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**Design of pilot activities to improve the management of
selected Protected Areas, and of a system for monitoring key
species, populations and ecosystems in those areas**

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EXECUTIVE SUMMARY

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Design of Pilot Activities to Improve the Management of Selected Protected Areas and of a System for Monitoring Key Species, Populations and Ecosystems in those Areas

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EXECUTIVE SUMMARY

Introduction

On the initiative of the Regional Development Office of the United States International Development Agency (USAID-Peru), the design was undertaken of a **MATRIX FOR THE INDIRECT MONITORING OF THE DEGREE OF BIODIVERSITY CONSERVATION BY EVALUATING OF THE MANAGEMENT CAPACITY OF STATE PROTECTED NATURAL AREAS (PAPM)**, which was presented at the start of 1997

This report recommended a series of activities to improve the management capacity of areas within the national protected areas system (SINANPE) It also recommended that mechanisms should be designed to validate the methodology based on indirect monitoring, by verifying the relation between the capacity of protected areas to carry out their work and the actual fulfillment of their management objectives It was suggested that this verification could be carried out by monitoring key species and ecosystems

The second stage of this initiative, which was initiated in October 1997, has consisted in taking up the recommendations contained in the above mentioned study, which were to select no less than three protected areas from among the 14 included in the original matrix, identify and propose pilot activities to improve their management capacity, and identify a set of species and ecosystems for each protected area which would permit the design of a monitoring program to validate the methodology proposed in the indirect monitoring matrix (PAPM)

The subsequent application of PAPM should reflect the improvements in the management capacity of the protected areas concerned

Background information

Protected areas are continental or maritime areas within the national territory, expressly recognized and declared as such, with the aim of conserving biological diversity and other related cultural, landscape or scientific values, and in recognition of their contribution to sustainable development at a national level Their legal antecedents in Peru date back to the signing of the Convention for the Protection of Flora, Fauna and Scenic Beauty of the Western Hemisphere in 1940 This convention was ratified by Peru in 1946 The first proposal for a National Park in Peru was made in 1941, but it was not until 1961 that the first National Park was established, in the province of Cutervo, in Cajamarca

In 1975 the Forestry and Wild Fauna Law (Legal Decree 21147) was passed, which defined the legal framework for state protected areas in Peru. In 1977, this Law was complemented by the Regulations for Conservation Units (Supreme Decree 160-77-AG). In 1990, the structure of the national system of conservation units was modified, and the National Protected Areas System (SINANPE) was established. A new National Protected Areas Law (Law No. 25834) was passed in 1997, however the existing Regulations for Conservation Units remain in force until such time as the Regulations relating to the new law are issued. According to the "Organic Law" of the Ministry of Agriculture (Legal Decree 25902 and Supreme Decree 055-92-AG), the agency responsible for the administration of protected areas is the National Institute of Natural Resources (INRENA), acting through its General Directorate of Natural Protected Areas and Wild Fauna (DGANPFS).

In accordance with current legislation, the National Protected Areas System contains the following categories of protected area: National Parks, National Sanctuaries, National Reserves, Landscape Reserves, Wildlife Refuges, Protected Forests, Game Reserves, and Communal Reserves. At present there are 35 protected areas within these categories, with a total area of 6,820,337.04 Ha. In addition there are 11 State Reserved Zones (with a total area of 3,403,363.84 Ha), which have been established for conservation purposes on a provisional basis until such time as they are assigned a definitive category within the protected areas system.

In accordance with Legal Decree No. 26154 (29 December 1992), the National Fund for Natural Protected Areas (FONANPE) was created. This is an endowment fund to be used exclusively for the conservation, protection and management of state protected areas, set up with resources provided by international cooperation agencies, with complementary funding from the public and private sector in Peru.

An additional possibility which should be considered is the establishment of separate trust funds for specific areas. This could be an attractive option for some donors. To benefit from economies of scale, these funds could form part of FONANPE, however the use of the resources they generate would be restricted accordingly.

It is also worth emphasizing the important role played by non-government organizations in the development and management of a number of areas within the SINANPE.

While the evaluation of the effectiveness of the SINANPE should ideally consider their efficiency in protecting biodiversity, this could only be achieved by monitoring landscapes, ecosystems and species, which would require a considerable investment of time and money. For this reason, the methodology proposed by PAPM was designed to measure the degree of protection of biodiversity indirectly, through an evaluation of the capacity of the protected areas to achieve their objectives. This methodology is based on indirect evaluation, since it is based on an analysis of available secondary sources of information about the administrative capacity of each area concerned. The design of the PAPM identifies 12 important elements which define the capacity of the protected areas to fulfil their objectives.

The basic objective of PAPM was to propose a simple and practical system which would permit progress towards improving the management of protected areas to be identified using information readily available within the different sectors which make up the protected area system. Since PAPM clearly presents detailed information about management efficiency in each protected area, it also functions as an early warning system with respect to limitations in management capacity, and allows weaknesses in the management of biodiversity protection to be rapidly identified. But it should be borne in mind that PAPM does not provide direct information about the quality of biodiversity protection, since the analysis does not involve the study of biological factors, such as the viability of populations or the recovery of threatened species. Nor can one infer from the matrix which conservation unit is "best" or most important from a biogeographical point of view.

The analysis of the state of wild populations or their habitats requires more information. In most cases this information would need to be generated and therefore would not be available for immediate analysis. In these circumstances, it is clear that the ability to evaluate management capacity is a crucial tool for monitoring the health of natural protected areas, and for prioritizing actions designed to correct limitations in their management programs.

The criteria used for the selection of the elements considered by PAPM were that they should be easily quantifiable and have a direct bearing on management effectiveness, as well as being relevant in all or most of the protected areas selected for monitoring. The six dimensions or fields into which the different variables or elements are grouped for the purpose of compiling the matrix affect administrative effectiveness with different degrees of intensity, and for this reason it was deemed appropriate to weight to their influence as follows: Legal Field – 6%, Administrative Field – 40%, Planning Field – 30%, Knowledge of the Area – 9%, Use of Natural Resources – 9%, and Threats Field – 6%.

It shouldn't be forgotten that PAMP represents an attempt at synthesis, processing solely secondary information, in order to permit an evaluation of the quality of our response to the challenge of protected area management in a country with limited resources available for monitoring these areas.

The final score determined for the entire sample is the value which should be compared for each year of the period evaluated (1996-2004). It is assumed that annual increases in this value signify improvements in management, and thus improvements in the protection of biodiversity. The values obtained also permit the identification of priority elements, or those which are having a significant impact on the management effectiveness of the system. This possibility gives the matrix a practical value for prioritizing actions to support the protected areas system.

The proposed methodology was applied to a sample of 14 protected areas. The aims were, firstly, to adjust the methodological process in accordance with the availability of information for processing, and secondly to establish a base line against which changes recorded in subsequent applications of the matrix could be compared.

As a result of the application of the matrix (using information available in 1996), values were obtained for each element and each of the 14 protected areas, giving an overall efficiency value of 45%

Reviewing of the elements considered in the evaluation of management effectiveness of protected areas, it can be appreciated that what is really being assessed is whether or not appropriate or optimal conditions exist to enable the objectives of each protected area to be fulfilled, the matrix does not measure the degree to which these objectives are actually being attained

It is clear, as was detected during the collection of information for use in the application of the proposed methodology, that no complete systematic data bases exist to enable the progress of the protected area system to be assessed. In fact there is a complete absence of monitoring programs of any kind

The Natural Protected Areas selected

In accordance with the terms of reference submitted by the Office of Rural Development of USAID-Peru, the following criteria were used to select to protected areas for inclusion in the study

- Importance and relevance of their ecosystems in terms of their priorities for the SINANPE
- Their representativeness in relation to the five management categories established in the PAPM
- Their major habitat types, within the three existing environmental monitoring levels, and their relevance for the development of pilot monitoring system for key species and populations
- Their likelihood to influence the PAPM scores in terms of any major improvements are likely to cause a move upward within the performance categories

The six protected areas selected cover almost the entire range of management capacity classes within the protected area sample analyzed by PAMM in 1996, as can be appreciated in the following table

Table 1 Management capacity classes

Management capacity class	Bad	Deficient	Acceptable with limitations	Good	Excellent
Score range (%)	0 – 39	40 - 59	60 – 69	70 - 84	85 - 100
	Junin NR (28) Salinas NR (10) Calipuy NS (5) Machupicchu HS (33)	Huascarán NP (57) Cerros de Amotape NP (57) Yanachaga NP (47) Titicaca NR (41) Bahuaja Sonene NP (58)	Manu NP (65) Rio Abiseo NP (64) Manglares de Tumbes NS (61) Paracas NR (61)	Pacaya Samiria NR (73)	

Cerros de Amotape National Park

The Cerros de Amotape National Park covers an area of 91,000 Ha and contains an excellent sample of the Dry Tropical Forest Biogeographical Province in north-west Peru. Because of its proximity to Pacific Tropical Forest biome, this National Park is a very special site – unique in Peru – where the plant and animal communities contain a mixture of species from these two biomes. This protected area has been identified as a center of endemism (birds and invertebrates), an important area in terms of information gaps (plants), and a priority conservation area.

At present a series of development projects with conservation linkages are being undertaken in the area, with the participation of NGOs and local communities. There is an Operational Plan for the Park drawn up in 1989, on the basis of recommendations by planning and evaluation workshops held with the active participation of the local population. This protected area obtained a score of 57.18% in the application of the PAPM, close to the average within the range of scores obtained by National Parks in the sample.

At present the Cerros de Amotape National Park has a Park Chief and 9 park guards. In general the Tumbes Sub-Region provides considerable support for the management of the 4 protected areas in its ambit. INRENA, acting through DGANPFS, has established as a short term objective the completion of the legal and physical demarcation of all protected areas, and this obviously includes the Cerros de Amotape National Park.

The River Tumbes rises in Ecuadorian territory, and the river transports the problems originating there, such as water pollution caused by the use of mercury by artisanal gold miners and the discharge of organic and inorganic waste products. Problems within the National Park include deforestation, poaching, the extraction of wild fauna, cattle grazing within the Park, and the extraction of timber for parquet flooring. Management problems include the lack of control posts and refuges in strategic sites, the lack of adequate facilities for research, recreation and environmental education,

and access and communications difficulties. The last of these problems will undoubtedly get worse during the current year.

Six activities are proposed for direct application in this National Park, and one that will have an indirect influence on management capacity. It is hoped to improve management capacity by updating the Operational Plan, providing training for professional and technical staff, and the initiation of three monitoring programs (covering forests and animal indicator species). At the end of the implementation period it is expected that the Operational Plan will have been officially approved, and all professional staff will have attended one training course, and that park guards will also have received training.

Huascaran National Park

Huascaran National Park is the third largest National Park in Peru (340,000 Ha) and covers almost the entire Cordillera Blanca, the highest tropical mountain range in the world.

Seven life zones have been identified within the Park, creating a range of micro-climates and giving rise to a high degree of biodiversity. The Park is located within a highly threatened eco-region and has been identified as being of maximum regional conservation policy. Its biological diversity includes an number of endangered and vulnerable species of flora and fauna.

This protected area has a long planning and management history. It has a Master Plan designed by a multidisciplinary team from different regional organizations, which was approved in 1990, and a plan for tourism and recreational use which was approved in 1996. Huascaran National Park obtained a score of 57.03% in the application of the PAPM, close to the average within the range of scores obtained by National Parks within the sample.

In 1997, Huacaran National Park had a staff of 24, including 7 professional workers and 15 park guards. Although the Park has three control posts, these are all located in the Santa river basin, leaving the problematic Conchucos sector without any physical presence of the Park authority.

Problems include the inappropriate use of natural resources and ecosystems, overgrazing of pasture lands, large scale extraction of wild flora, poaching, the presence of large numbers of visitors in restricted areas, lack of local awareness of the Park and lack of compliance with its regulations, the attitude of tour companies which seek profits even at the cost of environmental damage, lack of local knowledge of environmental laws, the failure to delimit and appropriately manage recreational zones, and pressures from mining companies which want to extend their operations into the Park. Some mining companies are already operating illegally within the protected area, mainly in the Callejon de Conchucos sector.

Six activities are proposed for direct application in this National Park, and one that will have an indirect influence on management capacity. It is hoped to improve

management capacity by providing training to professional and technical staff, and by constructing and equipping a control and surveillance post in the Conchucos sector. It is intended that this post should operate more as a conservation and development center than a control post. In addition three monitoring programs will be initiated (grasslands, *Puya raimondii* and indicator animal species)

By the end of the implementation period it is expected that all professional staff will have received training (1 training course). In the case of the park guards, these should have attained training index score of at least 0.7. The control post should have a built area of at least 100m² and contain accommodation facilities for three park guards (dormitory, bathroom, kitchen and dining room) as well as an office and storeroom.

Bahuaja-Sonene National Park

This is the largest National Park in Peru, with an area of 537,053.25 Ha. It was created in 1996 on the site of the former Pampas del Heath National Sanctuary and Tambopata-Candamo Reserved Zone. This region is outstanding for its biodiversity, its conservation status is relatively stable, but taking account of the conservation status of the eco-regions of Latin America and the Caribbean, it has been assigned maximum regional conservation priority.

Although the Bahuaja-Sonene National Park does not have an officially approved management plan, both the Pampas del Heath National Sanctuary and the Tambopata-Candamo Reserved Zone have been the object of participatory planning initiatives. The Bahuaja-Sonene National Park obtained a score of 58.07% in the application of the PAPM, close to the average within the range of scores obtained by National Parks in the sample.

Although the Bahuaja-Sonene National Park does have personnel assigned to it, these have been "inherited" from the former Pampas del Heath National Sanctuary. The same situation applies to the infrastructure of the Park.

Management problems identified in the Park derive fundamentally from budgetary constraints and the problem of continuity of operations financed by overseas agencies. In addition, the increased presence of tourists in the Park could cause the deterioration of some resources. Attention should be drawn to the presence of large numbers of artisanal gold prospectors in areas close to the Park, with the consequent environmental dangers. Finally, the operations of petroleum companies continue to pose a threat in areas surrounding the Park.

For this protected area, it is proposed to provide support for monitoring programs, giving priority to monitoring brazil nut stands, since this is an ecosystem subject to extractive pressures, as well as to the pampas of the River Heath, and populations of swamp deer and maned wolf. Since the extraction of brazil nuts is a traditional activity in the region with a significant local economic impact, monitoring this activity will provide valuable information which could be used to improve harvesting and management practices.

As in previous cases, providing staff training to personnel will improve the management capacity of the Park. Widespread publicity of its biological values will contribute indirectly to improved management of tourism within the Park. By the end of the implementation period, park guards should have attained a training index score of at least 0.7.

Pacaya-Samiria National Reserve

The Pacaya-Samiria National Reserve, located in the most important area of seasonally flooded forest in the Peruvian Amazon, is the largest protected area in Peru (2,080,000 Ha). Although it is not outstanding in terms of biological diversity, it provides a home for a number of important species. 130 species of mammals, 330 of birds, 150 of amphibians and reptiles and 220 species of fish have been recorded.

As a National Reserve it fulfils a double role in the conservation of biological diversity: both protecting and ensuring the sustainable use of the region's living resources.

The Reserve has been the site of one of the Peru's most important conservation projects, implemented by Pro Naturaleza and The Nature Conservancy with the support of USAID, and this means that there is a special interest in monitoring the changes that have occurred, both in terms of management capacity, and – through ecological monitoring programs – the fulfillment of conservation objectives. The Pacaya-Samiria National Reserve obtained a score of 72.93% in the application of the PAPM, the highest score of all the protected areas in the sample.

As of December 1997, the Pacaya-Samiria National Reserve had a staff of 49, including 41 park guards, 5 professional staff, 2 administrative staff and the Reserve Chief. It has 14 control posts equipped and in operation, as well as a biological station at Cahuana, which is not adequately equipped, however. The Reserve receives support from the Loreto Regional Government.

One of the principal problems of the Reserve is the high degree of vulnerability caused by its large size and numerous access points, which facilitate the illegal extraction of natural resources.

Another important problem is the high degree of human pressure on the natural resources of the Reserve, and lack of awareness by the local population of the need to use them sustainably. Despite the number of people who work in the Reserve, there is still a shortfall of professional workers, and the park guards are inadequately trained.

Seven activities are proposed which will provide direct benefits to this protected area, and one that will provide indirect benefits (publicity). Among proposed activities with a direct impact, are two training courses, in which members of staff from other protected areas will also participate, the installation of a meteorological station at the Cahuana Biological Station, and the initiation of monitoring programs covering "charapa" turtles, giant otters, bird communities (on the basis of diversity indices) and

agricultural lands located on the periphery of the Reserve. It is expected that the results of these programs will enable the Reserve authority to improve and/or correct management policies and strategies in the area. At the end of the implementation period, it is expected that park guards will have attained a training index score of at least 0.7.

Paracas National Reserve

This National Reserve is the largest protected area on the Peruvian coast and practically the only sample of marine and coastal ecosystems within the protected area system. From a biodiversity point of view, Paracas is an important habitat for migratory shorebirds from the nearctic and provides a home for significant colonies of marine mammals. It is also the nesting site for various birds endemic to the Peruvian (Humboldt) current which are currently considered to be vulnerable or in danger of extinction.

The Paracas National Reserve has a Master Plan which was approved in 1979. An updated version of this plan was approved in 1996. In the surrounding area a number of projects are being implemented to prevent coastal pollution with the support of USAID-Peru. These projects got underway in 1995. Paracas obtained a score of 61.43 in the application of the PAMP, the fourth highest value in the sample, and the second highest of the National Reserves.

At present the National Reserve has 2 professional staff and 6 park guards, as well as updated planning and management instruments. However there are serious limitations in terms of infrastructure, staffing levels and equipment.

The Reserve suffers from pollution both of coastal and recreational areas. Marine contamination is caused by industrial activity located in its area of influence, and discharges from nearby population centers. Pollution of beaches is caused by waste products deposited by artisanal fishermen, bathers and visitors.

Illicit fisheries activities, using dynamite and other illegal methods, are another problem, which is compounded by over-fishing and the inappropriate management of fisheries resources. Other problems originate from unregulated tourism in the areas of influence and buffer zones of the Reserve.

Finally, because of budgetary constraints, the Reserve suffers from inadequate logistic, communication and transport facilities. This, which combined with the insufficient number of park guards, restricts surveillance activities in the Reserve.

Five activities with a direct impact and one with an indirect impact are proposed for this protected area. The former include training courses which will improve the management skills of Reserve staff, and three programs to monitor key species (2) and ecosystems (1). At the end of the implementation period, it is expected that park guards will have attained a training index score of at least 0.7, and professional staff a score of at least 0.75.

Calipuy Complex (National Sanctuary and National Reserve)

Together these two protected areas are the only sample in the Peruvian protected area system of the Meridian Tropical Andean Biogeographical Province. They were established in 1981, with areas of 4,500 Ha (National Sanctuary) and 64,000 Ha (National Reserve).

From a biodiversity point of view, the National Sanctuary contains the densest and probably most extensive stands of *Puya raimondii* in Peru. It also corresponds to the northern limit of distribution of this species. The National Reserve protects the most important known population center of guanacos, and also represents the northern limit of distribution of this species. The area as a whole is however notable for the lack of available biological information.

This area (National Sanctuary and National Reserve) is proposed for its effects on the development of this second phase in the application of the PAMP, since the almost complete lack of information, management plans, equipment and personnel, as well as its location adjacent to important areas of mining activity, make it singularly interesting for monitoring purposes. It should be stressed that these reserves have received no funding from overseas agencies to date. It is for these reasons that Calipuy only obtained a score of 4.95% in the application of the matrix, the lowest score in the sample.

Both protected areas are characterized by lack of personnel, infrastructure, and planning and management documents. However, attention should be drawn to the work of the National Council of South American Camelids (CONACS) in carrying out a census of the guanaco population in the Calipuy National Reserve.

At present, neither area has staff nor infrastructure, nor are they considered in the investment program proposed by PROFONANPE for 1988. From 1988, responsibility for the management of these areas has been assigned to the new Chief of the Rio Abiseo National Park.

Eight activities are proposed which have a direct impact on these protected areas, and one with an indirect impact (publicity). The physical demarcation of the two areas, and the construction and provision of basic equipment for an administrative center and control post (with a built area of 100 m²), should permit a significant increase in the PAMP score obtained by these areas.

All these efforts clearly start from the premise that these protected areas need personnel. Training the staff taken on in these areas (to obtain a minimum training index score of 0.7), the formulation of an Operational Plan, the installation of a meteorological station, and the development of two monitoring programs, should provide a good starting point for improving the management capacity of these areas.

Pilot activities in selected protected areas

The following criteria have been taken into account in the selection of activities to be proposed

- Problems and needs of the protected area, and as a consequence their capacity to influence PAPM indices In the application of these criteria we have taken account of the structure of PAPM, which classifies protected area management capacity into six fields or dimensions
- Official prioritization of needs (by INRENA)
- Existing activities (currently being implemented or recently completed)

Three different procedures are proposed for the implementation of the recommended activities The selection of the most convenient procedure will depend on the nature of the activity, the location of the protected area, and the experience and trajectory of the institutions involved

- Implementation by contractors selected by public tender
- Implementation entrusted to institutions or organizations selected for their recognized experience in the field of protected area management
- Direct implementation by the administration of the protected area concerned (INRENA)

Prioritization of activities

For the prioritization of activities we have taken account of the selection criteria listed above, as well the capacity of each activity to influence the scores obtained in the application of the PAPM On this basis we have drawn up a list of the pilot activities according in descending order of priority, which is given below

- | | |
|-------------|---|
| Priority 1 | Training course for park guards |
| Priority 2 | Training course for chiefs and superintendents |
| Priority 3 | Updating the Operation Plan of the Cerros de Amotape National Park |
| Priority 4 | Construction and equipping a control post in Huascarán National Park |
| Priority 5 | Drawing up operational plans for Calipuy |
| Priority 6 | Construction and equipping a control post and administrative headquarters in Calipuy |
| Priority 7 | Physical demarcation of Calipuy National Sanctuary |
| Priority 8 | Physical demarcation of Calipuy National Reserve |
| Priority 9 | Publicizing the protected area system on INTERNET |
| Priority 10 | Installation of a meteorological station at the Cahuana Biological Station in Pacaya-Samiria National Reserve |
| Priority 11 | Installation of a meteorological station in the Calipuy National Reserve |

Description of the proposed pilot activities

The eleven activities listed above are described below The total budget required to implement these activities is **US \$169,800**

Activity 1 Training course for park guards (US \$15,000)

It is estimated that a basic level course provided to 30-35 members of staff would be sufficient to raised the PAPM training index score to an average of 0.7 (compared with the present value of 0.5)

A basic level course is required because almost 55% of park guards have received no training to date. By contrast with previous courses, this one will be evaluated in such a way that the participants are required to obtain a minimum score in order to pass.

Activity 2 Training course for chiefs and professional staff (US \$14,000)

Since this course is aimed at professionals (chiefs and superintendents), of whom 55% have attended previous courses or received instruction in protected area management, an intermediate level is considered appropriate. In contrast to similar courses held in the past, this course consist of two parts: the first part residential and the second with tuition by correspondence. The course will be evaluated in such a way that participants are required to obtain a minimum score in order to pass.

Activity 3 Updating the Operational Plan of the Cerros de Amotape National Park (Participatory Rural Appraisal Workshop) (US \$16,500)

The new Operational Plan will require the development of more profound forms of participation, in order to intensify local participation in the management of the National Park.

The Operational Plan proposed should focus both on the management of the National Park and the management of renewable natural resources in its zone of influence.

It is recommended that a workshop held in the city of Tumbes should be followed by three local workshops in the settlements of Tamarindo, Fernandez Alto and Chaylo. This will provide coverage of the most important population centers in the area, and the principal areas of conflict over the use of resources. These workshops should be conducted by facilitators with experience of this kind of participatory process, with the participation of experts in protected area management and planning. This series of workshops should conclude with a final regional event at which a summary of the conclusions of previous workshops and the terms of the proposed Operational Plan would be presented. The aim would be to secure consensus approval for this document, prior to submitting it to the authorities for official approval.

Activity 4 Construction and equipping of a Control Post in the Huascarán National Park, Conchucos sector (US \$33,500)

It is proposed to construct a new control post located on the eastern flank of the Cordillera Blanca, in the Callejon de Conchucos. The built area of this control post should be at least 100m²

The cost of basic equipment for the control post as been included in this activity. This equipment consists of solar panels, batteries and fluorescent bulbs (12 volts), VHF radio equipment, and basic furniture and fittings (beds, desks, cupboards, seats, tables, etc.) This is vital to ensure that the control post is ready to put into operation as soon as construction work is completed.

Activity 5 Drawing up an Operational Plan for the Calipuy National Sanctuary and Calipuy National Reserve (Participatory Rural Appraisal Workshop) (US \$15,900)

There have been no previous planning experiences in these protected areas, for reasons explained above, and for this reason a series of preliminary meetings will be required to prepare the ground for the rural appraisal workshops. It is proposed that an introductory workshop should be held in the city of Trujillo, with the principal aim of securing the involvement of the authorities of La Libertad Regional Government. After this it will be necessary to establish contact with the provincial authorities in Santiago de Chuco, and with local authorities around the protected areas, to explain the aims and objectives of the evaluation and planning workshops.

The third stage of the process would start with an introductory workshop in the provincial capital Santiago de Chuco, as an introduction to the topic of protected area management at a local level. This would be followed by a workshop in the locality of Hacienda Calipuy, and another in a population center to the South of the Calipuy National Reserve (still to be determined). The proposed Operation Plan should focus both on the management of the protected areas and the management of renewable natural resources in their zones of influence. The objective is to secure consensus approval for the Operational Plan at a local level prior to submitting it to the authorities for official approval.

Activity 6 Construction and equipping of a Control Post and Administrative Headquarters for the Calipuy National Sanctuary and Calipuy National Reserve (US \$33,500)

It is proposed to construct a control post/administrative headquarters, to be located at Hacienda Calipuy, and with the built area of no less than 100m². The design of the control post should ensure that the basic needs of the park guards are satisfied, using simple, economical construction techniques to achieve optimal levels of functionality, comfort and hygiene.

Construction materialize used should be those commonly used in the region (stone, stabilized adobe, timber, concrete and cement). Roofs could be of painted corrugated iron sheets or rustic tiles.

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Activity 7 Physical demarcation of the Calipuy National Sanctuary (US \$3,250)

To physically demarcate the Calipuy National Sanctuary the construction of three boundary stones is recommended, located on the north-western, eastern and southern boundaries of the Sanctuary

These stones will be constructed of stone, cement and tiles and have the following dimensions 2 metres high by 2.5 metres wide, with a thickness of 40 cm

The boundary stones will bear the following information the name of the protected area, a map showing the protected area boundaries, and graphics illustrating legal restrictions on activities in the protected area

Activity 8 Physical demarcation of the Calipuy National Reserve (US \$5,250)

To physically demarcate the Calipuy National Reserve the construction of five boundary stones is recommended, located at key points of access into the area

These stones will be constructed of stone, cement and tiles and have the following dimensions 2 metres high by 2.5 metres wide, with a thickness of 40 cm

The boundary stones will bear the following information the name of the protected area, a map showing the protected area boundaries, and graphics illustrating legal restrictions on activities in the protected area

Activity 9 Regular dissemination of information about the protected area system via INTERNET (US \$23,200)

The objective of this activity is to make relevant non-sensitive information about biological diversity and the protected area system available to interested persons and institutions on a web site on INTERNET The web site would be permanently accessible and regularly updated

The institution charged with collecting and disseminating this information should have the experience and capacity to manage and undertake the preliminary data processing required The type and nature of the information to be disseminated would be regularly reviewed by a directorate whose membership would include representatives of representative user groups It is considered that for the time being updating the information on a monthly basis would be sufficient to present secondary information generated during the period

Activity 10 Installation of a meteorological station at the Cahuana Biological Station in the Pacaya-Samiria National Reserve (US \$4,750)

It is proposed to install an automatic meteorological station (powered energy generated by solar panels) This type of meteorological station has demonstrated its

effectiveness in both coastal and sierra regions of Peru, in terms of the number of parameters recorded, memory capacity, ease of management and relatively low cost

The data base generated would record the following parameters every 120 minutes date, time, average internal temperature during the period (two hours), average external temperature during the period (two hours), minimal external temperature during the period (two hours), maximum external temperature during the period (two hours), current barometric pressure, current relative internal humidity, current relative external humidity, average wind speed during the period (two hours), maximum wind speed during the period (two hours), predominant wind direction during the period, precipitation during the period, and recording period This information can be stored on the station's memory bank for a period of up to four months, and subsequently copied onto a portable computer

Activity 11 Installation of a meteorological station in the Calipuy National Reserve (US \$4,950)

It is proposed to install an automatic meteorological station (power by solar energy) This type of meteorological station has demonstrated its effectiveness in both coastal and sierra regions of Peru, in terms of the number of parameters recorded, memory capacity, ease of management and relatively low cost

The data base generated would record the following parameters every 120 minutes date, time, average internal temperature during the period (two hours), average external temperature during the period (two hours), minimal external temperature during the period (two hours), maximum external temperature during the period (two hours), current barometric pressure, current relative internal humidity, current relative external humidity, average wind speed during the period (two hours), maximum wind speed during the period (two hours), predominant wind direction during the period, precipitation during the period, and recording period

Indicator species and ecosystems monitoring programs

As stipulated in the terms of reference, it is proposed to implement 18 monitoring programs to monitor the status of key species and ecosystems The total budget for implementing these 18 programs is **US \$289,700**

The implementation of these monitoring programs should take account of the following recommendations, which could serve as a basis for the formulation of the strategies required for their application

- Organizations or investigators currently undertaking similar activities should be involved in the monitoring programs
- Staff of the protected area concerned and members of the local population should be involved in drawing up the final design of the program, in such a way as to ensure that they remain involved in the operation of the program on a continuous basis

- If similar programs already exist (or partially exist), those operating these programs should be invited to submit funding proposals on the basis of the terms of reference recommended
- If no similar programs exist, operators (to execute the assigned budget) could be selected by public competition
- Financial provision should be made to allow periodic evaluations of each monitoring program to be carried out

Cerros de Amotape National Park

Program 1 Dry tropical forest (hardwoods) US \$17,500

This program would establish a process to keep track of both the area of different types of forest within the National Park and its zone of influence, and their structural characteristics and species diversity

Program 2 Primate populations US \$19,000

This program would establish a surveillance process for two key species the Tumbes howler monkey and the white capuchin monkey. Both of these species are subject to pressures caused by hunting and loss of habitat, and are considered to be good indicators of the conservation status of the northern ecosystems of the Cerros de Amotape National Park

Program 3 Monitoring bird communities through the evaluation of diversity indices US \$17,000

This program would establish criteria for surveillance of possible changes in the structure of bird communities in the Cerros de Amotape National Park, through the evaluation of diversity indices of these communities

Huascarán National Park

Program 4 Vicuña and taruka populations US \$13,500

These threatened species are good indicators of the conservation status of the high Andean habitat of the Huascarán National Park. This program would produce recommendations to improve the programs for conservation and protection of these species and their habitats

Program 5 Natural grasslands US \$15,000

This program would aim to systematize information about the use of natural grasslands within the National Park, in a way which would contribute to the management of this resource by rural communities in the region

Program 6 Stands of *Puya raimondii* and queñua forests US \$11,500

Both of these plant communities are threatened throughout their range. Monitoring these species in a strictly protected area will provide support for the design of improved management and protection programs in other areas, as well as enabling the efficiency of their protection within the National Park to be assessed.

Bahuaja-Sonene National Park**Program 7** Brazil nut tree stands US \$17,000

Since the brazil nut tree stands are plant communities which are being used for productive purposes, the surveillance of this process is vital to establish guidelines for their conservation. This program will be implemented both within the National Park and in the Tambopata-Candamo Reserved Zone.

Program 8 The pampas of the River Heath US \$14,000

The communities which make up the so-called pampas of the River Heath have a special dynamic which includes some human intervention, such as periodic burning. It is clearly important to monitor this process, since the management of plant succession affects a number of species of wild fauna that occur nowhere else in Peru.

Program 9 Swamp deer and maned wolf US \$14,000

Both these species apparently occur only in this type of habitat, and for this reason their distribution is extremely restricted in Peru. Monitoring their populations will enable the conservation status and quality of management of these ecosystems to be assessed. This program is closely related to program 8 (above).

Pacaya-Samiria National Reserve**Program 10** Charapa populations US \$20,500

The charapa river turtle is one of the most threatened species in the Reserve, due to its continuous exploitation. Since efforts are being made to restore population levels,

a monitoring program to verify whether this objective is being attained is clearly important

Program 11 Giant otter populations US \$20,000

Like the charapa, the giant otter is threatened throughout its range. A number of isolated populations are known to exist in the ambit of the Pacaya-Samiria National Reserve, monitoring these populations will provide information to improve resource management and protection programs within the Reserve.

Program 12 Monitoring agricultural lands US \$20,000

A large part of the periphery of this Reserve is occupied by human settlements, where the principal economic activities are agriculture and the extraction of certain natural resources. Monitoring changes in land use will allow the Reserve authorities to improve their community natural resource management programs, as well as verifying the success of a number of development programs based on the introduction of improved techniques and natural resource management practices.

Program 13 Monitoring bird communities through the evaluation of diversity indices US \$16,500

Monitoring bird communities is considered to be a good way of verifying the conservation status of habitat within the National Reserve, since these communities are sensitive to environmental changes. Their surveillance will provide information to help improve resource management and protection programs.

Paracas National Reserve

Program 14 Sea lion populations US \$15,000

Since sea lions are species sensitive to environmental changes in coastal habitats, monitoring sea lion populations in Paracas will allow the fulfillment of one of the conservation objectives of the Reserve to be verified. This will provide the basis for improving protection programs both within the Reserve and along the entire Peruvian coast.

Program 15 Potoyunco populations US \$15,500

The potoyunco is a bird endemic to the Peruvian coast and is currently considered to be an endangered species due to loss of habitat and pressure from hunting. Monitoring populations in the Paracas National Reserve will serve as a basis for the improvement of protection programs along the entire Peruvian coast.

Program 16 Coastal water quality US \$18,500

The presence in the Bay of Paracas of a number of fish processing factories has caused serious concern about the pollution of coastal waters caused by their activities, and programs have been initiated to improve the industrial processes concerned. Monitoring water quality in the Bay of the Paracas will allow the success of these programs to be assessed. It will also provide information to assess the quality of management programs in the Reserve and the fulfillment of its objectives.

Calipuy National Sanctuary**Program 17** Stands of *Puya raimondii* and other plant communities US \$9,700

The fundamental conservation objective of the Calipuy National Sanctuary is to protect the most extensive stands of *Puya raimondii* in Peru. To date the protected area authority has had no physical presence in the area, initiating a monitoring program will contribute to the design of a protection program for this national sanctuary.

Calipuy National Reserve**Program 18** Guanaco populations US \$15,000

The fundamental objective of this national reserve is to protect the guanaco, a species threatened throughout Peru. No management plans for the Reserve yet exist, and the protected area authority has no physical presence in the area. In these circumstances, it is considered that monitoring populations of this species will make a vital contribution to the design of management programs for the Reserve.