosystem being protected; and

(2) to provide material and propagation methods for the use of genetic resources, e.g., for re-introduction to their natural habitat, forestry purposes or other (research, establishing new habitats, etc.)

As the gene bank will serve the entire country, all forest tree species and their associated species would be included in this "national program for the preservation of forest genetic resources". Activities of the gene bank comprise the *in-situ* and *ex-situ* conservation of populations, stands and groups of trees or single trees and their associated species which are important for the maintenance of genetic makeup of the species because of the special composition, the uniqueness or the scarcity of their genetic structure.

As the Polish Forest Service (GDSF) has a long tradition in the country, a scheme for the selection of seed stands (a stand from which seed is collected) has been in place for many decades. It was restructured in 1990. The scheme covers all forest tree species of silvicultural significance (conifers and deciduous tree species) on a country wide area in plots whose total area is 13,344 ha. These seed stands serve as resources for the collection of seed for forest purposes (reforestation and afforestation). Together with the regional seed extractory station, the seed stands are essential for the procurement of tree seeds. The proposed gene bank, therefore, must not necessarily be involved in the procurement of forest reproductive material and can focus their activities on the preservation of genetic resources. The gene bank and the GDSF, however, should cooperate to the benefit of both.

II. MANAGEMENT AND ADMINISTRATION

The proposed gene bank requires flexibility in operation to meet changing needs. The Technical Review Team of the GEF recommends that the gene bank be provided the status of a Division within the Forestry Service. The staff should include:

1 - Director
1 - Secretary to the Director
3 - Scientists (preferably knowledgeable in provenance research of forest tree species, seed physiology, ecology, phytopathology)
1 - Data Manager
1 - Engineer
4 - Technicians (laboratory, field etc)
5 - Workers (nursery maintenance, cleaning, vehicle, etc.)
16 Total Staff

The proposed total staff is subject to change according to needs, but it should not be lower than a total of 16, which is considered to be a minimum number.

III. DETAILED PROJECT DESIGN

The proposed gene bank would carry out two complementary strategies. The *ex-situ* work would be primarily done at the gene bank. The *in-situ* work would be organized and managed by the GDSF.

A. Activities

The principal activities of the proposed gene bank would be the following:

1. Evaluation.
   - Inventory of species, populations and relicts.
   - Genetic characterization by suitable phenotypical and genotypical traits.
   - Characterization of the adaptedness of the populations to be preserved.
   - Checking the importance for biodiversity and use for afforestation and reforestation.
   - Setting up the programs for the species and/or tree sources to be preserved according to the priority list.
2. Prepare Working Plans for both *in-situ* or *ex-situ* conservation of the species to be protected.
3. *In-situ* Conservation.
   - Applying proper silvicultural treatment.
   - Natural Regeneration (inducing and stimulating).
   - Minimizing impacts from adjacent stands or areas on the conserved material.

4. *Ex-Situ* Conservation.

   - Collection of seed (cones of coniferous species and fruits of deciduous species).
   - Extraction, cleaning and further pre-storage processing of seeds, e.g., drying.
   - Storage according to the requirements of the seed.
   - Testing the quality of the seed before storage, health, viability, germination rate, repeated testing of germination rate during storage.
   - Use of the seed after storage, e.g., conditioning, stratification, preparation for sowing and raising plants, multiplication of small seed samples by vegetative propagation techniques.
   - Collection of other plant material such as part of plants (cuttings, tissues) and pollen, pre-storage treatment, storage, testing, post storage treatment before use.
   - *Ex-situ* conservation under field conditions such as collection of plant material, propagation of the plant material, e.g., by vegetative means (grafts, cuttings), raising plants in a nursery, and establishing orchards and clone archives in the field.

5. Databank of *in-situ* and *ex-situ* genetic resources.

   - Collection and administration of data on the source of the material, the amount, quality, the year of collection, the registration, the storage (place and conditions), and other items of scientific need.
   - Installation of proper software for the management of the genetic resource including the development of programs and strategies.

6. National Cooperation with:

   - Forest landowners to get permission for collections.
   - Forest service and seed extractory stations to get technical assistance for the forecast about seed crops, collection (tree climbers), establishment of orchards and clone archives and other related activities.
   - National program for the preservation of ecosystems *in-situ* (e.g., national parks and protected reserves) to ensure the compatibility and the complementary character of the activities of the gene bank.
   - National research organization to make use of the scientific and technical knowledge available and to enhance research.

7. International Cooperation.

   - Exchange of scientific and technical information.

- Exchange of seed and other plant material for use or storage at a second location (for security reasons).

B. Building and Equipment Requirements

The project would support the construction and equipping of a gene bank center in Central Poland. The site chosen should be sufficient in size (a minimum of 10 ha) for the buildings, the nursery and some contiguous area for growing stock material and clone archives.

Building Requirements

The buildings would consist of four sections, which may be integrated into a complex of buildings. These are bureaus and laboratories, rooms for extraction and processing, rooms for storage and a greenhouse. The extraction and processing part should be separated from the storage part to prevent contamination. The approximate sizes area as follows:

Bureaus and Laboratories:	600 m^2
Rooms for Extraction and Processing	1,000 m^2
Rooms for Storage	300 m^2
Greenhouse	200 m^2
Total	2100 m^2
Nursery Area	2 ha
Stock material, clone archives, buffer zone	8 ha

Equipment Requirements

- Laboratory equipment for testing purity, germination (x-ray, germination chambers) health of seed (microscopes) for pollen handling and assessing genetic variation, e.g., by isoenzyme studies (electrophoretic equipment), etc.

- Extraction equipment for extracting and processing seed from conifers and broad leaved tree species and shrubs (extractors for cones, extractors for seed from fruits, cleaning and dewinging facilities). Rooms are also needed for the pre-treatments under controlled conditions. Packaging and sealing facilities would also be included.

- Cold storage rooms are needed at different temperatures, e.g., from -5 to -20 °C, facilities for storage at very low temperature using liquid nitrogen (-196 °C).

- Greenhouse facilities would also be included in the project. The greenhouse would be equipped with automatic shading and watering systems. It would be subdivided into 3 to 4 compartments to meet the requirements of different species. Some small chambers would be included for the collection of pollen to keep different pollen donors separately.

C. Estimated Costs

Assuming the landsite of 10 ha is available without cost, the proposed gene bank components of the project are estimated as follows:

	(US$ Including Contingencies)
Site Preparation and Civil Works:	
Site Preparation	354,000
Civil Works (Government)	777,000
Civil Works (GEF)	168,000
Greenhouse (200 m^2)	236,000
Sub-Total	1,535,000
Laboratory, Storage and Processing Equipment:	
Extraction & Cleaning Equipment	689,000
Testing & Evaluation Equipment	318,000
Low Temperature Storage Equipment	689,000
Supplies	107,000
Sub-Total	1,803,000
Operating Costs, Professional Development and Training	197,000
Total Estimated Costs	3,534,000

IV. BENEFITS TO BIODIVERSITY IN POLAND

There are a series of important benefits of the genebank in fostering forest biodiversity in Poland. These are:

- stop the genetic erosion and losses of genetic resources which are part of the heritage of nature;
- enable man to restore ecosystems destroyed by either natural or anthropogenic factors by re-introducing populations into their natural or equivalent habitats after having reduced the influence of the most striking destroying factors;
- stabilize ecosystems by maintaining a high level of genetic variability within species. Thus the species can adapt themselves to the site, even if the site conditions are changing to a certain extent; and
- increase the forest economy at a long term by being able to use the full amplitude of genetic variability available, e.g., by replacement of not adapted species by better adapted ones and tree improvement programs.

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

GEOGRAPHIC INFORMATION SYSTEM (GIS) MAPPING OF THE BIALOWIEZA BIOSPHERE RESERVE AND THE SUDETY REGION

I. BACKGROUND

A GIS system uses spatial data which are displayed as "themes" (forest cover, pollution damage, threatened habitat, etc.) to objectively analyze and display the solution to a spatial land management problem. Such useful products can include, for example, the least cost siting of a logging road, areas of highest return on habitat development activities, dispersion of pollutants, etc. Such data are usually acquired through remote sensing of the environment from a platform such as a satellite, or aircraft.

The aerial photographs or images of digital information transmitted from a satellite are then "processed" manually or statistically to make them meaningful for aiding the achievement of the goals of the project. Perhaps the greatest failures of GIS technology lie not in the technology but in the failure of the resource scientists familiar with the area of interest, to educate both the image (ground truthing), as well as the computer scientist who provides the image and does the initial processing. Lack of precise communication at this point can lead to expensive but useless products whose categories are meaningless in terms of real habitat or forest types.

Forestry applications of GIS are now more common. Forest inventory, infrastructure, wildlife habitat, geotechnically suitable sites for extraction activities, and other themes can be overlaid. Likewise, the least expensive environmentally acceptable travelsheds can be spread over a compartment, silvicultural treatments allocated, and other analyses performed of use to foresters. Graphic output can include hard copy maps or digital files.

Other environmental applications of GIS of particular use in the conservation of biological diversity are emerging. One common problem is in inventorying valuable resources such as endangered species. Often they are fugitive, furtive, and their ranges are not fully known. In one application which involved assessing impacts (in this case of roads) to one such important but poorly located species, field studies were conducted on twenty habitat variables such as vegetation type, and distance from water, at the few known population sites.

Statistical analyses revealed that only four of the environmental features contributed to the presence of the bird on its mating display grounds—the critical environmental requirement in its annual cycle. These four map variables were overlayed and the priority areas for habitat preservation were predicted. Furthermore, forest succession and encroachment due to effective fire control efforts were predicted and the habitat losses due to the loss of open mating grounds were also predicted for twenty years.

Another use of the GIS was in predicting the impacts of poaching due to the siting of a mine in a rich wildlife area. Surveys revealed that people would travel up to two hours to recreate and a "travelshed" of two hours on three different grades of roads and trails was created by the GIS. The travelshed was overlain on key habitat and revealed that only 3 percent of the area described by drawing

a circle of two hours travel at 80 kph (the traditional method) needed to be patrolled. The GIS analysis produced an efficient focus of effort and savings of project money.

II. SYSTEM SELECTION

The acquisition of a GIS will, to a degree, lock the IBL and the Forestry Department into the hardware and software system selected. It *must* be able to satisfy the requirements of the Department while being adaptable to future needs and compatible with the systems of related users (and sources of data) in the Sudety Mountain area, Mazurian Lakes, for the proposed National Forest Development Project and related national mapping agencies, and other resource agencies. An important step is inventorying the activities and systems of other parts of Government. The next step is in conducting a workload analysis.

This lays the groundwork for making appropriate choices which will have a long-lasting effect. It reviews current uses which are being made of spatial information, projects future uses, and assesses those uses which can be replaced by such an automated system as a GIS. How many maps are used for how long? How many users? Are uses centralized or distributed? How many maps are created by the different uses? How many overlays? The answers will reveal system requirements. Specifically, what will need to be purchased, the supporting infrastructural requirements, and staff.

The product will be a five-year implementation plan with annual costs and progress— i.e., a life cycle analysis. At this point the procurement people can craft a procurement contract and RFP for the system, including the training necessary before operations can be productive. At that point the potential vendors will provide considerable ad hoc planning advice. It should be stressed that although the process will take several months and an initial pulse of money, the savings from the up-front planning are inevitably considerable. As mentioned at the beginning of this Annex, the entire process must be closely supervised by knowledgeable resource scientists—i.e., the users (the biologists and foresters), not only the providers (vendors and programmers), or the system is guaranteed to be maladaptive. However, a well-planned GIS is a proven and essential tool in the kit of today's resource planners and managers.

For example, the provision of GIS-aided impact assessment analysis by the National Ecology Research Center of the U.S. Fish and Wildlife Service for Forest Plans of the U.S. Forest Service has resulted in a 75 percent saving of time and money over traditional manual methods. Although the initial tasks involve inventorying existing resources and capabilities and projecting the demands and uses of a GIS, we have provided an initial estimate of such needs based upon our visits and discussions with the likely users. These estimates will be useful in budget estimates now, but may require revision after the systematic analyses conducted during the initial tasks.

III. A GIS AT BIALOWIEZA

Land Use Planning and Zoning. Some resources are, in part, spatially defined. These include seasonal ranges of such wild animal species as the herbivores (e.g., cervids and bison), as well as other important faunal elements upon which the ecosystem may depend—i.e., pollinators such as insects and bats. The distribution of forest stands and unique plant and animal associations is also mapable. Land use activities, physical features, cultural features are also mapable "themes". In support of the land use planning activities elaborated in Annex II, these resources will need to be inventoried and mapped. The

GIS will assist in analyzing these resources and in planning their uses by "map modeling"—overlaying them, spreading them onto each other, subtracting some from others, etc. Locating the resources is the first requisite to planning for zones of their best uses.

Pollution Monitoring and Analysis. A GIS can be of immense value in projecting the dispersion and attenuation of pollutants from a source. The GIS applications software "spreads" the pollutants from their sources and will complement the use of the data which are now being collected by researchers at Bialowieza. The use of these spatial data will be coordinated with the land use planning described above. For example, forest thinning where pollutants are projected to increase, placement of monitoring stations where anayses indicate problems, the placement of research plots, the replacement of marginal agricultural sites in heavily polluted areas, the location of the most viable candidate sites for protection in the primeval protected area network, and other uses influenced by the projections of pollutants can be materially assisted with inventive applications of the GIS.

Siting of Development Features. As the implementation of the land use plan occurs, the siting of supporting infrastructure such as roads, tourist lodges, waste disposal/treatment facilities and other such features which attend development can be assisted with a GIS.

Although numerous uses will be made of this analytic tool, those mentioned above are indicative. The final point is the need to coordinate any GIS system development with the broader needs of the FRI and the Forestry Department. It is critical that the system be reviewed and found suitable in outline by the Forest Development Project planners.

GIS Work Plan, Level-of-Effort, and Budget

WORK PLAN

TASK	MONTH OF THE FIRST YEAR											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Inventory current activities/resources	■	■										
2. Workload analysis		■										
3. Implementation Plan—FRI/Bialowieza			■									
4. Review, Forestry Project coordination			■									
5. Facilities enhancement				■								
6. Secure equipment, imager/photos/maps					■							
7. *In-situ* training						■						
8. Training tour								■	■			
9. Initial analyses										■	■	■

BUDGET

COMPONENT	No. of Units	$ Cost/Unit	Total Cost
A. Initial Inventory of Maps, Mapping Activities, and GIS Capabilities in Poland			
(To be conducted by Forest Research Institute) - 2 months			
B. Work Load Analysis and GIS Implementation Plan			
Consultants:			
Forest Ecologist/Land Use Planner - 1 mo.			
GIS (Land use and forestry experience) - 2 mo.			
TOTAL for Item B			**39,000**
C. Computer Hardware			
1. 486 PC*	2	7,000	14,000
2. Hi-resolution Color Monitor	2	1,500	3,000
3. Internal Backup Tape Device	1	1,500	1,500
4. Digitizing Tablet 36 x 48" w/ elec. pedestal	1	5,000	5,000
5. Color plotter 8-pen, 36" width	1	4,500	4,500
6. Laser Printer	1	2,500	2,500
7. Uniterruptable Power Supply (UPS)	2	750	1,500
8. Additional Serial & Parallel Cables			300
9. Supplies (paper, plotter, pens, etc. for 2 yrs)			10,000
TOTAL for Item C			**42,300**
E. Imagery, Geocoding, and Digital Merging			
TM Imagery Data	2	4,350	8,700
TM Geocoding	2	900	1,800
SPOT Imagery Data	3	2,450	7,350
SPOT Special Aquisition	3	600	1,800
SPOT Geocoding	3	900	2,700
SPOT Digital Mosaic	3	600/edge	1,800
TM/SPOT Merge	1	3,000	3,000
TOTAL for Item E			**27,150**
F. Change Detection			
Digital Change Detection	1	2,000	2,000
GIS Data Conversion	1	250	250
TOTAL for Item F			**2,250**
G. Photographic Prints and Processing			
TM	2	2,300	4,600
TM/SPOT Merge 1:50,000	5	1,200	6,000
Land Cover Classification	3	1,500	4,500
TOTAL for Item G			**15,100**
H. Computer Software			
Arc/Info GIS	1	6,000	**6,000**
I. Air Fare and Related Expenses			
Assumes 2 Int'l trips, 75 Travel Days**			**35,000**
J. System Training			
Consultant for 2 months including workshops			**27,000**
TOTAL			**193,800**

* A Unix system may also be considered, as it provides additional power at marginal cost increase. The consultant would review with IBL the final choice of equipment most suited for long term needs.

** Two study tours (Task 8) are not budgeted here but in the Training

Therefore, a working GIS unit within the Forest Research Institute/Bialowieza Station, would require about $193,800 to achieve a GIS capability. This cost may increase by some $10,000 if the IBL and the Consultant concur that a somewhat more powerful UNIX system is appropriate.

This does not include an image processing capability. Image processing of digital data from satellites is an esoteric activity quite removed from the interests and capabilities of the Forest Department/FRI. It should be the function of the Survey and Mapping Agencies of Government, or contracted from, for example, EOSAT at about $8,000/TM image.

A GEOGRAPHIC INFORMATION SYSTEM FOR THE CONSERVATION OF BIOLOGICAL RESOURCES IN THE SUDETY REGION OF POLAND

I. BACKGROUND

The montane regions of Southwestern Poland are distinguished as reservoirs of an internationally significant biological system characterized by a high level of endemism. These resources are threatened by industrial pollutants from both domestic and transboundary sources. The important variables which define this issue include:

- characteristics of the materials being burned;
- the climatic patterns which are agents of the distribution of pollutants;
- the location of the sources;
- the dispersion characteristics of the gases and particulates;
- the relative vulnerability of the different forest systems;
- and the seasonal variation in these factors.

These variables need to be understood to project future impacts, to understand the mechanisms of pollutant action, and to take prophylactic and mitigative measures. Many of the variables are spatial in nature—i.e., they can be mapped. A better understanding of their action and dispersion can be greatly assisted by analysis which employs "map modeling" through the use of a Geographic Information System (GIS). A fuller description of the elements and uses of such a technical tool provided in the treatment of GIS at the Bialowieza Primeval Forest.

The acquistion of a GIS system for the needs of the BPF, can leverage the applications which can be so useful in the Sudety. For example, *if* a compatible system is available at the Sudety, the two systems can back each other up, do comparable analyses of similar phenomena which both Stations are investigating like pollution dispersion, and will benefit from the specialized training which will need to be imported from time to time. In a significant sense, there are large economies of scale which should be taken advantage of.

II. SYSTEM CHARACTERISTICS

A workload analysis, similar to that suggested for Bialowieza, will target the hardware and software requirements to which a Sudety GIS system must respond. The analsis can be added to the Bialowieza's to achieve some savings in consultant travel and fees. Similarly, training would be simultaneously attended by scientist/users of both systems. Because of the specific uses for dispersion analysis, particle behaviour, etc., it is anticipated that some differences in applications and tailored software development will occur. A library of existing dispersion models will need to be acquired which, for example would include the U.S. EPA models.

BUDGET

Budget assumptions and costs are largely presented in the discussion of the Bialowieza GIS. The costs below are additional to Bialowieza estimates, and like them, are indicative for budgeting purposes. We expect some revision after the workload analysis.

	Component	Cost (US$)
1.	An initial inventory of relevant literatue, data, models and thematic maps.	
	A. FRI Station and Central Staff - 2 months	1,000
2.	Workload Analysis and Sudety Implementation Plan	
	A. Consultants: Forest Pathologist (0.5 months), Meteorologist (0.5 months), GIS Specialist (1 month)	40,000
	Travel	14,000
3.	Computer Hardware 486 PC (with UNIX and DOS), color monitor, digitizing tablet, color plotter, laser printer, UPS, supplies	25,000
4.	Imagery, coding, merging	27,000
5.	Processing	3,000
6.	Software and training to be shared with BPF Station	
	TOTAL	120,000

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

ECOLOGICAL FARMING IN THE BIALOWIEZA PRIMEVAL FOREST

I. INTRODUCTION

An estimated 450 small farmers, mostly part-time, operate farms within the Bialowieza Primeval Forest. Primary production focuses on basic grains (wheat, rye), forage crops, and potatoes. Dairy and pork production are the primary cash producers of most of the farmers, many who work as loggers in the abutting forest. In a small portion of the southern portion of the Park (see Map 2), the use of chemical fertilizer and pesticides is forbidden. This project component would widen this practice and provide technical assistance and cash incentives as necessary to farmers to shift from chemicals to ecological agriculture.

Objectives:

To study the impact in the Bialowieza Primeval Forest of changing from conventional farming methods to ecological agrochemical-free farming methods on small family farms on:

A. farm yields, farm income, and farm employment;

B. soil, water, and product quality; and

C. To estimate and compare the costs of these two farming systems on farms in the Bialowieza Primeval Forest

II. BACKGROUND

In recent years, agricultural technology which depends substantially on chemical inputs and fossil fuels as a means of increasing yields and quality of produce, or maintaining already high levels of yield and quality, has become under review. The main focus of this review has been in the industrialized countries of Western Europe, the United States, and Japan, due largely to concerns about pollution of soil and groundwater, but also to fears of chemical residues in food which may affect human health.

Consequently, there has been a search for alternative approaches to sustaining agricultural, and particularly food production. Attention has been directed principally to farming based on organic measures to maintain soil fertility, and to biological or physical means of controlling pests, diseases, and weeds. Various labels have been attached to this type of agricultural technology: *ecological agriculture* is synonymous with *organic farming* which is defined precisely by the International Federation of Organic Agricultural Movements (IFOAM). While not yet widely practiced by a large number of farmers, this movement is spreading and claims as to its potential are being made by its proponents. Consumer demand for products grown *organically* is also increasing in Poland,(especially by hospitals and clinics in Krakow, Katowice and Wroclaw), and some markets now have special sections for *organic* produce, often at premium prices. It is important to distinguish

organic food, produced entirely without the use of synthetic chemicals, from that ambiguously labelled *healthy* food which may (or may not) be grown with chemical inputs.

Because some of the alleged benefits are difficult to document or have been inadequately studied, skepticism has been expressed concerning these claims. There are fears that, if such claims are accepted at their face value by farmers in a very competitive economic environment, they may lead to cut backs in their already low levels of fertilizer and pesticide use, making it difficult if not impossible to maintain their living standards during the difficult adjustment period in the agricultural sector of Poland.

Moreover, it is of paramount importance that ecological farming is economically viable for the producer.

Ecological Agriculture in the Bialowieza Buffer Zone

As concern about environmental damage increases in the Bialowieza Primeval Forest, the role of current conventional agriculture, as a contributor to environmental pollution and degradation of the natural resource base, requires further attention. Attempts are now being made to quantify and value these *external costs* in order to reflect a more realistic economic framework with which to compare conventional and ecological farming systems.

There are a number of local ecological societies and action groups in Poland, and a desire to prevent further environmental degradation. One important consequence of this spontaneous development is an increasing demand for foodstuffs produced without chemicals on *healthy* land and *ad hoc* small markets for food certified as organic are evolving spontaneously. Similarly, there is a corresponding movement on the part of a small number of farmers towards *ecological* farming, mainly through the medium of an organization known as *Ekoland*.

Ekoland is a small organization of ecological farmers in Poland, and of academics teaching and researching in ecological farming methods. Established unofficially in 1982 on the initiative of a Professor at Warsaw Agricultural University, it was registered formally in 1989 following political changes. *Ekoland* promotes ecological farming, registers and certifies genuine organic farms according to IFOAM standards, and has established a reputable trademark for their products. *Ekoland* is reported as having 190 members in mid-1990, and there is a waiting list for new entrants who have to undergo a conversion period under supervision before their produce can be registered.

Conversion Issues

Two major problems would face farmers in the Bialowieza shifting to ecological agricultural practices: a lack of financing during the difficult conversion period when former chemical-boosted yields are reduced and the still-uncertified farms are not eligible for price premiums, and a lack of organized markets for their produce.

Despite an apparently considerable demand, markets for registered organic products are not organized or monitored. Consequently, farmers may fail to realize their full price potential and are open to competition from imitators.

Costs of Conversion

An even more critical problem affecting the progressive expansion of ecological farming, and one which is of crucial importance to the survival of such farmers, is the initial impact on yields of switching from predominantly agrochemical inputs to nonchemical methods of growing crops and feeding livestock.

Evidence suggests that yields fall substantially once synthetic chemicals are excluded from the farm and take several years to be restored to comparable levels. Similarly, profits are reduced because premium prices for produce are not available during conversion. In some cases, it seems probable that farmers would have gone bankrupt had it not been for off-farm employment. Cereal yields seem to have been most seriously reduced, by up to 30 percent, but no crop is immune. One farmer reported that growth of his young cherry trees was lagging about a year behind that of his neighbor's orchard, although he had lost less trees from disease. Indeed, diseases or pests do not seem to have been a major contributory factor to the reduction in yields, despite the substitution of chemical methods of control by other approaches. Other reasons for the reduction in yields may include increased weed competition, and nutrient deficiencies—especially of nitrogen on cereals.

Furthermore, it seems probable that lower purchased input costs are more than offset by the combination of higher labor costs and initial lower yields, leading to net income loss during the conversion period.

III. THE PROJECT COMPONENT

A. Objectives

- To study the impact on farmers in the Bialowieza Primeval Forest of changing from conventional to ecological farming methods on small family farms, on (a) farm yields, farm income, and farm employment; and (b) soil, water, and product quality.

- To estimate and compare the costs of these two farming systems in this buffer zone.

B. Procedure and Methods

The project is designed as a 2-year program, with two principal stages:

Stage 1 - the establishment of baseline data, preliminary reports, review of farm sampling and methodology

Stage 2 - collection of comparative data for analysis, preparation of a research report, and conclusions concerning the future project implications of the results.

Stage 1 (Year 1)

Establishment of Baseline Data

This would proceed as shown below:

1. Survey of the general environmental situation impacting farmers in the Bialowieza buffer zone. Retrieval of data on the air, soil, and water environment of the sample farms from the project supported mobile monitoring station.

2. Survey on a rapid rural appraisal basis to establish baseline data on the following parameters:

   - Farm size
   - Key ecological data: soil type and pH, drainage, agroclimate and frost-free days, altitude, slope, and aspect
   - Land use, farming system, and crop rotation, before and after change in farming methods
   - Nature, levels, time, and methods of application of purchased inputs (fertilizer, pesticides, fungicides, herbicides, seed dressings, animal feed, hormones, tractor fuel, lime, etc.)
   - Farm livestock and system of management, before and after change
   - Crop and livestock yields, before and after change
   - Main sales of produce, before and after change
   - Location of main markets for organically grown produce
   - Family descriptions, size, composition, and education levels
   - Farm labor force: permanent, part-time, casual

3. Procedures for soil, water, and plant material sampling and analysis.

The following approach will be followed to permit meaningful collection and analysis of different parameters without involving unnecessary details:

Soil: Before taking soil samples, data will be collected and assessed to establish a 5-year historical information base on the use of the land in terms of cropping, livestock, fallow, etc., and the quantities of inputs and output. All fields on each farm will thence be sampled twice a year: in spring before seeding and in the autumn. Samples will be taken at three levels: surface, topsoil (15 cm), and subsoil (30 cm). General

information on soil type is likely to be available from maps, and from soil profiles if it is not. Mechanical composition, bulk density, particle size, porosity, water-holding capacity, total soil carbon, organic matter content, and microbiological activity will be determined. Chemical analysis will include: pH; total, and available N and P; NO_3; K; Mg, Ca; micronutrients; Pb, Cd, pesticide residues.

Water: Leachate, runoff, and well water will be sampled three times a year in early spring, autumn, and winter, from each farm. Infiltration rate will be determined. Chemical analysis will cover the same elements as for soil analysis. Well water will also be analyzed for microbiological activity of significance to human health, e.g., *E. coli.*

Plant material: Each crop will be sampled twice, once after germination in the vegetative stage, and once at maturity both grain (or root crop) and straw. The crops to be sampled will be specified after the selection of farms. Dry mass will be determined and chemical analysis will cover the same elements as for soil analysis.

Health condition of crops: These will be estimated from field inspection, and sampling where essential to establish the nature of a problem.

Analysis of soil and water quality will be undertaken by contracted research institute or university staff at appropriate intervals as indicated above, in parallel with other farm survey work, once the work on identifying and mapping of ecological farms has been completed. This information will be incorporated into the baseline survey data base, and sampling will continue at scheduled intervals in subsequent years.

Qualitative analysis of farm produce will be undertaken at harvest time in year 1, and at appropriate intervals during storage and marketing thereafter for year 1 produce; with similar procedures in subsequent years.

Consumer opinion surveys will be taken at appropriate intervals once established outlets for organically grown produce have been identified.

C. The Proposed Work Program

The First Year (1992). January to April: Project Preparation

1. Identification, visiting, mapping, and categorization of farms in the Bialowieza Primeval Forest; selection and mapping of participating farms using up-to-date soil and land-use maps. Selection and development of agreements with farmers to participate in the project.

2. Establishment of an appropriate sample of participating farms (stratified, clustered, or pooled) for detailed socioeconomic evaluation; and soil, water, and plant analysis.

3. Preparation of the questionnaire for rapid rural appraisal of participating farms.

4. Selection and training of enumerators and spot-checking questionnaire.

5. Finalizing arrangements for rapid rural appraisal, soil, water, and plant sampling and analysis (meeting of project staff with external advisory panel).

The First Year (1992). May to September: Survey of Environmental and Baseline Data

6. Collection of environmental data on sample farms from monitoring stations.

7. Collection of farm management and socioeconomic data from individual farm surveys.

8. Initial (spring) sampling of individual farms for soil, water, and plant analysis.

9. Fall sampling of individual farms for soil, water, and plant analysis.

The First Year (1992). September to December

10. Analysis and interpretation of baseline farm management and socioeconomic data.

11. Analysis and interpretation of soil, water, and plant sample data.

12. Preparation of report on first year's results and implications for subsequent year's work.

The Second Year (1993).

Three months: Review and synthesis of results of first years work and discussion with external advisory panel.

Preparation of final report, conclusions, policy implications, and recommendations for developing a detailed program ecological farming in the Bialowieza Primeval Forest.

D. Proposed Composition of the Project Team

Specialist in Ecological Methods of Food Production (Manager) . . . . . Polish

Agricultural Production Economist (Deputy Manager) . . External Consultant

Soil Scientist (Fertility Specialist) . . . . . Polish

Research Administrator . . . . . Polish

Farm Marketing Specialist . . . . . Polish

Soil Hydrologist . . . . . External Consultant

Agronomist . . . . . External Consultant

3 Enumerators part-time (Farm economic survey) . . . . . Polish

Soil and water sampling and analytical team (contract) . . . . . Polish

III. DETAILED COST ESTIMATES

	Quantity			Base Costs US$ Thousands)			Including Contingencies (US$ Thousands)		
I. INVESTMENT COSTS	1992	1993	Total	1992	1993	Total	Foreign Exchange	Local	Total
A. Vehicles and Equipment									
4WD Pickup	1	0	0	17	0	17	18	0	18
Personal Computer & Printer	1	0	1	4	0	0	4	0	4
Sub-Total				21	0	21	22	0	22
B. Technical Advisory Panel[1]	1	1	2	8	8	15	16	0	16
C. External Specialist[2]									
Fees	23	11	34	23	44	34	26	0	36
Per Diem	12	6	18	12	6	18	19	0	19
Travel	12	9	21	12	9	21	22	0	22
Sub-Total				47	26	73	78	0	78
D. Local Experts[3]									
Salary Supplements/Fees	1	1	2	16	16	33	0	42	42
Per Diem	1	1	2	5	5	10	0	13	13
Travel	1	1	2	2	2	4	0	5	5
Sub-Total				23	23	47	0	60	60
Total INVESTMENT COSTS				99	57	156	116	60	176
II. RECURRENT COSTS									
A. Vehicle Maintenance	1	1	2	3	3	6	0	8	8
B. Enumerators[4]	1	1	2	3	3	5	0	6	6
C. Analysis of Samples[5]	1	1	2	15	15	30	0	38	38
D. Sundries	2	1	3	2	1	3	0	4	4
E. Report Production/Translation	4	3	7	4	3	7	0	9	9
Total RECURRENT COSTS				26	24	51	0	65	65
TOTAL				125	81	207	116	125	241

1 Three external advisors: Agricultural Economist, Soil Chemist and Sociologist
2 Mkt. Econ. (Year 1 - 2 months, Year 2 - 2 months), Agronomist (Year 1 - 1 month, Year 2 - 1 month)
3 500/month x 6 months x 4 persons, $250/month x 6 months x 3 persons
4 Five enumerators (Farm Economic Survey)
5 Soil, Water and Plant sampling team (contract)

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

BIALOWIEZA PRIMEVAL FOREST
POPULATION STRUCTURE BY SOURCE OF INCOME

GMINA /YEAR	TOTAL POPULATION	NON-FARM		FARM	SOCIAL BENEFITS				
					TOTAL	AS PERCENTAGE OF TOTAL	OF WHICH HAVE ADDITIONAL INCOME		
		TOTAL	FARMER WORKERS	TOTAL			TOTAL	ON FARM	AS PERCENTAGE OF TOTAL
BIALOWIEZA									
1978	3512	1552	255	390	1960	56	157	151	96
1988	3327	1273	291	198	2054	62	212	201	95
HAJNOWKA									
1978	5900	3389	562	2358	2511	43	109	102	94
1988	5338	2799	562	1813	2539	48	681	676	99
NAREW									
1978	6641	3725	183	3130	2916	44	80	78	98
1988	5530	2796	184	2225	2734	49	771	767	99
NAREWKA									
1978	6118	3382	672	1964	2736	45	161	155	96
1988	5226	2660	612	1381	2566	49	551	542	98

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

INSTITUTIONAL RESPONSIBILITIES

I. Conservation of Biological Diversity of the Ecosystem of the BPF
   A. Risk Assessment - IBL
   B. Seed/Plant Collection - GDSF and IBL
   C. In-situ Conservation of trees, shrubs and herbaceous plants - GDSF and IBL
   D. Determination of Genetic Diversity - IBL
   E. Field and Laboratory activities - IBL
   F. Training - GDSF and IBL

II. Protection and Management
   A. Protected Area Expansion - MENRPF (Minister)
   B. Conservation Planning - MENPRF
   C. Applied Research - IBL and Agricultural Academy (Warsaw) and other scientific institutions selected by recipient
   D. Environmental Impact Assessment - IBL
   E. Man and the Biosphere, Secretariat at Bialowieza - IBL

III. Pollution Monitoring and Mitigation
   IBL and State Inspectorate for Environmental Protection of MEPNRF

IV. Ecological Agriculture
   MENPRF and Ministry of Agriculture with support from scientific institutions

V. Scientific Cooperation with the Republic of Belarus
   IBL and other scientific institutions

VI. Bielowieza Primeval Forest Foundation
   Bialowieza Foundation Board

VII. Sudety Biodiversity Protection
   A. GIS - IBL
   B. Planning for Forest Biodiversity Conservation - GDSF and IBL
   C. Seed Collections - GDSF and IBL
   D. Vegetative Propagation - GDSF and IBL
   E. Forest Gene Bank - GDSF and IBL
   F. Air Pollution Monitoring - State Inspectorate for Environmental Protection of MEPNRF, GDSF and IBL
   G. Scientific Cooperation with the Czech and Slovak Republics - IBL and other scientific institutions

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

GEF PROPOSED PROGRAM FOR THE BELARUS SEGMENT OF THE BIALOWIEZA PRIMEVAL FOREST

I. OBJECTIVES

The Bialowieza Primeval Forest (BPF) is the last remnant of a vast continental forest type which covered Europe after the last continental glaciers receded about 10,000 years ago. It is significant as the home of early European man and the ecosystem which supported him. His institutions, material culture, behavior, and technology were molded by this environment, now only found in this remnant patch of about 1,500 square kilometers of which only 20 km^2 is strictly protected and essentially unmodified. Although the forests were still largely intact in the Middle Ages, requirements for food and fiber extended those areas largely modified by humans. By the 12th century, the primitive cow or auroch was extinct in France, and by the 16th century it was found only in the Bialowieza with the rapidly disappearing European bison, and tarpan (Przewalski's) horse. By the 18th century the need for ship timbers and masts had caused the disappearance of most of the best old growth forests. Schools of Forestry appeared in France and Germany to redress the unsustainable uses of forest resources. This Project is the latest initiative in this effort to insure the sustainability of the forest resource.

Although 58,000 ha (the area of primeval forest in Poland) seems like a large tract of land, it is not quite 600 km^2, about the area needed to sustain one pack of wolves at average densities of one wolf/150 km^2. Only two wolves were regularly observed in the Polish BPF. Similarly for the very rare European lynx. Furthermore, the edge to total area ratio renders the protected area vulnerable to catastrophe such as windfall or fire. The small area under strict protection in Poland currently houses only 40 of the 113 natural plant associations known for the area. Other than its importance in archiving elements of a disappearing natural system, it is likely that a much wider range of plant species than is now protected is required for the foraging of the European bison. One study catalogued nearly 350 plant species in the diet of the bison at Bialowieza.

Two-thirds of the 145,000 km^2 forest is within the Republic of Belarus. Although the GEF Project appraised by the team on the Polish side will be important to the continued existence of the BPF and stands alone (i.e., does not depend on any further input to achieve its goals), the incorporation of the forest resources on the Belarus side will significantly add to the value of the Project. The same basic approach suggested for the Polish side is no less appropriate for the Belarus side. However, some differences exist, such as a much poorer data base. The program suggested below accommodates such differences.

As noted in 3.08 (and above), the BPF is a truly transnational as well as global resource. The suggestions which follow provide for stimulating coordinated planning and management on this basis through the MaB vehicle, and joint research and planning structures. A detailed investment program will await the initial deliberations of the Joint Polish/Belarus Scientific Committee on the Bialowieza Primeval Forest. They would take place no later than July 31, 1992, at which time the program will also be finalized. Based upon the Appraisal of October, 1991, full details of the following activities will be developed and costs refined.

The Appraisal Team assessed the requirements of a Project for the Polish side of the BPF. We understand that the local forest management and forest research administration feel strongly about the need for such joint bilateral coordination to achieve an effective research, planning and management approach for the BPF. They had just initiated such joint technical meetings at the local level prior to our Appraisal.

II. ASSUMPTIONS

The basic premise of the Bialowieza program as devised by Government (and reviewed by the Appraisal team) is the importance of treating the forest as a whole integrated system (which it is), and not as two political departments, 113 forest associations, or some other compartmentalized categorization which may be administratively convenient but unmanageable. Since the forest occurs in both Poland and the Republic of Belarus, it is more realistic to devise a degree of cooperative planning and management if the basic goal of preserving the unique forest is to be achieved. One researcher simply stated that most research needed for managing the Polish BPF resources could only be done if it was conducted in the whole forest which is currently divided by the border.

III. DETAILED PROJECT DESIGN

The Project elements summarized below include the costs of consultants and their travel. Costs are based on a 2-year life of project:

1) $85,000 Joint management structures will be discussed. These will be the permanent institutional structures and arrangements which ensure that overall goals for the entire forest are pursued without surrendering responsibilities - i.e. that suggestions and activities are above individual, sectoral, or national styles or agendas, and beyond short-term time frames. It will be useful to have a symmetrical MaB designation for each side. The Project will support a MaB Secretariat for each side who will coordinate activities such as the hosting of the Joint Scientific Committee, international coordination and publicity (with UNESCO and other MaB programs), and land use planning-related activities. Some other joint structures may need to be tested - enforcement for example. This funding will support the MaB Secretariat (of two), travel, office, and consultants.

2) $125,000 Coordination of research which addresses the connections or common attributes of the forest. Clearly, most research can not be conducted on only one side of the border. The investigations might address biological topics such as seasonal migrations of bison, or keystone[1] seed dispersers and pollinators such as the bats and insects. Investigations of human uses of the forest and related transhumance, pollutants and other topics for investigation will be supported by the Project. The studies of forest pattern and process, human residents, and selected markets, will constitute a subset of the work described for the Polish side, will employ student research, and will include the acquisition and maintenance of equipment and a vehicle.

1/ Species which play a fundamentally important role in ecological processes which define/maintain a particular ecosystem, without which it would experience a state change to a different system.

3) $65,000 The Project will support initial basic inventories of the wildland resources and human ecology which are necessary on the Belarus side. Many years of research and thousands of publications reflect a state of knowledge which can permit some initial land use planning on the Polish side. However, very little is currently known about the nature and disposition of natural resources on the eastern side of the border. This is an absolute necessity for the development of symmetrical programs (of management, research, protection, etc.). These inventories will require transport and maintenance, chemical monitoring equipment, and field equipment to be for by the Project.

4) $35,000 Coordination of land use planning to permit treating viably sized working units which would be too small if only the resources on one side of the border were treated, or preserved. This is essential, for example, in planning the geometry of protected areas which should reflect the minimum critical areas or habitat corridors required by some of the species and forest associations, for viable hunting management, planning and marketing of tourism, projection of privatization approaches, etc. The land use planning, including required hardware, analytic software, a data base manager, and staffing will be supported by the project. Periodic information exchanges and public briefings/Scoping are also supported.

5) $200,000 Field trials of new land uses are going to constitute an important element in the monitoring of the benefits of these interventions. They are also needed to iteratively "tune" the treatments, and, possibly most important, to serve as demonstrations of the efficacy of the new use to conservative resource managers who have been largely isolated from developments in new types of sustainable land uses in topics of great significance to the global environment. The Project will support such work in, for example, uneven-age, natural regeneration, small-scale forestry, lo-input ecological agriculture, etc. At least 3 replicate treatments, with the required supporting technology transfer are envisioned at present. This will establish variance and replicability, and the proof of the concepts which are suggested by the applied research and land use planning. Included in the costs are business management/microenterprise and marketing assistance where appropriate.

6) $275,000 This Project will foster technical collaboration with common or shared technical resources which should be compatible. For example, the project needs to provide a similar GIS/MIS and training to Belarus counterparts as it does for Polish scientists so that maps are the same scale and match. In the absence of a genebank facility on the Belarus side, rare genetic material should be stored at the Jarocin facility. The costs of a GIS and MIS, seed collection/ interim storage, and pollution monitoring equipment are included.

7) $40,000 Under the auspices of the MaB Secretariat, an initial planning workshop employing a integrative protocol such as the Integrated Planning Technology will be supported to:

- initiate the identification of important human resources on both sides of the border;
- bring together scientists and planners from the West and both sides of the border;
- inventory and collate existing data; and
- focus on planning for a collaborative planning and management program.

The goals, concerns, and perceptions of the participants need to be identified early as a part of the coordinated process supported by the Project. This seminal event will engage the technical assistance available around the world as well as local interests and knowledge. The meeting will take a week. This element of the GEF will support the meeting and 5 consultants.

8) $175,000 Each of the seven elements described above require a degree of training, study, and professional development to ensure competence and a permanent legacy of the Project. On-site training of local participants with the assistance of consultants is funded here. The Project will also support such human development with study tours and shared educational expenses. This element will support one Masters degree and seven study tours.

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

THE PROPOSED CZECHOSLOVAKIAN/POLISH JOINT SCIENTIFIC SUDETY MOUNTAINS COMMITTEE

A small sum ($25,000) is included in this GEF project to cover travel, subsistence, honoraria, organizational and meeting costs for semi-annual meetings and necessary follow-up publication costs of work emanating from a proposed *Joint Scientific Committee for the Sudety Mountains* of Polish and Czechoslovakian Specialists.

Rationale

The need for a Joint Scientific Committee reflects the commonality of issues in the Sudety Mountains which is shared by the forest service, parks, research and land use planning authorities of both nations. The issues are shared, the ecosystems are shared, there are economies of scale such as the common use of a gene bank and opportunities exist to work cooperatively on problems which can not be tackled alone.

The advantages of a coordinated effort can be illustrated by looking at the issue of the dying forests on both sides of the border in the Sudety Mountains. Restoration in this transborder area will eventually require the banked genetic material at the gene bank planned for the GEF Project at Jarocin, Poland. Effective restoration will depend on process-related research in montane ecosystems in Czech natural areas, since such work is not provided for in the Polish GEF project.

Such research will look at succession in the forest types, nutrient cycling, soil dynamics and other rate-dependent phenomena important as goals for restoration work. Such data do not currently exist and air pollution is erasing local baselines. Re-establishment of the forest will also depend on control of red deer populations which move freely across the border and which will have to be cooperatively researched and managed.

Economic efficiencies will also depend on cooperative working arrangements. Sharing the nature/culture-based tourism will be important if a situation leading to the destructive competition experienced between Kenya and Tanzania, for example is to be avoided. The natural units are not that large. The natural attractions are located in both countries and tourists will not experience what they might if they are precluded from seeing, for example, a herd of chamois located just across the border in one of the countries. Skiing can utilize runs on the whole mountain rather than on one slope (the ski "circus", or haute route concepts familiar in the alps of Western Europe).

The increasing ease of border crossing will facilitate such resource sharing for the greater good. Ultimately, the client markets which have the hard currency to be shared by the two countries, will reflect the greater enjoyment of an approach which uses the entire resource complex.

Proposed composition of the Joint Scientific Committee for the Sudety Mountains. The Joint Scientific Committee for the Sudety Mountains (JSC) should have certain general characteristics. It should embrace a minimum capability set which reflects the types of issues which it will address.

Therefore, it is recommended that it include a forester, wildlife biologist, environmental scientist, agricultural scientist, land-use planner, sociologist/decision analyst, economist/microenterprise specialist and recreation/parks planner from each country.

The JSC will be dealing with some new issues—from private enterprise to land-use planning and impact analysis. Therefore, provision should be made for easy and regular access to global expertise. One regular Committee member come from outside the two countries and be rotated as to skill and source. It is also suggested that such a JSC structure be considered for each distinct resource set (i.e., a protected area or protected area complex in a region).

For the first two meetings, an Integrated Planning Technology is proposed to identify goals, problems which might attend each goal, key questions which need to be answered to solve the problems and data required to answer each key question identified. The initial two meetings will employ consultants in the skill areas noted below, in addition to the regular members of the JSC. A facilitator may also be used for the initial two meetings.

All regional JSC bodies should meet regularly, perhaps annually, to present progress, share information, technology, prevent duplication and incompatible data sets, etc. The "European Trust for the Conservation of Nature and Culture" in Eastern and Central Europe would be a suitable venue for such integrated plenary meetings. The products of the JSC will be contributions to land-use plans, quality assessment and quality control.

The Polish GEF could use the results of some specific research to take full advantage of the banked genetic material on which so much emphasis has been placed. The Czech GEF could help with its provision. The Czech Project could benefit from using the gene bank and from the GIS-assisted land-use planning for the buffer areas to protected sites. These can be assisted by the Polish GEF Project. The JSC is the bilateral vehicle for such scientific coordination.

POLAND

FOREST BIODIVERSITY PROTECTION PROJECT

PROPOSED SUPERVISION PLAN

Supervision Program for the Project

With the number of innovative components in this Project being implemented in a short time frame, a wider and more intensive program of supervision is proposed than is commonly applied in Bank Projects. For example, the life of this GEF Project is only 2 years, rendering the Annual Project Review less meaningful. Also, its thrust differs somewhat from the normal concerns of the implementing Agency (Forestry). This will probably not be unusual for such relatively new technical concerns as biological diversity in many areas of the world which most require such efforts. The normal checks and balances and quality assessment mechanisms of such agencies may be unfamiliar with the novel elements of such Projects, and may therefore benefit disproportionately from Bank supervision activities.

As was the case with the response to the Environmental Impact Assessment requirements of the initial U.S. law of 1969 (NEPA), there is the distinct danger of a paper blizzard with lots of raw data but little analysis and *useful* synthesis. The Supervision Plan suggested is more frequent (three times per year) as well as more scientifically oriented compared to the normal schedule of semi-annual staff/consultant efforts in regular Bank projects. The scheduled supervision visits respond to milestones proposed in the Project.

The skill mix proposed in the table below is tentative, but suggests that the initial consultants or scientists with similar skills be employed to work with the Task Manager—all of whom worked on the initial documentation (Appraisal). The rationale is driven by the desirability of comparing progress or unanticipated changes against the conceptual baseline at Project development. The requirement is to maintain the vision of the goals of the Project while avoiding rigid adherence to the original design if changes are warranted.

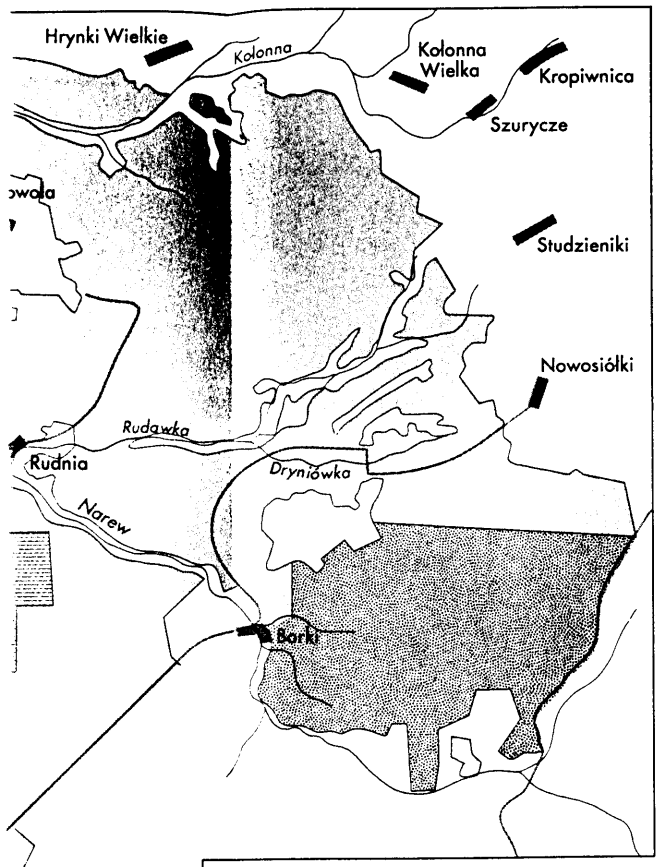
	Staff Weeks			Staff Weeks			Staff Weeks
Proposed Staffing Pattern	**April 1992**	**July 1992**	**Oct. 1992**	**April 1993**	**July 1993**	**Sept. 1993**	**June 1994 Wrap-up**
Task Manager	2	2	2	2	2	2	2
Forest Ecologist	2	1	1	1	1	1	1
Forest Geneticist	2	2	1	2	2	1	1
GIS Specialist (Trust Fund)	1	—	—	1	—	—	—
Ecological Farming Specialist (Trust Fund)	1	1	—	1	1	1	—
Gene Bank Specialist (Trust Fund)	2	1	1	1	1	1	—
Wildlife Specialist	—	1	—	—	1	—	—
Proposed Supervision Staff/Weeks	**10**	**8**	**5**	**8**	**8**	**6**	**4**

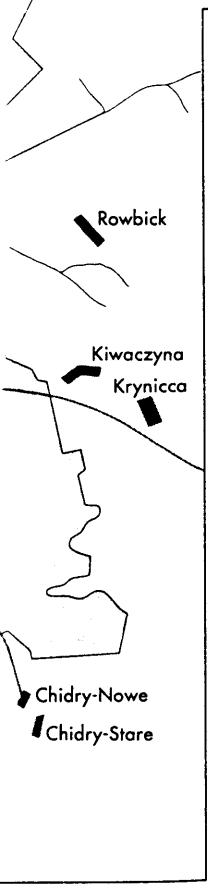
Three supervision missions are planned for each year of the proposed two year project implementation period (estimated at 2 weeks each, with 1 week of report writing upon return). Each of these missions should have the flexibility to adapt to the conditions at the time. The Core Team would include the Task Manager, the forest ecologist, and the forest genetics specialist supplemented by additional scientists. The first supervision is proposed for April, 1992. At this critical juncture, the initial Joint Scientific Committee (Czechoslovakia-Poland) workshop would be held, equipment and infrastructure procurement would be underway, the MAB staff at Bialowieza would be finalized, the GIS implementation plan completed, and the applied research initiated. The second supervision mission will take place in July, 1992 when the work is largely in progress, and the initial JSC meeting with Belarus counterparts would be scheduled. The penultimate supervision mission would occur in September, 1993 for the End-of-Phase I meeting which will summarize progress, and the land use demonstrations are just underway.

The proposed budget for this intensive supervision work is 49 staff weeks, 23 staff weeks for 1992, 22 staff weeks for 1993 and 4 staff weeks for the wrap up work in 1994. The estimated total supervision cost is estimated at $75,000 for 1992, $70,000 for 1993 and $16,000 for 1994, for a total supervision cost estimate of approximately $160,000 (inclusive of staff costs, consultant fees, travel and subsistence) according the detailed program outlined in the matrix above. The Division expects at a minimum of 20 staff weeks of the specific scientific supervision work on the GIS, Ecological Agriculture and air and water monitoring work would be eligible for Trust Fund support. This would leave a direct supervision charge of 29 weeks, which is in line with regular GEF supervision co-efficients on an annualized basis (12 staff weeks per annum).

MAP SECTION

IBRD 23380R2





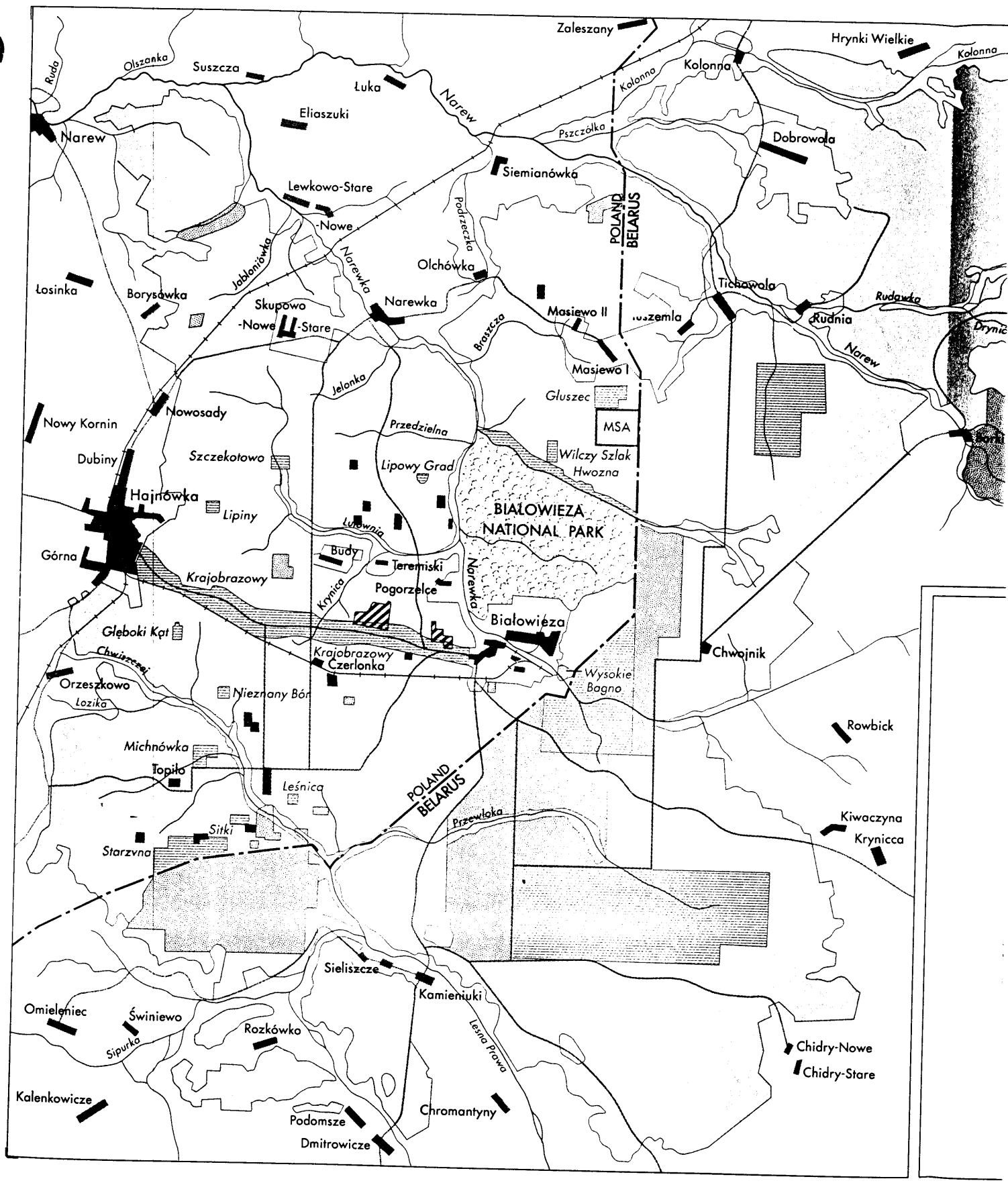
POLAND
FOREST BIODIVERSITY PROTECTION PROJECT
BIAŁOWIEZA PRIMEVAL FOREST

- PROTECTION AREA
- EXISTING PROTECTED RESERVES
- PROPOSED PROTECTED RESERVES
- PROTECTED TREE SEED STANDS
- RESERVES OF BISON, WILD HORSES, AND ELKS
- MSA — MODEL SOIL AREA

- ROADS
- RAILROADS
- RIVERS
- TOWNS AND VILLAGES
- INTERNATIONAL BOUNDARY

KILOMETERS
0 5 10 15
0 5 10
MILES

SEPTEMBER 1993


Zaleszany
Hrynki Wielkie
Kolonna
Kolonna
Kolonna
Ruda
Olszanka
Suszcza
Łuka
Narew
Eliaszuki
Narew
Pszczółka
Dobrowola
Siemianówka
Lewkowo-Stare
-Nowe
Podrzeczka
POLAND
BELARUS
Jabłoniówka
Narewka
Olchówka
Łosinka
Borysówka
Skupowo
-Nowe
-Stare
Narewka
Masiewo II
Tichowola
Rudawka
Rudnia
Drynic
Brzeszcza
Narew
Masiewo I
Jelonka
Gluszec
Nowosady
Nowy Kornin
Przedzielna
MSA
Dubiny
Szczekotowo
Lipowy Grad
Wilczy Szlak
Hwozna
Hajnówka
Lipiny
BIAŁOWIEŻA
NATIONAL PARK
Ludwinia
Budy
Teremiski
Górna
Krajobrazowy
Krynica
Pogorzelce
Narewka
Białowieża
Głęboki Kąt
Chwojnik
Krajobrazowy
Czerlonka
Wysokie
Bagno
Orzeszkowo
Nieznany Bór
Lozika
Rowbick
Michnówka
Topiło
Leśnica
POLAND
BELARUS
Przewłoka
Kiwaczyna
Krynicca
Sitki
Starzyna
Sieliszcze
Kamieniuki
Omieleniec
Świniewo
Rozkówko
Sipurka
Leśna Prawa
Chidry-Nowe
Chidry-Stare
Kalenkowicze
Chromantyny
Podomsze
Dmitrowicze

POLAND
FOREST BIODIVERSITY PROTECTION PROJECT
PROJECT AREAS

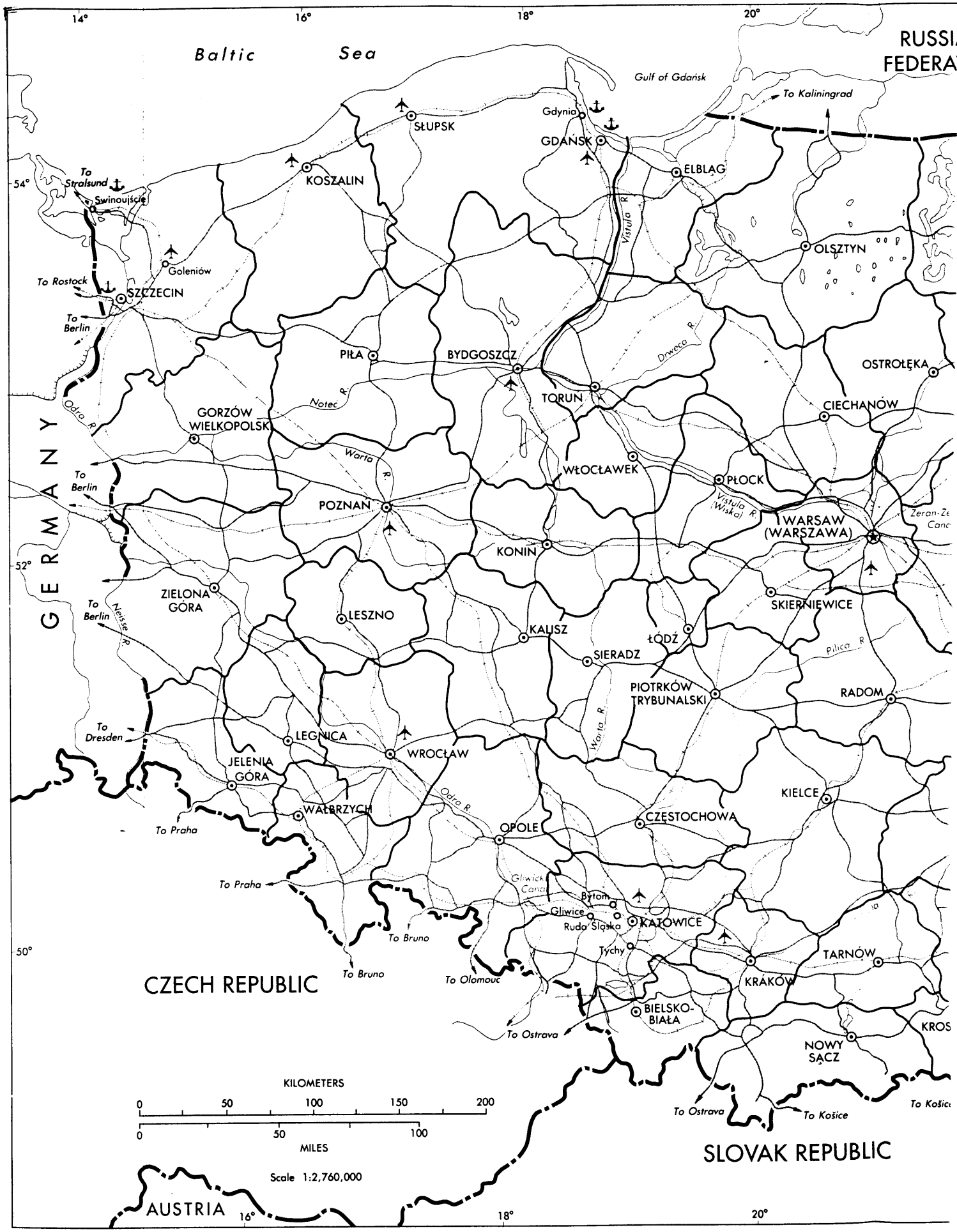
ZONES OF BIODIVERSITY PROTECTION:

PHASE I

PHASE II

- MAIN ROADS
- RAILROADS
- AIRPORTS
- NATIONAL CAPITAL
- PROVINCE CAPITALS
- CITIES AND TOWNS
- MAJOR PORTS
- RIVERS
- CANALS
- PROVINCE BOUNDARIES
- INTERNATIONAL BOUNDAR

SEPTEMBI


14°
16°
18°
20°
Baltic Sea
Gulf of Gdańsk
RUSSIA FEDERATION
To Kaliningrad
Gdynia
SŁUPSK
GDAŃSK
ELBLĄG
KOSZALIN
To Stralsund
Swinoujście
54°
Vistula R.
OLSZTYN
Goleniów
To Rostock
SZCZECIN
To Berlin
PIŁA
BYDGOSZCZ
Drweca R.
OSTROŁĘKA
Notec R.
TORUŃ
CIECHANÓW
Odra R.
GORZÓW WIELKOPOLSKI
Warta R.
To Berlin
WŁOCŁAWEK
PŁOCK
POZNAŃ
Vistula (Wisła) R.
WARSAW (WARSZAWA)
GERMANY
KONIN
52°
ZIELONA GÓRA
SKIERNIEWICE
To Berlin
Neisse R.
LESZNO
KALISZ
ŁÓDŹ
SIERADZ
Pilica R.
PIOTRKÓW TRYBUNALSKI
RADOM
To Dresden
LEGNICA
WROCŁAW
Warta R.
JELENIA GÓRA
KIELCE
Odra R.
WAŁBRZYCH
CZĘSTOCHOWA
To Praha
OPOLE
Gliwice Canal
Bytom
Gliwice
Ruda Śląska
KATOWICE
To Praha
To Bruno
Tychy
TARNÓW
50°
To Bruno
To Olomouc
KRAKÓW
CZECH REPUBLIC
BIELSKO-BIAŁA
To Ostrava
KROS
NOWY SĄCZ
KILOMETERS
0 50 100 150 200
0 50 100
MILES
Scale 1:2,760,000
To Ostrava
To Košice
To Košic
SLOVAK REPUBLIC
AUSTRIA
16°
18°
20°