National Parks in Brazil:

A Study of 50 Years of Environmental Policy

(With Case Studies of the National Parks of the State of Rio de Janeiro)

Presented as a partial requirement
for the conclusion of
the Masters in Environmental Studies Program
at The Evergreen State College

Committee Members

Thomas B. Rainey, Chair

Ralph Murphy

Eduardo Viola

by Jose Augusto Drummond

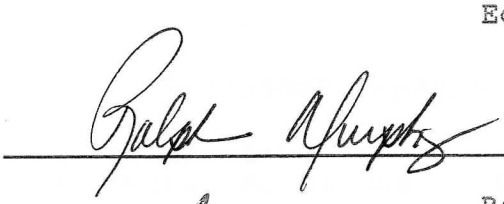
Olympia, Washington, September 1988

VOLUME I

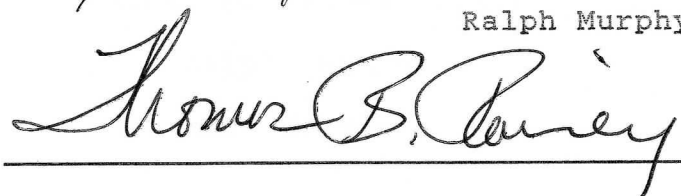
APPROVAL SHEET

This Thesis was accepted by the members of the Committee and approved as the final requirement for the title of Master of Environmental Studies, issued by The Evergreen State College

Eduardo Viola



Ralph Murphy



Thomas B. Rainey, Chair

ABSTRACT

National Parks in Brazil
A Study of 50 Years of Environmental Policy
(With Case Studies of the National
Parks of the State of Rio de Janeiro)

Jose Augusto Drummond

Part I analyses the evolution of the Brazilian National Park system since its inception in 1937. The objective is to study the guidelines and results of a specific environmental policy during a period of extremely rapid economic and demographic growth. Historic and contemporary environmental laws and regulations are evaluated. Existing government agencies with authority over environmental problems are discussed, particularly Brazil's park service. All types of public protected lands in Brazil are mentioned and briefly described to provide a context for a more detailed examination of Brazilian National Parks and National

Biological Preserves. Topics discussed in the analysis of the park and preserve system include age, area, land ownership situation, infra-structure for visitation, personnel, management guidelines, research projects, criteria for location, ecological quality and ecosystem representation.

Policy recommendations are presented for crucial issues such as land acquisition, adequate staffing and funding, research policy, creation of new units and private funding. The conclusions are that Brazilian national parks are inadequately managed public goods and that their ecological qualities are being jeopardized for lack of proper control and management.

Part II presents an environmental history of Rio de Janeiro state to provide a background for the evaluation of all types of public protected lands extant in the state. Sugar cane plantations, mining and coffee plantations combined to make Rio de Janeiro one of the most depleted states in Brazil, with very little natural areas to be protected. Despite that, four of the country's 28 National Parks are located in it. Each of the four parks, **Itatiaia, Serra dos Orgaos, Tijuca** and **Serra da Bocaina** is briefly examined. Topics examined in each park are natural characteristics, history of human occupation, context of creation, main features and current situation. The main conclusions are that Rio de Janeiro's national parks have many chronic managerial problems and that they protect only precariously a combination of reclaimed, second growth and scarce original natural areas.

Table of Contents

List of Tables

List of Figures

Acknowledgements.....1

Preface.....3

Notes on the Text.....10

Abbreviation and Acronyms.....11

Part I The National Park System in Brazil

Chapter

1 Introduction.....13

2 Institutional Framework Of National Parks in Brazil.19

3 The Brazilian Park Service in Action.....57

4 Brazilian National Parks and Other Protected Areas: A Comparative Analysis.....96

5 Park Policy, Park Service and the Park System: Prospects, Conclusions and Proposals.....190

Part II National Parks in the State of Rio de Janeiro

Chapter

6 Paradise Lost, Found and Depleted: Human Occupation and Natural Characteristics of the State of Rio de Janeiro.....223

7 Protected Lands in Contemporary Rio de Janeiro.....275

8 Itatiaia National Park - Beyond Brazilian Geology..307

9 Serra dos Orgaos National Park - The Pipe Organ Peaks.....327

10 Tijuca National Park - The Garden in the Machine...344

11 Serra da Bocaina National Park - The Last Frontier.384

12 Conclusions, Prospects and Policy Proposals.....397

Addendum.....403

Notes.....407

Sources.....425

List of Tables

1 - Brazilian Economic Growth, 1946-1987: Yearly GNP Growth Rates Per Capita Income Growth Rates and Figures 21

2 - Types of Conservation and Protected Areas Existing in Brazil, with Respective Legal Basis and Objectives, as of 1988 97

3 - State Parks and Equivalent Preserves in Brazil: Number and Approximate Composite Percentage of State Area, as of 1982....100

4 - Brazilian National Forests: Name, Location, Date of Creation and Approximate Area, as of 1987.....103

5 - Brazilian Ecological Stations Created, Being Created and Planned by SEMA: Names, Location, Date of Creation and Areas, Per Ecosystem, as of 1987.....108

6 - Brazilian Environmental Protection Areas Created by SEMA: Name, Location, Date of Creation and Approximate Area, as of June 1986.....114

7 - Brazilian Ecological Preserves Created by SEMA: Name, Location, Date of Creation and Area, as of 1987.....118

8 - Brazilian Areas of Relevant Ecological Concern Created by SEMA: Name, Location, Date of Creation and Area, as of 1987.....120

9 - Brazilian Forest Preserves: Name, Location, Date of Creation and Area, as of 1988.....125

10 - Brazilian National Parks: Name, Date of Creation and Alteration, with Respective Legal Act.....132

11 - Brazilian National Parks: Location and Approximate Area, as of November 1986.....140

12 - Brazilian National Parks: Land Ownership Situation, as of May 1988.....146

13 - Brazilian National Parks in Good Conditions for Visitation (I): Management Plan, Yearly Visitation and Access, as of 1988.....150

14 - Brazilian National Parks in Good Conditions for Visitation (II): Lodging, Camping, Picnic and Visitor Center

Facilities, as of 1988.....161

15 - Brazilian National Parks in Good Conditions for Visitation (III): Hiking Trails, Nature Trails, Published Literature and Food Facilities, as of 1988.....162

16 - Brazilian National Parks with Potential for Visitation (I): Management Plan, Yearly Visitation and Access, as of 1988.....166

17 - Brazilian National Parks with Potential for Visitation (II): Lodging, Camping, Picnic and Visitor Centers Facilities, as of 1988 167

18 - Brazilian National Parks with Potential for Visitation (III): Hiking Trails, Nature Trails, Published Literature and Food Facilities, as of 1988 168

19 - Approximate Combined Areas of Brazilian Federal Conservation Units, Per Type of Ecosystem, as of 1988 171

20 - Brazilian National Biological Preserves: Name, Date of Creation and Alteration, with Respective Legal Act.....174

21 - Brazilian National Biological Preserves: Location and Approximate Area, as of January 1988 181

22 - Brazilian National Biological Preserves: Land Ownership Situation, as of May 1988 183

23 - Brazilian National Biological Preserves: Management Plans, Research Facilities and Administrative Facilities, as of 1988 187

24 - Federal Conservation and Preservation Units in the State of Rio de Janeiro (I): National Parks and National Biological Preserves, Name and Location 231

25 - Federal Conservation and Preservation Units in the State of Rio de Janeiro (II): Ecological Station and Environmental Protection Areas, Name, Location and Area 283

26 - Federal Conservation and Preservation Units in the State of Rio de Janeiro (III): Union Protective Forests, Name and Area 289

27 - State Conservation and Preservation Units in the State of Rio de Janeiro (I): State Parks, Name, Location and Area...292

28 - State Conservation and Preservation Units in the State of Rio de Janeiro (II): State Biological Preserves, Name, Location and Area 295

29 - State Conservation and Preservation Units in the State

of Rio de Janeiro (III): State Forest Preserves, Name, Location and Area 297

30 - State Conservation and Preservation Units in the State of Rio de Janeiro (IV): State Environmental Protection Areas, Name and Location 298

31 - Population Growth in the Municipios of Mage, Petropolis and Teresopolis, between 1960 and 1980 336

32 - Number of Seedlings Planted in the Tijuca Forest for Selected Years or Periods Between 1862 and 1872 360

List of Figures

1 - Distribution of National Parks and National Biological Preserves in Brazil .....between 133/134

2 - Location of National Parks in the State of Rio de Janeiro.....between 236/237

Acknowledgements

Concluding this text has had the unavoidable effect of putting an end to an extremely positive period of my professional and personal life. The two years I have spent in Washington and in The Evergreen State College's MES Program have been most stimulating and renewing. I tried hard to take advantage of the many favorable circumstances that brought me here and made my stay so worthwhile. "Circumstances" is just another name for people and the institutions they work in. I will try here to do justice to some of them, hoping that those unmentioned are confident that I did not forget them.

First of all, I owe my colleagues at the Political Science Department of Universidade Federal Fluminense (in Rio de Janeiro) the opportunity of an extended leave of absence for studies abroad. I would like to thank Maria A. P. Leopoldi, head of the department, and all others. Also at UFF, Jacob Binsztok kept me informed about the Environmental Planning Graduate Program under his direction.

Brazil's National Council for Scientific and Technological Development awarded me a full scholarship that made my stay abroad possible. Maria Celina Soares d'Araujo handled my boring personal affairs back in Brazil and let me have lots of time for work and fun over here.

At Evergreen the MES faculty went beyond their duties in helping a foreign student through the mazes of local academic requirements. Oscar Soule, James Stroh, Jaime Kooser, Paul Butler, Steve Hunter, Betty Tabbutt, John Perkins and my thesis committee members Tom Rainey and Ralph Murphy shared their expertise with me. Unknowingly, they also taught me an incredible amount about the business of teaching, in which I am also involved. Jane Lorenzo and Bonita Evans, of the MES Secretary, kept me informed about procedures and deadlines, always helping me in a most friendly way. My 1986 MES class was a lively group from which I was happy enough to recruit quite a number of friends.

The research for this thesis was done mostly in Brazil, in April and May of 1988. In Rio de Janeiro I am grateful to the staff of the Fundacao Brasileira para a Conservacao da Natureza, specially Head-Librarian Carmen Moretzsohn Rocha, who helped me find precious documents. Jose Augusto Padua, my most constant Brazilian source of ideas, information and projects about environmental and political ecology issues, was most kind in supplying some sources and arranging some contacts for me.

Jairo C. M. Nicolau organized the excellent abstract and news clip files that I read at the Instituto Brasileiro de Analises Socio-Economicas. He was also a voluntary research assistant who came up with several precious sources and leads. Frederico R.C.D. Britto was my official research assistant and his work was extremely well done.

In Brasilia Fabio de Jesus was my host at the Departamento de Parques Nacionais e Reservas Equivalentes, Brazil's equivalent to

a National Park Service. He helped me gather up-to-date and unpublished information still being prepared by a small and dedicated staff for future publication. Margarene M. L. Bezerra, Antonina Ornelas and Aureo Faleiros were also helpful in that same Department. Maria Tereza Jorge Padua, Director of the Fundacao Pro-Natureza (FUNATURA) and Brazil's utmost authority in National Parks and related issues, shared her knowledge with me in a congenial manner and provided me with important leads. I thank her also for giving me access and permission to cite texts that she is in the process of concluding. Nikolaus H.J.M. von Behr briefed me about FUNATURA and found some valuable reference materials for me in its library. Elimar P. Nascimento and his family exhibited the very best traditional Brazilian hospitality during my stay in Brasilia.

I was kept well informed on environmental issues in Brazil over the last two years by letter-writing friends and relatives, some of which have been mentioned in other "capacities". To them I must add my parents and Paulo Kramer (Universidade de Brasilia). Herbert Martins did volunteer research about federal, state and municipal parks in the state of Minas Gerais. Warren Dean (New York University) was most kind in responding to inquests related to my thesis project.

Eduardo Viola, a Political Scientist from the Universidade Federal de Santa Catarina, in Brazil, was my Brazilian committee member (although he is actually from Argentina). He is Brazil's leading scholar in social-environmental issues. Our recent acquaintance is a reassurance that I will have an intellectual and academic setting for my incursions in this rather unexplored territory of Brazilian academia.

Ralph Murphy, a Political Scientist of interdisciplinary training and interests, was responsible for keeping my thesis on a definite track with his sharp comments on my research and writing.

Tom Rainey had a major role in my Evergreen experience as teacher in several programs, as course adviser, as MES Program director, as Chair of my Thesis Committee and as stimulator of my quest for new fields of work. This thesis owes very much to his outlook on environmental and social issues and my future professional work will certainly reflect his teachings and those of the many authors with whom he put me in contact. I came to Evergreen looking for something just a little bit short of a mid-career change and Tom Rainey was for me the right man, at the right place and at the right time. He fully understood my objectives in the MES Program and helped me achieve them.

There is only one bad thing about concluding this thesis: it means that my good days in Evergreen's MES Program are over. Then, again, a new chapter is just around the curve. I am committed to making the best of it as I tried to do here. Time will tell.

I dedicate this text to Maria and Helena, my daughters, hoping that they will have parks to enjoy.

Jose Drummond
Olympia, Washington, September 1988
Rio de Janeiro, February 1989

Preface

Brazil is currently the world's fifth largest nation in territorial size. It has about 1.7% of all the planet's land surface. Inside its borders are the largest share (33%) of the world's remaining tropical forests, about 80% of the Amazon Basin and the richest and most densely populated zoological province of the Americas, the Mato Grosso Swampland. There are extensive and biologically rich savanna-like areas and more than 7,000 kilometers of Atlantic coastline, plus large areas of other types of landscape. Many biologists believe that Brazil today hosts more living species than any other single country, including the largest number of developed plants, 15% of all birds, the largest diversity of primates and fresh water fish, a great number of mammals and reptiles and an unsuspected amount of arthropods. This territory has, therefore, a crucial importance in any worldwide strategy of nature conservation and preservation and in the planet's ecological fate.

On the other hand, no country in the world has experienced in the last 40 years more economic growth than Brazil. Although still a poor and underdeveloped country overall, Brazil's economic output is the eighth in the capitalist world and the tenth among all nations combined. This was due mainly to the rather recent industrialization of the economy, which combined with a modernized agricultural plantation system to form a dynamic combination of voracious natural resource consumption and extremely concentrated

wealth distribution. Population growth was fast, too. The yearly rates were consistently above 2,4% between 1940 and 1980 and the total population tripled in the same period. In 1940 there were 41 million Brazilians; today, there are 144 million, the sixth largest population in the world.

Many fields of Brazilian environmental policy are today packed with severe problems generated by all this economic and demographic growth. Environmental health in rapidly growing cities and pesticide contamination in modernized rural areas are probably the most prominent inside Brazil. Depletion of rain forests is still more an international issue than a Brazilian one. I chose to examine in this text a somewhat more "traditional" field of environmental policy. The creation and administration of national parks was a policy started in the 1930's, before Brazil's recent growth upsurge. This thesis topic came to me as a consequence of some readings and discussions in the MES Program, particularly in the core program Ecological and Societal Processes (Fall of 1986) and the elective cluster contract Environmental History (Summer of 1987). Two books in particular produced persistent thoughts about the importance of National Parks for nature preservation and, more important, as an expression of a nation's commitment to preserve nature: Roderick Nash's Wilderness in the American Mind and Alfred Runte's National Parks - The American Experience.

I was surprised to discover how little I knew about the origins of the Brazilian National Parks, although I have visited a good number of them as a hiker. I also discovered that I did

not know much about their current situation nor about the current directions of the country's park policy. I decided to develop my thesis around these issues.

In my thesis project I proposed to concentrate on the National Parks located in the state of Rio de Janeiro, where I have lived for most of my life. Although that emphasis remains I spent considerably more space than I originally planned on issues related to the National Park policy and system. Serendipity had its hand in this development, but there was also my mid-research consciousness of the extremely poor state of published information and of comprehensive technical and scholarly writing about the policy and the system. In contrast, I found that Rio de Janeiro's parks are among the most studied and visited. I then decided that it was worthwhile to strike a better balance between my investigations of Rio de Janeiro's parks and a broader analysis of the park system and its institutional framework. Therefore, in Part II used Rio de Janeiro's parks to illustrate some of the issues pertaining to the park system.

I have tried, therefore, (1) to analyze the National Park system as the result of a specific type of environmental policy and (2) to focus Rio de Janeiro's National Parks as particular landscapes with a social and natural history affected by the overall policy. This emerged as a more original and more needed approach. The two central questions of my analysis were: (1) What is the state of national parks as public goods? (2) What are the ecological values of these parks? Indeed, the literature about

Brazilian National Parks is still in the stage of unpublished manuscripts, scattered articles and scarcely available administrative reports, with the exception of the comprehensive Planos de Manejo (Management Plans) published for 14 of the 28 existing parks. However, these excellent texts are specific to each park.

I could find only two books and one small article that conveyed substantive analytical views of the national park policy and system and of their ecological quality. Both books are by Maria Tereza Jorge Padua, then Brazilian Park Service Director. The article is by Angela Tresinari, at the time also a Park Service staff member. Padua's books (Os Parques Nacionais e as Reservas Biologicas do Brasil and Os Parques Nacionais do Brasil, this second one co-written with Adelmar Coimbra Filho) are both composed with short sketches of each National Park (and National Biological Preserves), with excellent photographic illustrations and detailed descriptions of natural features. Both books are much more about each park than about the system or the policy, but Padua's comprehensive knowledge of the system and the policy shines through in many passages. I found Tresinari's article to be the only published attempt to correlate national parks and Brazil's overall park policy with its recent stages of economic growth.

Besides these three texts, the rest of the available published information about National Parks is either specific to one unit, or general and superficial, or policy statements not necessarily implemented. I studied the legislation about National Parks and

related preservation and conservation issues. I read every law and decree I could find creating or altering parks and preserves; I did the same for all other existing preservation and conservation units. I studied all available policy evaluation documents and critical reports issued by the Park Service and environmental groups. I read the in-depth interdisciplinary investigations (Management Plans) on several Parks and various other shorter reports on the state of specific parks, drafted by people inside and outside the Park Service. I tried to focus on National Parks against the background of a surprisingly large number of other types of preservation and conservation units currently extant in Brazilian legislation; some have actually been created and managed to some degree. To obtain updated information on all parks and preserves, I went to Brasilia, the national capital, to gather it directly from the Departamento de Parques Nacionais e Reservas Equivalentes, Brazil's National Park Service.

As for Rio de Janeiro's National Parks, I tried to convey their creation and situation in the context of the state's social and environmental history. This approach was specially important because Rio de Janeiro is one of Brazil's most ravaged states, thanks to a combination of sugar cane and coffee plantations, erodible soils on hilly topography, urbanization and industrialization. It is in itself intriguing that four out of twenty-eight national parks are located in densely populated, coastal Rio de Janeiro state, because Brazil is one of the few countries in the world still having vast sections of unsettled

territory.

Therefore this thesis is an original contribution to the state of knowledge about national parks in Brazil. It synthesizes secondary and some primary material, most of which is readily available to anyone, although in a scattered form. The originality lies in (1) the comparison of national parks with other types of preserves, (2) in the analysis of four parks which illustrate to some degree the virtues and problems of the park system and (3) the simultaneous analysis of political and natural characteristics of national parks. Hopefully, this text has also established some new trails for my future professional scholarship, research and teaching.

I reached disheartening conclusions about the state of national parks in Brazil. They are, indeed, in poor shape. These conclusions imposed themselves through all the sources I sifted through. Personally it has not been easy studying the subject because I am not prone to negativity. As I see it, the extremely precarious situation of Brazil's National Parks, after 50 years of park policy, is a particularly grim side of a wider picture: the breakdown in minimum efficiency patterns of public administration in general. Not only are parks abandoned, but the whole Brazilian citizenry is paying for and not receiving even the most basic public services. The recovery of acceptable administrative efficiency in all levels of Brazilian government will demand several decades. The prevailing patrimonial spoils-system has simply depleted government's coffers and paralyzed its ability to

act. Things will probably get worse before they get any better and national parks will continue to suffer.

In the meantime, parks and other preserves will have to be defended mainly by citizen groups and by a handful of dedicated individuals, inside and outside government. As public goods, national parks are currently orphans. In a way, it is as if the park system were beginning again. This is how bad I consider the situation to be. The new beginning will not be from a scratch, to be sure, but from a starting point very much behind what 50 years of park policy would allow to expect. Until government can be forced to do a better job, the biological diversity of Brazil is still the best hope for a future park system that is ecologically sustainable, culturally valuable and politically viable.

Notes

1 - Rio de Janeiro is the name of both a state and a city. I have distinguished them by referring explicitly to "Rio de Janeiro state" and "Rio de Janeiro city". Occasionally I refer to the city as "Rio". "Province of Rio de Janeiro" refers to the present state during the Brazilian Empire (1822-1889).

2 - All distances and areas are expressed in the metric system. Here are some conversions relevant to the text:

1 kilometer (km) = .62 miles

1 meter (m) = 1.09 yards (or 3.27 feet)

1 square kilometer (km^2) = 247 acres

3 - **Municipio** is the smallest administrative unit in current Brazilian governmental structure to have independent tax revenues. I chose to retain the term in Portuguese and graph it in bold rather to dubiously translate it as county or city.

4 - I have preserved Portuguese denominations for states, **municipios**, cities, regions, mountains, rivers, government agencies,etc. I used bold to enhance only those geographical names which also designate preservation or conservation units, with the exception of **Serra do Mar**, the major mountain range in the state of Rio de Janeiro. Other Portuguese terms are underlined and translated into English when I use them for the first time.

5 - Native American leagues and tribes names are graphed in bold.

Abbreviations and Acronyms*

Conselho - Conselho Nacional de Meio Ambiente, National Environmental Council, Brazil's highest ranking agency for environmental policy.

Departamento - Departamento de Parques Nacionais e Reservas Equivalentes, Brazil's park service; subordinated to the Instituto Brasileiro de Desenvolvimento Florestal.

EMBRATUR - Empresa Brasileira de Turismo, a federal government company dealing in tourism.

EPA - Environmental Protection Area, a type of conservation unit.

ES - Ecological Station, a type of preservation and research unit.

FEEMA - Fundacao Estadual de Engenharia do Meio Ambiente, Rio de Janeiro state's government environmental quality company.

Fundacao - Fundacao Brasileira de Conservacao da Natureza, a major Brazilian private environmental group based in Rio de Janeiro.

Instituto - Instituto Brasileiro de Desenvolvimento Florestal, Brazil's equivalent to the U.S. Forest Service, responsible for Brazil's National Parks. Parent agency of the Departamento.

NBP - National Biological Preserve, also referred as preserve.

NP - National Park, also referred as park.

Secretaria - Secretaria Especial de Meio Ambiente, Brazil's equivalent to the U.S. Environmental Protection Agency.

UPF - Union Protective Forest, a type of conservation unit.

* Only the most used ones.

PART I

The National Park System in Brazil

CHAPTER 1

Introduction

28 National Parks and 15 National Biological Preserves exist today in Brazil under direct responsibility of the federal government. The total area covered by these two types of preservation units is approximately 110,000 km², which corresponds to only 1.3% of the country's territory. Several other types of protected lands exist under federal and state and even local jurisdictions. A few others have been proposed. But these 43 units clearly encompass the largest areas and the most diversified sampling of Brazilian ecosystems under public protection. They still are the country's best potential basis for a broad effort in serious landscape and species preservation, for whatever purposes, scientific, educational, recreational or even intrinsic value.

This study will focus first on Brazil's 28 National Parks, although the 15 National Biological Preserves will play a supporting role. Brazil's park system recently celebrated its fiftieth birthday, if the date of creation (1937) of the first National Park is taken as a starting point. But this is misleading because the average age of Brazil's parks is much lower than that, around 20 years. One of the striking characteristics of Brazil's

park policy is precisely the irregular pattern of park creation over the 50 year period from 1937 to 1986. Geographical location, site selection criteria and political momentum have been other changing aspects of Brazil's park policy.

All this irregularity is reflected, among other things, in the fact that the "fourth generation" of parks (as defined in this text), established after 1974, was the first one to reach the Amazon region. It was also the first to include significantly large areas, in proportion with the extensive national territory. The largest parks are the youngest and were created mostly in the relatively remote Amazon and Mid-Western regions. The older parks are smaller, sometimes minimal, and closer to the most densely settled areas. Other countries created first extensive parks in remote and frontier areas. The Brazilian case evolved the other way around. Other oddities and some virtues of Brazilian parks will be discussed at length.

The second focus will be on the environmental history and current situation of the four parks in the State of Rio de Janeiro. The guiding research hypotheses was that Brazilian National Parks resulted from a combination of (1) government initiative and (2) scientific community demands. As a consequence, (3) little or no active participation of citizen or environmental groups in the decisions to establish National Parks was expected to be found. Rio de Janeiro's parks confirm all three hypotheses.

Admittedly these were <u>not</u> wild speculations for someone with experience in studying Brazilian politics and society. The role

of government in Brazil's social life is so great as to practically undercut possibilities of widespread and durable democratic institutions in the Western European and North American sense. In fact, capitalism deserves many adjectives by whomever studies it in Brazil: "authoritarian", "patrimonial", "regulated" and "state" are the most common. These qualifications stress the political restrictions on economic activity and citizen participation.

Government is a strong element in Brazilian society and it has developed the ability to act preemptively to control activities which might further the civil liberties of Brazilian citizens. This is evident in political organizations such as workers' unions, which have been under effective government control for more than 50 years, and in productive economic enterprises, such as oil and energy production (both government monopolies), or the computer industry (strictly regulated and in part run by government). Science and scientists are also subject to government direction and control and a majority of scientists in any given field works directly or indirectly in government agencies or with government funding. The author himself is a civil servant of the federal government.

It is not surprising, therefore, that whatever systematic pressures there have been towards the creation of National Parks and Biological Preserves have been generated by or filtered through the scientific community. Citizen groups, including the ones interested in preservation, are in a very hostile environment for democratic participation. The scientific community, though, is

closer to government than in other economies where private enterprise has a larger expression. Therefore, scientists are able to influence many decisions more effectively than any citizen group.

The location of many parks and preserves is a clear indication of the influence of scientists. Brazil's very first park - **Itatiaia** - was created in an area of geological, geomorphological and biological uniqueness studied by scores of foreign and Brazilian scientists ever since the early 19th century. **Brasilia** National Park is strategically located in the interconnection of three major river basins (Amazon, Parana-Plate and Sao Francisco), an area certainly selected with the help of geographers. **Emas** National Park is similarly on the divide of the Parana-Plate and Araguaia rivers. **Tapajos** National Park, the first one created in the heart of the Amazon region, contains samples of the different geological and botanical settings of the Tapajos river as it flows from the Northern tip of Brazil's ancient Central Plateau into the lower Amazon basin. All younger parks were established with scientific ecological considerations and active scientists's participation. Some biological preserves are indeed direct outgrowths of field work developed by Brazilian field naturalists.

But government did not simply react to scientists' interests and demands. It had its eyes on its own interests too. While the national capital was Rio de Janeiro city, two parks - **Itatiaia** and **Serra dos Orgaos** - were created in the state of Rio de Janeiro, both along major roads. In 1959, while Brasilia, the new capital,

was being built in the Central Plateau region, three parks were established in the neighboring state of Goias: **Araguaia**, **Emas** and **Chapada dos Veadeiros**. Another called **Brasilia** was created in 1961 only 20 minutes away from the capital on a good road. In all these cases government certainly envisioned the parks as recreation and leisure areas for its legions of employees and numerous other national capital inhabitants.

Rio de Janeiro's four parks have several characteristics that make them an illustration of the park system. They are analyzed as case studies of Brazilian park policy. First of all, these parks have an average age of almost 40 years, in sharp contrast with the overall average of 20. Rio de Janeiro had the first and third national parks to be created (the ones mentioned above). Another one, **Tijuca**, derived from lands publicly managed for a whole century for the purpose of water supply and public recreation. The older age of these parks allows a more substantial view of the managerial efficiency of the park service.

A second characteristic is that Rio de Janeiro's parks were created in the wake of the destructive coffee plantation system. Rio de Janeiro, city and province, was between 1780 and 1880, roughly, the main producer of coffee in Brazil. This gave it the dubious distinction of being one of the three most ravaged states in the country, together with Sergipe and Alagoas, two small Northeastern states secularly affected by sugar cane plantations. At least three of Rio de Janeiro's parks once had extensive stands of coffee inside their borders. **Serra dos Orgaos** seems to be the

was being built in the Central Plateau region, three parks were established in the neighboring state of Goias: **Araguaia**, **Emas** and **Chapada dos Veadeiros**. Another called **Brasilia** was created in 1961 only 20 minutes away from the capital on a good road. In all these cases government certainly envisioned the parks as recreation and leisure areas for its legions of employees and numerous other national capital inhabitants.

Rio de Janeiro's four parks have several characteristics that make them an illustration of the park system. They are analyzed as case studies of Brazilian park policy. First of all, these parks have an average age of almost 40 years, in sharp contrast with the overall average of 20. Rio de Janeiro had the first and third national parks to be created (the ones mentioned above). Another one, **Tijuca**, derived from lands publicly managed for a whole century for the purpose of water supply and public recreation. The older age of these parks allows a more substantial view of the managerial efficiency of the park service.

A second characteristic is that Rio de Janeiro's parks were created in the wake of the destructive coffee plantation system. Rio de Janeiro, city and province, was between 1780 and 1880, roughly, the main producer of coffee in Brazil. This gave it the dubious distinction of being one of the three most ravaged states in the country, together with Sergipe and Alagoas, two small Northeastern states secularly affected by sugar cane plantations. At least three of Rio de Janeiro's parks once had extensive stands of coffee inside their borders. **Serra dos Orgaos** seems to be the

exception. Studying these parks means discovering how they included the meager floral remains and the second growth of the lush tropical rain forests that once covered 95% of the state's territory. Rio de Janeiro's parks were thus plotted in a landscape almost void of undisturbed stretches.

A third aspect is that these four parks are in the most urbanized state in the country. 92% of the population is urban. Rio de Janeiro was Brazil's largest city from roughly 1800 until 1950 and still is the second largest one by far. It is the ninth largest urban concentration in the world and grows faster than the rest of Brazil's population. The "visibility" and the potential for overuse of these parks are, therefore, great, specially as compared with the younger parks created in what are still remote regions. This situation brings up the issues of visitation pressures, potential for environmental education and competing land use interests.

These are some of the topics examined in the following chapters. Part I will analyze what seems to have been mostly a haphazard national park policy. Part II will present a fairly detailed account of the origins, characteristics and current situation of four of the 28 national parks, the ones located in the state of Rio de Janeiro.

CHAPTER 2

The Institutional Framework of National Parks in Brazil

Becoming Modern

When Brazil created its first national park in 1937 it was a very different country then it is now. This section will show how Brazil went through exponential rates of economic growth exactly as it developed its park system. This growth obviously affected the patterns of natural resource use and the occupation of the national territory, conditioning all types of preservation and conservation policies.

In 1937 more than 70% of the population of 41 million was rural. Export agriculture of coffee, sugar, cocoa and other rural activities were predominant in the economy. A modest light and traditional industry was coming out of years of severe recession. Heavy and capital goods industries were still in the planning stages, at the most. There were no major metalworks plants, no oil production, no chemical industry, no automotive industry, little mechanical industry or shipbuilding. Infra-structure was modest or non-existent. Not even the road between the two main cities of Rio de Janeiro and Sao Paulo was paved. Energy sources were modest

and local, communications were slow. Transportation around the country, even in coastal areas, was a minor adventure. Vast portions of the interior were all but unreachable, even by plane.

Beginning in the 1940's the country changed rapidly. Government investments and government-stimulated investments, with a heavy participation of foreign capital, both public and private, expanded chemical, mechanical and automotive industries, shipbuilding, mining, oil and energy production, road-building, transportation, communications and related services. Important sections of agriculture were also modernized. Brazil began a trend of accelerated growth which is still to be matched by another country in this half of the century.

144 million Brazilians now dwell the land, more than 70% now in the cities. For better or worse, Brazil became a modern, industrial and urban nation, although not exactly a developed one because of its massive poverty, low health and educational standards and inefficient government services. This change was based mainly on the transfer of resource-consuming industries from other countries. Industrialized Brazil intensified its use of resources and pushed back its frontier while it was shaping its park system.

In 1957 Brazil was already de 11th national economy in output, ahead of Australia, Belgium, Argentina and Spain. By 1984 it was the eighth economy in the non-socialist world, behind only the major developed countries: US, Canada, England, France, West Germany, Italy and Japan.1 The dream of becoming a "first class

Table 1

Brazilian Economic Growth, 1946-1987: Yearly GNP Growth Rates, Per Capita Income Growth Rates and Inflation Rates

Year	GNP Growth (%)	Per Capita Income Growth (%)	Inflation (%)
1946	-	-	22.6
1947	-	-	2.7
1948	7.4	-4.7	8.3
1949	6.6	4.3	12.2
1950	6.5	4.0	12.4
1951	6.0	2.8	11.9
1952	8.7	5.6	12.9
1953	2.5	-0.5	20.8
1954	10.1	7.0	25.8
1955	6.9	3.7	12.4
1956	3.2	0.2	24.4
1957	8.1	4.9	7.0
1958	7.7	4.6	24.3
1959	5.6	2.4	39.5
1960	9.7	6.6	30.5
1961	10.3	7.2	47.7
1962	5.3	2.3	51.3
1963	1.5	-1.3	81.3
1964	2.9	0.0	91.9
1965	2.7	-0.1	34.5
1966	3.8	0.8	38.8
1967	4.8	1.9	24.3
1968	11.2	8.1	25.4
1969	10.0	6.8	20.2
1970	8.8	5.8	19.2
1971	12.0	9.3	19.8
1972	11.1	8.4	15.5
1973	13.6	10.8	15.7
1974	9.7	7.1	34.5
1975	5.4	2.9	29.4
1976	9.7	7.1	46.3
1977	5.7	3.2	38.8
1978	5.0	2.5	40.8
1979	6.4	3.8	77.2
1980	7.2	4.6	41.5
1981	-3.4	-4.0	95.2
1982	0.9	-1.5	99.7
1983	-2.5	-5.5	200.0

1984	5.7	3.1	232.0
1985	8.3	5.0	233.6
1986	8.2	5.0	62.3

Sources: Based on Tables I and II in Wanderley Guilherme dos Santos. "A Pos-Revolucao Brasileira". Brasil, Sociedade Democratica. Rio de Janeiro, Jose Olympio, 1985. Data included also from Almanaque Abril - 1988. Sao Paulo, Editora Abril, 1988, pp.698-699.

world power" has spread to all established political elites, from the right-wing military to the underground communists and socialists. This includes nationalists whose only complaint has been the excessive importance of foreign capital. "Bigger is better" would be a good motto for Brazilian elites. The ideal trickles down to the common people who have supported all government policies related to economic growth.

Table 1 has some numerical data on Brazil's sweeping rates of change in the last decades. The GNP growth rates speak for themselves. Only twice was there "negative growth". Per capita income grew consistently over the whole period. Occasional setbacks were compensated for, except for the 1981-1983 period. As one illustration of the costs implied by such rates, Table 1 includes the yearly official inflation rates ever since they started being recorded. Inflation, associated with strict control over workers' unions and an export-oriented economy, combined to concentrate wealth in a degree incompatible with a locally sustained consumer society, in sharp contrast with developed nations. One more cost figure should be added here: Brazil's non-payable foreign debt, which at the last controversial counts soared

at 120 billion dollars.

Wanderley Guilherme dos Santos, a ranking Brazilian Political Scientist, has stated that Brazil's "conservative modernization" made it look today as distinct from Brazil in the 1960's as post-Meiji Japan differed from pre-Meiji Japan. Notice that his comparison is not with Brazil of the 1930's, as this chapter is proposing. The contrast with the 1930's is much sharper. Santos summarizes the changes in these words: Brazil

> grew, urbanized, industrialized, capitalized itself, expanded private enterprise, became more educated, reorganized itself and became extraordinarily more complex.2

His extensive demonstration will be summarized here. The added percentages of population for each decade between 1940 and 1980 were 26.0%, 34.9%, 32.9% and 27.9%. Population growth rates in the same decades were 2.39%, 2.99%, 2.89% and 2.49%. Brazilians urbanized at "unprecedented" rates in modern world history, as shown by the very impressive figures for urban population growth in those decades: 4.9%, 8.6%, 11.2% and 11.7%.[3]

Between 1940 and 1980 industry expanded its share in the liquid national product from 13.0% to 34.0%. Between 1968 and 1980 industrial goods jumped from 20.2% to 56.5% of the value of total exports. Industrial capital goods were produced in a massive scale, growing from almost nothing at an average geometrical rate of 12.8% between 1947 and 1980. Agriculture was vastly modernized, specially in the South and Southeast, through mechanization, modern fertilizers, pesticides and other modern inputs. By 1980 salaried

work became widespread for the first time in Brazil, when autonomously employed workers were reduced to only 30.1% of the economically active population, as compared with 50.0% in 1960.4

At least 485 publicly owned and operated companies deal directly with oil drilling, prospecting and refining, electricity generation, transmission and distribution, metalworks, mining, airplane manufacturing, telecommunications, computer hardware and software, port and airport administration, tourism and dozens of other activities. In 1982 they invested 3 billion dollars and employed 1.5 million Brazilians, around 3.5% of the economically active population. Despite this, Santos argues that 85% of all wealth is produced by private enterprise. Santos does not compute here voluminous public subsidies in many areas.

Rural workers declined from 65.9% of the economically active population in 1940 to only 29.9% in 1980. Illiteracy rates fell from 56.9% to 25.5% in the same 40 years. Enrollment in universities grew faster than the population and women's enrollment in universities surpassed the proportion of women in the population. From 1960 to 1980 the proportion of industrial workers employed in traditional industries (textiles, leather, clothing, wood, food and beverages) fell from 81.8% to only 41.7%.[5]

Santos summarizes Brazil's modernization in a sentence:

> From the innards of a patriarchal society, from a network of social relationships borne out of kinship, primary group loyalties and personal relations, another society starts to emerge: it is open, porous, fluid; 'traditional society' traits are starting to loose their grip.[6]

Not all was "positive" in the process of modernization, to be sure. Santos himself points out the many drawbacks of "conservative modernization". Income levels of rich and poor became more distant from each other; wealth became much more concentrated; more workers have been working per family unit in order to compensate for real wage losses; for the same reason average years of schooling is falling; illiteracy is again on the rise; Blacks and people of mixed blood are consistently poorer than the rest of the population.

On the political side, the "modern" economy is contrasted with what Santos calls "regulated citizenship", which means simply curtailed citizenship. The Brazilian state is most impermeable to modern citizenship demands and institutions. Santos proposes one way that Brazil's modern economy could help engender modern citizenship patterns. It could become the basis of policies aiming at a wider and more efficient scope of substantive "public goods". He mentions health, sanitation, urban renewal, education and even "environmental protection".[7]

The impacts of recent economic growth on the environment was assessed in 1975 by Brazil's equivalent to the US Forest Service, the Instituto Brasileiro de Desenvolvimento Florestal (Institute). In a comprehensive policy statement about national parks, for which it is responsible, the Instituto warned that between 1960 and 1970 Brazil had occupied 340,000 km² of virgin land for agriculture and cattle-raising. 105,000 km2 of forests suffered "predatory devastation" in the same period, without replanting, reclamation

and sometimes without even a chance of natural regeneration.

The Instituto is a pragmatic conservation agency which earns revenue from forest products at the same time as it runs the park system. It stated openly, as if it were itself non-existent, the urgent need of a "...policy for rational use of renewable natural resources", for "harmonizing urban, agricultural, animal husbandry and industrial development [with]] ecological imperatives". "Samples of the original ecosystems" of the country should therefore be set aside from development.[8] Considering that in 1970-1980 economic growth rates were even higher than in 1960-1970, the Instituto's warning were realistic.

It was in this time of development that Brazilian national parks came into being. It was almost half a century of accelerated economic growth, of geographical expansion, of extensive use of vast reserves of land and resources. It was a time of turning abundance into scarcity, one of humankind's favorite occupations, and of little action to protect dwindling natural resources and areas. A sense of scarcity, which seems to be the major moving force behind any serious drive for preservation or conservation, has arisen only very recently in the minds of Brazilians, and even more recently among policy makers. Most policy makers still believe in development at any cost. Unfortunately, as will be shown, park policy, park creation and effective management of existing parks lagged much behind the dynamics of economic growth.

The Political Setting

Brazil's national parks are managed by the central government. A brief background of Brazil's political history is needed here. Brazil is an outgrowth of European expansion. Its enormous territory was carved out by Portuguese sailors and explorers, who managed to control indigenous populations along the coastline and to introduce scores of Black slaves to work in vast sugar cane plantations. Brazil became independent only in 1822 and turned into the only monarchy on the American continent. It was officially an Empire for more than 60 years. Republicanism was introduced in 1889 and it has gone through various forms of oligarchy (coalition of local and regional political bosses), authoritarian populism, democratic populism and, more recently, "national security" military dictatorships.

Since 1985 a civilian government has been in power. This brought extensive political reforms, including a total rewriting of the Constitution. This rewriting started in early 1987 and is expected to conclude in October 1988.[9] The rewrite is needed because the 21 years of military dictatorship (1964-1985) brought unprecedented institutional chaos to Brazil's political system.

For the time being, Brazil is a Federative Republic, with a presidential regime and separate Executive, Legislative and Judiciary powers. A two-chamber Legislature and a Judiciary system survive with varying degrees of independence. The new Constitution will establish 26 States and a Federal District. States are divided into **municipios** (roughly equivalent to American counties) and below them are **distritos** (districts). **Distritos** have no

independent source of taxpayer's money, but municipios have a few sources.

Central government's fiscal power is strong. Only two or three Brazilian States have enough local tax revenue to run independent and substantive public policies. **Municipios**, even the ones with big cities, have a very narrow tax-base and are chronically dependent on grants and transfers from the federal administration. It should be noted that State capitals are always located in their largest cities, which helps concentrate federal and state investments in them. A wider tax tax-base for States and **municipios** is certain to arise from the new Constitution and could change this picture. This would allow a larger number of locally decided and funded government policies, including environmental ones.

Central government has today 27 Ministerios (Departments). They formulate and implement the most important public policies, tapping central governments extensive tax-base, its virtual freedom to emit currency and its privileged access to foreign loans. Many of these policies affect environmental resources and land use patterns. Of course there are important differences in the budgets of these Departments.

Brazil does not have a Department of the Environment, although the idea has been brought up continually inside and outside government in the last decade. Comprehensive environmental policies in Brazil had a start only in 1973 with the creation of the Secretaria Especial do Meio Ambiente (or Secretaria), a

Special Secretariat for the Environment. The Secretaria was originally under the Interior Department, a powerful agency that managed a vast unemployment compensation fund earmarked for urban renewal, popular housing and sanitation and had responsibilities in draught relief and irrigation. Interior was a strong institutional base for environmental policy, although much of what it did was itself worthy of environmental concern and regulation.

Bureaucratic fragmentation is immediately evident when it is known that Brazilian national parks have since 1937 been under the jurisdiction of a different Department, that of Agriculture. In the 1930's Agriculture was a "strong" Department, but its importance has decreased along with the rise of industrialization. This probably helps explain the many shortcomings and discontinuities in park policy, which has a poor record when compared with some more recent areas of environmental policy.

Environmental Policy Agencies in Brazil

In order to better evaluate the role of the Departamento of Agriculture's Instituto Brasileiro de Desenvolvimento Florestal as manager of the park system, this section will develop a discussion about other government agencies and institutions with environmental policy responsibilities.

There is hardly a shortage of them. Ranking above all is the Secretaria, mentioned in the previous section, created by Decree 73030, October 30, 1973. It deserves a few paragraphs. It was mandated to "monitor environmental changes, identify adverse

developments and act to correct them", assist other agencies in the "rational use of natural resources", establish "rules and standards", "train personnel", procure funds for "reclamation of polluted or depleted areas", help preserve "endangered species", establish a checklist of "polluting agents and noxious substances" and develop "environmental education".[10] Indeed, these were tasks worthy of a whole Department, or at least an agency similar to the US Environmental Protection Agency.

Eduardo Viola states that the agency was created "with the sole purpose of complying with demands of some international agencies" worried about environmental impacts of large development projects. Another source considers the Secretaria as a consequence of the famous Environmental Conference in Stockholm, in 1972. The Secretaria's head for 12 years - a very long tenure for Brazilian standards - was Paulo Nogueira Neto, a Biologist. Routine duties of the Secretaria vary from fining local governments which destroy mangroves, developing pollution control techniques with World Bank funding or allotting funds for local governments who agree to execute pollution abatement projects.[11] Over the years the Secretaria broadened its responsibilities, including the creation and management of two types of protected areas to be studied in Chapter 4: ecological stations and environmental protection areas.

The Secretaria's broadest arm is the Conselho Nacional do Meio Ambiente (or Conselho), a National Environmental Council, created in 1983 by Decree 88351. The Conselho is coordinated by the Secretaria and is the nation's highest forum for environmental

policy. It met for the first time in June 1985. It currently has 56 members representing federal and state government agencies, workers' and employers' unions and environmental groups. It has taken some landmark decisions, such as requiring environmental impact statements for all projects affecting the environment and a ban on all alcohol mills in the vicinity of the Mato Grosso Swampland. It achieved the feat of making Brazilian "nucleocrats" bend to the law and produce impact statements on nuclear plants under construction. A list of the Conselho's priorities for 1985 included pesticide legislation, training teachers for environmental education and fixing emission standards for motor vehicles.[12] Although the Secretaria and the Conselho have been reshuffled into newly created Departments after 1985 they are both very active. They will the backbone of an Environment Department, if ever one comes to be in Brazil. The next section will have more to say about both.

In the federal Executive area many other agencies have environmental protection duties and/or generate environmental impacts. The list cannot possibly be exhausted here but a sampling may help envision the complex institutional framework of environmental policy in Brazil. The Brazilian Census agency, for instance, has an office called Supren dedicated exclusively to natural resource data and research. Recently this office even adventured itself to coordinate an ambitious "Ecological-Economic Zoning Plan Proposal", although void of any executive powers to do so. Surprisingly, the Census agency also has a small nature

preserve of its own, 1.3 km2 of cerrado (savanna-like terrain) near Brasilia. In 1986 the agency closed this facility and was trying to pass it on to another agency with activities more akin to running preserves.[13]

A new Irrigation Department created in 1985 brought together two agencies which generate large impacts on the environment: the Departamento Nacional de Obras Contra as Secas (drought-relief) and the Departamento Nacional de Obras de Saneamento (sanitation). The Instituto Nacional de Pesquisas da Amazonia researches rational use of forests and supports the crucial project that seeks to determine "minimum critical areas" of tropical forests required to sustain biological diversity. The Instituto Nacional de Pesquisas Espaciais monitors fires, atmospheric pollution and logging operations through satellite pictures.

Even the inconspicuous and recently created Department of Culture affects environmental policy and park policy in particular. Ordinance 818/87 extended a tax incentive law (originally for cultural and artistic purposes) to environmental preservation efforts. The Conselho reacted quickly and defined how private citizens and companies could help preserve the environment and get tax breaks. They can now donate money, specimens or equipment or otherwise sponsor research and educational activities in ecological stations, national parks and preserves, environmental protection areas, botanical gardens and other preservation units. The Department of Culture also spent some of its meager budget money in the identification and preservation of Brazil's "natural

heritage". Some of this money was injected directly into the Sete Cidades National Park, for purposes not specified.[14]

An experimental farm for the breeding of a sub-species of cattle was created by the Empresa Brasileira de Pesquisa Agro-Pecuaria, an agriculture technology research company. The purpose was to preserve the sub-species, very well adapted to the arid landscape of the Brazilian Northeast. Also under the Department of Agriculture is the Superintendencia Nacional da Pesca, the major fisheries authority. A regional development agency, seemingly on its own initiative, created three "ecological preserves" in areas affected by its projects. Army, Navy and Air Force personnel have participated together with the Federal Police in the repression of illegal hunting in the Mato Grosso Swampland.[15]

Mining and Energy, Land Reform and Transportation Departments have agencies that regulate or affect the environment in many ways. Dozens of federal government companies active in natural resource use (oil production, hydroelectric plants, energy transmission, mining, etc) could also be mentioned. Most of these companies are now investing considerable sums of money in pollution abatement, reclamation and environmental impact studies, under the pressure of international financial agencies.

On the state level the proliferation of agencies is more recent and just as impressive. Nowadays just about every State government has one or all of three kinds of environmental agencies. The first are Environment Departments, sometimes autonomous and sometimes lumped together with Health, Public Works or Agriculture.

Their activities are still in the stage of definition, for most of them are less then five years old. State parks and preserves are under their authority, for example. Nonetheless, they seem to act more through the other two type of agencies.

Environmental pollution control and monitoring companies are the second type. They are much like Washington State's Department of Ecology in their personnel and responsibilities, but they are public foundations. Their staffs are typically composed of Engineers, Biologists, Chemists and experts in sanitation. Some of these companies have acquired a fame for being very strict with polluters and with impacting projects. They monitor air and water quality, do clean-ups, set standards, research, license activities, map pollution sources and apply fines. Although in general older than the respective Departments, they are under their authority. More recently, these companies' powers were enhanced by the Conselho, as will be explained below.

The third type of state environmental authority are "councils" or "commissions". They bring together state and local authorities, business and community representatives and environmental groups. Several States have them. Generally they have only a consultive role, but they are instrumental in extracting regulations and action from otherwise sluggish local agencies and in publicizing important issues. They are particularly important for local environmental groups, which frequently will have in them their only real chance of influencing public policy.[16]

An important recent trend are the special "Environmental

Curator" offices. Several State General Attorneys have created them and assigned attorneys dedicated exclusively to prosecute violators of environmental regulations and laws. At least four major States have adopted such a procedure, including Rio de Janeiro and Sao Paulo. Between 1985 and 1987 this resulted in more than 500 suits in those four States. This is a surprising development, considering how slowly the Brazilian Judiciary system reacts to "modern" issues such as environmental ones.[17]

One reference source for 1986 mentions the existence of 285 governmental agencies dedicated to environmental protection in Brazil, although no list or source is given. Considering the many agencies in the federal and state levels and the numerous ones in larger cities's governments, the figure is not absurd. A veteran conservation activist, Wanderbilt Duarte de Barros, writing in 1974, estimated in more than one hundred the number of environmental agencies in activity at that time. The decisive point, though, as he wrote, was that Brazil still "lacks quantitative and qualitative" to evaluate environmental problems, despite so many agencies. Barros would prefer "...a serious upsurge of supervisory control for better use of natural resources and better environmental management".[18] Administrative inefficiency is not a privilege of environmental agencies, but bureaucratic fragmentation does seem to be a major feature of the institutional framework of Brazil's environmental policy.

Environmental Laws and Regulations

A very long chapter could be written about the origin and current state of Brazilian environmental laws and regulations, even if restricted to the ones directly applicable to land use and park policy. This section will present a sketch of the more immediate legal setting in which Brazilian parks, preserves and similar units survive.

Probably the most relevant historical trend in Brazilian law for the analysis of park policy is the <u>total absence of a democratic land policy</u>. Portugal applied to its Brazilian colony the **enfiteuse romana** system of land grants. The king of Portugal leased vast portions of land to "respected and chosen" men who would pay annual fees for the "rights to use, transfer to heirs and sell". Leasers had full judicial, fiscal and military powers and could sub-lease at their will. This was how small Portugal tried to stimulate the occupation of its vast colony by its not too numerous subjects without spending the crown's money and actually collecting some. It should be noted here that Portugal's inquisitional Catholic conservatism barred any meaningful stream of Protestant, Puritan, Jewish or Moslem migration to Brazil until late in the 19th century. Portugal's colonial enterprise in Brazil was therefore strongly conditioned by its small population, its religious intolerance and by the absence of vast legions of free men seeking smaller tracts of land.

Although the **enfiteuse romana** system was changed over three centuries of colonial rule, even the more recent Portuguese occupation of parts of the Amazon region still relied on the same

basic system. Until today Portuguese royal charters may be exhibited as titles by local landowners, although their legal validity is now "questionable". The leasing system survived through the Brazilian Imperial regime (1822-1889). The Emperor issued documents called **cartas-sesmarias**, donating "uncultivated lands" to persons who could create "rural establishments". This really meant giving large tracts of non-cultivated land exclusively to rich men who could build extensive, slave-worked plantations. In 1824 the first Brazilian Constitution guaranteed unrestricted private property of the land, although government could buy out any owner for reasons of "public welfare".[19]

The first Republican Constitution (1891) maintained the rarely invoked "public welfare" acquisition clause but it also gave all public lands to each State to do as it pleased. Restrictions applied only to international borders, military installations and railroads. A Brazilian park expert says that the 1891 Constitution failed to put government as "controller and protector" of the land and its natural resources, certainly an unrealistic role to expect of the Brazilian government at that time. Land continued to be privately owned in large or extremely large holdings called latifundios, even though Brazil received between 1890 and 1914 a massive influx of 2 million land-hungry European and Asian immigrants. With few exceptions, they were absorbed as salaried workers in farms and cities, not as smallholders. With the exception of some sections of the States of Santa Catarina and Rio Grande do Sul, not even then was there an important democratic land

policy.

The second Republican Constitution (1934), in its Article 10, included a first and vague environmental provision. The Union and the States should "cooperate to protect natural beauties and valuable historic and artistic monuments". Public lands remained with the States, though. The third Republican Constitution (1937) conditioned concession of public lands of 100 km^2 or more by the States to Senate approval. But it was more emphatic about protecting scenic landscapes. Its Article 135 stated that "Historical, artistic and natural monuments and particularly important scenery and natural sites warrant the protection of the Union, States and Municipios". Any crime against these features was equalled to crimes "against the national heritage".

The fourth Republican Constitution reintroduced the "public welfare" clause for government buy-outs of private property not contributing to the "social welfare" of all Brazilians. Public lands lingered on in the hands of the States. Article 175 reinstated the 1937 "environmental" provision: "Works, monuments and documents of artistic value, and also monuments and sites of particular beauty, are to be protected by government". Public lands and associated taxes returned to the authority of central government only after a Constitutional Amendment (number 10, November 10, 1964). Buy-outs would be paid with special "public debt titles", and not necessarily in cash.[20]

The truth is that Brazilian government, colonial, Imperial or Republican, federal, state or local, <u>never controlled public lands</u>

with a clearly stated policy of democratic land tenure. Nothing resembling a Jeffersonian agrarian democracy was ever active in Brazilian public land policy. Public lands were occupied in large tracts by powerful individuals, according to local expansion trends. Although Brazil did not and does not have a "frontier democracy", the reason was not an active state that directly withheld land from prospective smallholders. The private power of the landed classes and the absence of the state combined to control access to land. This historical non-policy guaranteed an overall pattern of large holdings, with very few micro-regional exceptions. No class of smallholders emerged in Brazil. In other words, central government's record in dealing with public lands has been an unconditional surrender to the interests of the landed classes, or plain lack of will to act against those interests. The extensive latifundios were never object of conservation or preservation meausres by their wasteful owners.

As industrial modernization hit Brazil, land reform became a delicate issue. Populist democracy promised land reform but military dictatorships broke the promise. Anyway, it is interesting to stress here that Brazil's park policy developed, for some time, an uncomfortable but inevitable kinship with the explosive land reform issue. This was caused by Law 4504, November 30, 1964, called Estatuto da Terra (Land Law). This progressive land reform law stated that "private property of the land plays its full social role only when, together with its fair distribution and adequate use, it assures the conservation of natural resources".

In other words, conservation became a legal reason for government acquisition of private property for purposes of land reform, on the same and controversial status as "fair" distribution and "adequate" use. The central government could legally select private lands for reform or for conservation, and eventually for both. The fifth Constitution (1967) reinstated the principle of "public welfare" for private property and kept public lands under federal control. But a specific Decree-Law (554, April 25, 1969) authorized the acquisition of lands for national parks with a conspicuous exception in the case of "rural enterprises", or private productive farms as defined by the Land Law.[21] This was for all practical purposes a veto on national parks in the vicinity of such "productive" properties.

No national parks were created out of the 1964 Land Law, though. Most of the timid land reform of the military dictatorships was executed on public lands. Some parks incorporated public lands that had been set aside for land reform projects, but this seems to have been incidental. Serra da Bocaina National Park, in Rio de Janeiro state, studied in Chapter 11, was one of these parks. As will be shown, other legislation and rationales prevailed for the park policy. This temporary convergence of land reform policy and conservation or preservation policy did more harm than good to the cause of national parks. As landowners successfully resisted the application of the 1964 Land Law, conservation, preservation and national parks acquired a "bad name" by being in the company of landless peasant issues.

Frequently cited in articles on Brazilian conservation laws are two otherwise obscure colonial statutes. The Regulamento do Pau Brasil ("Brazil-Wood Statute"), issued on December 12, 1605, instituted "special licenses" for cutting the brazil-wood (Caesalpina echinata), a dye-bearing tree that lent its name to the colony. A royal ordinance of 1797 still strived to protect the remaining trees, calling for "...precautions for the conservation of forests in Brazil, in order to avoid their ruin and destruction".[22] Both statutes were ineffectual: wild brazil-wood trees are rare, even having long outlived their industrial utility as sources of dye. Besides, the Portuguese authorities were caring much more about their royalties in the wood trade than about the preservation of forests in far away Brazil.

Portuguese legal tradition did give Brazil's land-use laws at least one more substantial and utterly underrated trait. Squeezed against the Atlantic Ocean, the sea-faring Portuguese established that shorelines could never be under "full private property". Guaranteed public access to the seashore was important for commercial and military reasons. This principle was transferred to the Brazilian colony. In 1670-1680, for example, the population of Rio de Janeiro confronted the private Jesuit order when it blocked public access to local mangroves. The Jesuits lost the case. Shoreline properties were "conceded" by the Portuguese crown in colonial times, but beaches and intertidal areas were always under the "public domain".

The principle survived until today. On September 4, 1946,

Decree Law 9760 reaffirmed it and extended it to river and lake banks with tidal activity. In the case of the Amazon river alone this means an extensive area on both banks for almost 1,200 km up from the Atlantic, not including smaller areas in tributaries. Therefore, these lands cannot be legally owned by anyone. Government, if it wants, can control all human activities on them.[23] This legislation is indeed a neglected one, considering the extension of Atlantic and riverine intertidal lands. Extensive shoreline management can be based on this statute.

A landmark legislation with conservation purposes and effects was the Codigo de Aguas ("Water Code"), Decree 24643, July 10, 1934. It dissociated private land ownership from water and mineral resources, which became both government controlled resources. All water works (dams, hydroelectric plants, supply, irrigation) and all mineral prospecting and extraction (including petrol) have ever since been done directly by federal government agencies or companies or by private enterprise through specific concessions.[24]

Given government's massive participation in economic activities, though, water and mineral resources have frequently been used with little or no rationality. In a fast-growing economy with intense government investments, state operated companies can be as rapacious and short-sighted as any private business. Development is the overriding concern of government companies, for whom conservation, preservation and reclamation are still very alien concepts. As mentioned earlier, Brazil's big mining, hydroelectric and oil companies are currently being forced by

foreign and international finance groups to present environmental impact statements about their activities. They resist this more than many private companies.

1934 brought another important statute, Decree 23793, dated January 23. It was called Codigo Florestal ("Forest Code"). Its first article stated flatly that all forests in Brazil were considered as being of "common interest" to all Brazilians. Private property rights over them were therefore limited. In this sense, no forest had been privately owned in Brazil since 1934. Forests were classified in Articles 4 through 7 as "protective" "remaining", "model" and "productive". Protective forests were those conserving water, soils and dunes, defending borders (sic), public health, natural beauties and rare species. Remaining were those in national, state and municipal parks (there were none at the time). Model forests were the planted ones (there were at least a few extensive eucalyptus plantations in Sao Paulo). Productive forests were all others. The first two types were to be "permanently conserved".[25]

Article 9 brought the first legal reference ever to national, state and municipal parks. They were defined as

> public natural monuments perpetuating in their original floral composition sections of the country that for special circumstances deserve to receive such treatment.

All activities detrimental to their flora and fauna were prohibited. The Department of Agriculture was mandated to decide where parks should be created. Privately owned forests could be

included in them, with adequate compensation for owners.

Many other articles spelled out details of forestry practices and procedures for public bidding for logging rights in productive forests. A Conselho Federal Florestal ("Federal Forestry Council") was created with representatives from the Museu Nacional do Rio de Janeiro (natural history museum), Jardim Botanico do Rio de Janeiro (botanical garden), Universidade Federal do Rio de Janeiro (Brazil's largest university), Servico de Fomento da Producao Vegetal (an Agriculture Department office), Touring Club do Brasil (a private tourism organization), Departamento Nacional de Estradas (road-building authority) and the Servico Federal Florestal (another office of the Agriculture Department), besides "four specialists".[26] This Council had an important role in the creation of the first Brazilian national parks, between 1937 and 1939.

The Servico Federal Florestal (Federal Forest Service) had been created in 1921. At first it dedicated itself only to planting trees in the city of Rio de Janeiro. It lacked funding, authority and even public lands to manage. Only with the 1934 Forest Code did it start some long range forestry work. Now at least it had a mandate for managing some forests lands in public and private lands. The agency was active also in the selection of some areas later instituted as national parks. It was also the first agency to manage national parks. It was reorganized in 1942. Apparently, only on September 9, 1944, did it gain a specific park office, called Secao de Parques Nacionais ("National Park

Section"), which managed Brazilian parks until 1967.

1934, according to one author, brought about an "authentic conservation movement" in Brazil, with the Water Code, the Forest Code, the creation of Animal and Plant Health Services, the Hunting and Fishing Code and the Irrigation, Reforestation and Colonization Service. It should be added, though, that this not correspond to any important social movement in favor of conservation and that actual initiatives were quite rare in the following years. Neither was the legacy great. Warren Dean found only two forest preserves extant in Brazil before 1934. One was in Sao Paulo, donated by Herman von Ihering, a foreign conservationist to be mentioned in Chapter 3. The other was in Rio de Janeiro state, in the future site of Brazil's first national park.[27] Significantly, it was a forest practices act that brought the first legal reference to national parks. Parks were created by a forestry law and managed by a forestry agency from the beginning. As will be shown, this situation remains until today.

For more than 30 years the general legal framework for environmental policy and specifically for national parks policy did not go through any substantive change. Only two legal acts are remarkable enough to be mentioned. First came the Codigo de Caca, a new Hunting Code, introduced by Decree Law 5894 in 1943. Among other things it determined that government should "stimulate" private breeding of wild animals. It could use public lands as "breeding and refuge areas" and later transform them into national parks. This seems to have been practically ineffectual, except for

a single case. Sooretama National Biological Preserve, to be studied in Chapter 4, had its origin in such a preserve.

Second came a very rare Legislative Decree, number 3, of February 13, 1948, by which the Brazilian Congress approved the "Convention for Protection of Flora, Fauna and Natural Scenic Beauties of the American Nations". This was a comprehensive international agreement signed by a Brazilian representative on December 27, 1940. This allegiance was belated and formal. It took almost 20 years more for the Brazilian Executive to ratify the Convention, through the Decree 58054, of March 26, 1966.[28]

The Novo Codigo Florestal ("New Forest Code") established by Law 4771, September 15, 1965, was the first major legal innovation to affect park policy since 1934. It was in preparation since 1948, when Congress created a committee to review the 1934 Forest Code, already seen as ineffectual. Article 1 again considered forests and "other vegetation forms" as being common interest of all Brazilians, justifying "limits" to their private ownership. Violations of the Code were classified as "harmful use of private property" and subject to Civil Code punishments. Article 2 spelled out the floral covers to be "permanently preserved": along rivers (according to width), around lakes, lagoons, reservoirs and watersheds, on hilltops, on steep slopes, on beach dunes and, finally, all vegetation above the altitude of 1,800 m. The consideration of floral covers in general - as opposed to only forests - and the stricter definition of which vegetation was to be protected permanently were an improvement. Article 3 warned

that other vegetation forms could also be declared as permanently preserved to avoid erosion, fix dunes, protect roads, preserve sites of extraordinary beauty or scientific and historical value, save habitats and protect indigenous populations.

Article 5 defined parks and preserves should be:

> Government will create...National, State and Municipal Parks and Biological Preserves, with the objective of safekeeping exceptional natural attributes, reconciling full protection of flora, fauna and natural beauties with use for educational, recreational and scientific purposes.

This was the most authoritative and broad legal definition of national parks until its day. It remains as the ultimate legal basis for Brazil's 28 national parks. But Article 5, in the same breath, introduced "National, State and Municipal Forests", with "economic, technical and social" purposes. This was a modernized definition of the "productive" forests of the 1934 Forest Code. "Protective" forests were not mentioned, although many of them had been created under the authority of the 1934 statute.[29] Therefore, national parks were again defined by a forest practices act. At least there was a better definition of parks and a clear, distinct concept of national forests.

Article 6 of the New Forest Code included a provision that allowed privately owned forests to be classified as "permanent private preservation" units. As pointed out by one experienced Brazilian conservationist, this procedure could be important in view of government's continual ineffectiveness in preservation. He recalls several other statutes and even an Instituto ordinance

(327/1977) giving tax breaks to land owners who voluntarily adopt preservation and conservation measures.[30]

Another Brazilian law directly related to preservation is Law 5197, January 3, 1967, called Animal Protection Act. It gave further details about the "National, State and Municipal biological preserves" announced in the New Forest Code. They were for the preservation of rare or unique specimens of fauna or flora. No wild or domestic animals could be used, hunted or introduced in them. All changes in the environment were prohibited. Scientific research, with restrictions, could be authorized in them. The same law created also the possibility of "National, State and Municipal hunting parks".[31] This act is the legal basis of Brazil's current 15 national biological preserves.

Two years later the new Constitution drafted by a military junta, in its Article 168, reinstated the 1934 Water Code separation of land ownership from the ownership of all mineral and hydric resources. Article 180 reiterated that "documents, works of art and sites of historical or artistic value, as well as monuments, exceptional natural features and archeological sites" were under "special protection" of government authorities.[32] The principle of preserving cultural and natural sites seems, therefore, to have found a secure niche in Brazilian Constitutions.

From 1979 until 1988 there has been a surge of important environmental legislation and policies, broader than the conservation drive of 1934. Some of this effort affected directly park policy. Others proposed new types of protected lands.

Others, still, were of a more broad nature. On September 21, 1979, Decree 84017 approved the first Management Code for Brazilian national parks. This code will be analyzed in Chapter 4. Decree 84973, June 29, 1980, came as environmental reply from the Brazilian nuclear energy program to the rising criticism about its inefficiency, secrecy and high costs. It established the "co-localization" of nuclear plants and ecological stations. At that time the nuclear program was thriving and aiming at 18 power plants in 20 years. Ecological stations next to each power plant would "...do a precise observation of the characteristics of the environment." Although obviously this meant monitoring, this expression was not used in the statute.[33]

Some nuclear agencies' money did go into ecological stations on the shoreline of Sao Paulo state, where nuclear plants were planned to be built. But no funds were released for Rio de Janeiro, where the first three nuclear plants were actually being built without ecological stations in their vicinity. At any rate, the nuclear program has come to a virtual halt and it is very unlikely that any of the 18 projected nuclear plants will be concluded in the near future. Therefore, this combination of nuclear policy and public protected lands seems to have failed.

The Secretaria had already begun creating its ecological stations and environmental protection areas since the late 1970's when they were codified by Law 6902, April 27, 1981. Decree 86176, July 6, 1981, created "special areas of tourist interest" and "sites of tourist interest".[34] These units will be studied in

Chapter 4.

The most important of all recent environmental statutes is Law 6938, August 31, 1981, called National Environmental Policy Act. It pulled together many different laws and regulations and gave the Secretaria Especial do Meio Ambiente a leading role in a so-called "National Environmental System". The law expected to foster the "preservation, upgrading and restoration of the level of environmental quality proper for life". Its "principles" were the maintenance of ecological balance; the conception of the environment as a "public heritage to be necessarily guaranteed and protected"; the "rational use" of soil, water and air; ecosystem protection; "planned use" of natural resources; zoning of pollutant activities; incentives for technological research in use of resources; reclamation of degraded areas and protection of areas threatened with degradation and environmental education in all levels of schooling.

The law's ambition was to "make social-economic development compatible with environmental quality and ecological balance". The elaborate "National Environmental System" is described. The Conselho Nacional do Meio Ambiente and the Secretaria are its "superior" and "central" agencies. The states' environmental quality companies are "regional" and other existing agencies are termed as "sectional". The Conselho was to establish standards for environmental quality and for polluting activities, study environmental impacts and alternatives for public and private projects, create fines and control fiscal benefits received by

polluting industries.

The law broadened the scope of lands to be protected by the Secretaria. Besides ecological stations and environmental protection areas, now it gained the authority to create and manage "ecological preserves" and "areas of relevant ecological concern", to be studied in Chapter 4. All permanently preserved forests and other floral formations cited in Article 2 of the 1965 Forest Code were transformed into "ecological preserves" or "ecological stations" under the authority of the Secretaria.[35] Therefore, the Secretaria powers were multiplied by this act. It even put its hands on the Instituto's forest preserves without any recorded resistance from the latter.

In 1984 a war went on between several state governments and the Federal Executive about environmental legislation. At least 10 states passed legislation banning or restricting severely the manufacture, use and transportation of pesticides. The federal government, under the overt pressure of multi-national pesticide manufacturers, tried to move out of its laissez faire position on the subject by sending a bill to Congress. This bill would delete all state regulations on the matter. The bill was blocked in Congress.[36] In this case, the lack of federal initiative was challenged by a coalition of strong states, something that has not happened in the field of preservation and conservation.

Law 7347, July 24, 1985, was a major breakthrough for active citizenship in Brazil. It also had consequences for environmental legislation and policy. It allowed civil suits to be initiated

against all who committed aggressions to consumers' rights, the historical and artistic heritage and the environment. Most of the violations in these field were until then misdemeanors subject only to fines after violations were officially posted. Now, judges, civil servants, government attorneys, public agencies, foundations, private citizens and any civil association "constituted for at least a year" could initiate suits against violators. If accusations are confirmed, violators are fined, charged for damages and repairs and mandated "to do or not to do" certain things.

One expert judge stated that this law gave "...legitimacy to civil associations that defend diffuse interests and seek judicial against losses inflicted to the heritage which the association is organized to defend".[37] In other words, environmental groups gained standing for legal initiative in the defense of public goods such as parks, forests, rivers, lakes, shorelines and so on.

Resolution 001, January 23, 1986, by the Conselho Nacional de Meio Ambiente, opened the era of environmental impact statements in Brazil. For some time environmentalists had been claiming for them. J.L. Belart, for example, was in 1976 proposed "mandatory studies" for all development projects and the elimination of all tax breaks, fiscal incentives and credit for projects not observing "conservation methods" spelled out in existing legislation. The Conselho's resolution did not go so far but it created a new atmosphere of environmental concern in business, community affairs and public agencies.

Statements became mandatory for licensing any "activity

capable of transforming the environment", including roads, railroads, airports, ports, oil and gas pipelines, transmission lines, sanitation, irrigation, drainage, channelling, dikes, mining, landfills, metalwork plants, log mills and industrial districts. The statements are reviewed by each state's environmental control company, a procedure which has strengthened their authority. The Conselho and the Secretaria are responsible for the final decisions about licensing, however.[38]

The legislative and regulatory upsurge of the last 8 years finally found its way into the higher law of the land, the Constitution drafted in 1987-1988. An "environmental front" of 60 out of 550 legislators put together an environmental "chapter" and negotiated it into the Constitution. For the first time the Brazilian Constitution has a chapter dedicated exclusively to the environment, by the way still a rarity in the international constitutional scene.

Two articles, four paragraphs and seven items comprise this constitutional feat. Its main sponsor was Fabio Feldman, a young representative from Sao Paulo with a record in the local environmental movement. The main provisions are: (1) public authority's responsibility for "preserving and restoring basic ecological processes"; (2) preservation of the "genetic pool"; (3) mandatory environmental impact statements; (4) obligation of all States and Territories to create and manage preservation and conservation units, to be altered only by law; (5) public control over toxic substances, from manufacture to usage; (6) environmental

education in all levels of schooling; (7) protection of flora and fauna; (8) reclamation of mining lands; (9) aggressions to the environment are to be treated as crimes, as opposed to misdemeanors; (10) "national heritage" status for all forests, shorelines and the Mato Grosso Swampland; (11) prohibition of selling public lands without owners or squatters.[39]

It is clear that these constitutional provisions did not mean a great leap from the standing legislation. The most innovative were the transformation of environmental law violations in crimes and the veto on sales of unsettled public lands. The most relevant for park policy was the one mandating states to create, manage and protect parks and preserves. Other than that, the constitutional chapter on the environment is a summary of the best or most needed policy instruments.

Environmentalists spent a lot of energy to see this chapter through the floor of a very conservative Constitutional Assembly. Of course they expect to benefit from the overriding authority of constitutional principles. Two crucial points remain: (1) how much citizen activism will be needed to make government agencies perform their mandated responsibilities; (2) how permeable will regulatory and executive agencies be to such activism?

A veteran conservation activist and scientist, Ibsen de Gusmao Camara, writing in 1976, concluded that Brazil "..already has a reasonably adequate legal structure" for environmental protection. He was writing before the 1979-1988 surge of laws. What really worried him was the reality of the general population's "lack of

interest" in environmental matters, government agencies's inefficiency and business' attraction to "easy profits".[40] He was obviously correct in worrying about these things, because they do not change with laws, decrees, regulations or constitutions.

Wanderbilt Duarte de Barros, also writing in the 1970's, noted that many existing "conservation laws" lacked "technical basis". Practical and specific laws are immediately revoked, he said, while unpractical and generic laws survive despite their inapplicability. He pointed to the deficiencies of national park legislation: no prior geographical or ecological studies and no appropriations for personnel, installations or land acquisition. Barros argued that these traits "assure the reversibility of decisions" related to national parks.[41] The comments of both Camara and Barros are relevant to other field of environmental law and policy. Good laws still need social support and bad laws fizzle even with social support.

In conclusion, Brazil's environmental problems will not be left unchecked for lack of agencies and laws. The central issue is the effectiveness of both. It should be mentioned, though, that a fast growing country under authoritarian rule like Brazil did more progress than could be expected in the fields of environmental law and policy.

Anyway, national park and preserve statutes can and should be perfected. National parks are part of forestry policy; biological preserves are defined in a hunting code. Serious problems arise in preservation units because of these ambiguities, as will be

shown in subsequent chapters. Another problem is the existence of so many other types of preserved lands under the authority of different agencies. This has contributed to blur the tentative identity of national parks and preserves and to disperse scarce managerial energies. A more concerted effort for managing public protected lands is clearly needed. This could start with a general legislative reform defining better each type of unit, its management objectives and, of course, guaranteeing adequate funding.

Citizens organization and input are crucial, together with government permeability to both. Democratic rule and institutions are needed for environmental regulations to be minimally effective in Brazil. Many recent decades and different types of authoritarian rule have only stimulated bureaucratic fragmentation, administrative inefficiency and political irresponsibility, in all field of government.

CHAPTER 3

The Brazilian Park Service in Action

Preservation and Conservation Ideas in Brazil

Brazilian nature preservation and conservation ideas could have contributed to shape the national park system. Thus, a short sketch on the matter will be presented before a more extensive discussion of the Brazilian park service and policy. Although there was a string of environmentally concerned writers, no autonomous Brazilian strain of environmental thought presided the creation of the country's national parks. From the beginning the concept of national park was an imported idea. The oldest specific reference to national parks known to be made by a Brazilian continues to be a statement by Andre Reboucas in 1876. Reboucas (1838-1898) was a rare case of a free Black who earned an engineering degree and became a very well accomplished professional. He was active in the construction or reform of major Brazilian coastal ports, including Rio's. An outstanding slavery reform activist, he wrote regularly about Brazil's agriculture, forests, railroads, transports and social problems.

He was particularly worried about deforestation and land depletion. His 1876 plea for national parks in Brazil cited America's recent Yellowstone National Park as an example to be followed. A curious detail has kept alive the memory of his plea. Two national parks were created exactly in areas that he suggested: Bananal island (the largest fluvial island in the world, on which **Araguaia** NP is located) and Sete Quedas (the Parana river rapids where the extinct **Sete Quedas** NP was located).

More than an environmentalist or a nature appreciator, though, Reboucas was a dedicated social reformer. He wrote about and fought for slavery abolition, free labor, free enterprise, land reform for Black slaves and public education. As one Brazilian author puts it, Reboucas was not against modernization. He considered large land holdings and Black slavery responsible for the waste of natural resources in Brazil.[1] Therefore, Reboucas' pioneer Brazilian national park proposal was sparked directly by the American example of Yellowstone. Anyway, Reboucas is remembered today essentially as a progressive social reformer and an efficient engineer, not as an environmentalist.

Colonial accounts, according to the pioneering study of Brazil's "political ecology" by Jose Augusto Padua, were dominated by two perspectives: the religious or magic "discovery" of an earthly "paradise" and the scientific or entrepreneurial "renaissance-mercantile" view. Pious missionaries introduced a third perspective. Rather frequently they tried to defend Native Americans from slavery, displacement and death. But at the same

time they systematically broke the Natives' cultural backbone with relentless Catholic preaching. More often than not, the two first perspectives were compatible and led to the "succession of environmental disasters" which composes Brazil's history: while one party or generation ecstatically admired the "paradise", another party or the next generation conquered and subdued it for profit.[2]

J.A. Padua concentrates his study on the few writers and observers who escaped the environmentally lethal dichotomy of "laudatory rhetoric" and "relentless destruction". In general, even those who were most enthusiastic about Brazil's natural landscape were not practical in their suggestions to conserve it. Jose Bonifacio de Andrada e Silva, a leading Brazilian politician in the country's Independence process, was a conservation pioneer. Although politically moderate, as a constitutional monarchist, he strongly favored slavery abolition. This was enough to leave him stranded from vital elite support. Silva proposed a "new type of relationship between man and nature" in Brazil, in a way that Donald Worster would deem "imperialist". He wanted "rational exploitation" of resources on sustainable bases, warning that almost all countries that "lost their forests" were "sterile and uninhabited". As First Minister of Brazil's first independent government in 1822, Silva planned to gradually abolish slavery, "integrate" Native Americans, take advantage of Brazil's abundant natural resources without plundering them and stimulate a stable or resource conserving agriculture.[3] Of course Silva did not last

long in his post. The environmentally destructive combination of slavery, large holdings and export agriculture was unharmed by his short tenure.

Joaquim Nabuco was a contemporary of Andre Reboucas. Like Jose Bonifacio de Andrada e Silva, he combined a preference for constitutional monarchy and the proposal of slavery abolition in his political credo. He is better known as a leading slavery and social reformer, but his opposition to slavery had environmental colorings. Nabuco thought that slave-manned plantations were responsible for depleting soils without building a stable social legacy. He considered even Sao Paulo's late 19th century fabulous coffee richness as an illusion, because it was a monoculture. Nabuco scolded slavery in memorable words for not populating the territory in an adequate manner and for its failure to build a stable social structure.[4]

Euclides da Cunha was a late 19th century essayist with much to say about the relationship between Brazilians and nature. Born in a stagnant section of Rio de Janeiro Province where once coffee had thrived, he scoured Brazilians as "biologically nefarious agents" of nature destruction. His critique included the Natives' itinerant agriculture, colonial farming, mining and deforestation. Cunha's frame of mind was that the natural setting conditions social evolution and that rampant nature destruction was jeopardizing Brazil's prospects as a civilized nation.[5] Cunha is also remembered more as a writer and social reformer with racist, anti-Black tendencies than as an environmental writer of any kind.

Alberto Torres was another Rio de Janeiro born-essayist who wrote in the early 20th century. His little known text As Fontes da Vida ("The Sources of Life"), published in 1915, will certainly put him in a preeminent position among the founding fathers of Brazilian environmental consciousness, if ever such a consciousness becomes widespread. Torres is for the moment very well known as a political essayist and thinker. In 1915, though, he stressed the "finitude of natural resources" and for the need of their conservation, criticizing "scientific ideas" that defended their perennial character. Torres criticized itinerant, export-oriented, wasteful agriculture, specially the coffee plantations he knew so well in Rio de Janeiro. He defended widespread "reforestation" and "natural resource conservation" in the context of a predominantly agrarian economy with free workers and small to medium land owners. A strong central government should command the use of the nations resources, concentrate population in regions already exploited and reclaim ruined areas. A "Friends of Alberto Torres Society" was active in environmental and preservation causes in the late 1920's and early 1930's. Torres most probably read Gifford Pinchot and knew about American "progressive" conservation policies in the Theodore Roosevelt era. Warren Dean states that many Brazilian statesmen and scientists were well informed about recent American conservation issues.[6]

Torres' political authoritarianism is cherished by contemporary authoritarians. But his ideal of Brazil as an agrarian country was totally ignored by modern elites addicted to

industrial development at all costs, including the "social problems" characteristic of industrial societies that Torres so much wanted to avoid in Brazil. As J.A. Padua puts it, the Brazilian industrial boom after World War II produced a major shift in the assessment of environmental degradation, obliterating the debate sustained by Reboucas, Silva, Nabuco, Cunha and Torres. They correctly saw depletion as the "price of backwardness", mainly slavery and large land holdings. They perceived that slavery implied bad stewardship of the land. The industrial boom publicists imposed the idea of depletion as the "price of progress". Modern capitalistic industrialization accelerated the rate of environmental destruction, continuing the large amount of destruction produced by 400 years of agricultural and mining efforts.[7]

Manuel Gomes Archer (1821-1905) was Brazil's pioneer forester, as will be shown in Chapter 10. Between 1862 and 1874, while he was planting tens of thousands of seedlings on Rio's naked slopes, he wrote reports in which he went beyond daily accomplishments and problems, developing some far reaching ideas about forestry. Archer worried about the extensive plundering of Brazilian forests. He believed his reforestation project in Rio could be extended to other parts of the country, through forest legislation and forestry schools. Development of rational silviculture techniques would reclaim extensive portions of ravaged forests and could even allow the State substantial revenues in timber sales. Archer pointed out Germany's Saxonian forests as an

example.[8] Through his reforestation experiences and his readings and insights, Archer was actually a predecessor - an obscure one, to be sure - of Gifford Pinchot. But his experience and ideas have been all but totally forgotten in Brazil's later guidelines for reclamation and reforestation.

An interesting and utterly obscure conservationist was Herman von Ihering, a German forester who directed the Museu Paulista, a natural history museum in Sao Paulo. He was mentioned in Chapter 2 as creator of what probably was the first tract of public protected natural area in Brazil. In a 1911 text with strong Pinchotian overtones, Ihering criticized Brazilians for "wasting" their forests and for not replanting them. He experimented with reforestation and found that some Brazilian tree species, such as the conifer Araucaria augustifolia, had growth cycles of only 20 to 30 years, as compared with minimum cycles of 50 to 60 years of European tree species. This made reforestation a viable, medium-term activity. Ihering proposed the creation of a federal forest agency to experiment with and stimulate reforestation, restrictions on squatting and further governmental control over public lands.[9]

Conservation and preservation policies and initiatives were also recorded in Brazil before and after the creation of the first national parks. But there seems not to have existed a specific movement in favor of national parks. In 1895 the Brazilian government signed an "Egret Convention". In the words of an experienced Brazilian conservationist, Jose Candido de Melo Carvalho, Brazil "actively" participated in the preservation

efforts of several species of Amazonian egrets and herons hunted for their feathers. In 1902 Brazil signed an "International Convention for the Protection of Agriculturally Useful Birds". In 1921, as mentioned, a Federal Forest Service was created. In 1934 a Brazilian "Tree Friends Society" sponsored the First Brazilian Conference for Nature Protection, in Rio, under the leadership of the Botanist Alberto Jose Sampaio and Leoncio Correia. Carvalho states that this meeting had "positive" legislative results, probably referring to the 1934 preservation and conservation laws mentioned in Chapter 2.[10]

Brazil has been active in the International Union for the Conservation of Nature and Natural Resources ever since 1958. Private and government representatives have been on its Board, Councils, General Assemblies and Technical Meetings. Brazil is active in UNESCO's "Man and the Biosphere" program. Brazilian representatives attended all three international conferences on national parks, in Seattle (1962), Yellowstone (1972) and Bali, Indonesia (1982). As of 1979, the Instituto Brasileiro de Desenvolvimento Florestal and several other government and private organizations were affiliated to IUCN. Brazil has also signed numerous treaties, conventions and agreements, regional and international, referring to fisheries, hunting and endangered species.[11]

Maria Tereza Jorge Padua, Brazil's ranking national park expert, does not consider that national parks in Brazil were in any sense an "autonomous" idea. She recalls that ever since Andre

Reboucas' 1876 proposal, foreign concepts and examples have shaped the Brazilian park effort. She mentions, for example, a sense of "rivalry" that spurred the Brazilian government to act in the 1930's, when conservation minded officials realized that neighboring Argentina had a considerably large area preserved in national parks, while Brazil had none. In fact, Argentina created Latin America's first national park, called Nahuel Huapi, in 1902. Padua and Dean both mention that the Argentinian park on its side of Iguacu falls was a major motivation for the creation of Brazil's Iguacu NP in 1939. A 1960 text still conveys the importance of this rivalry. Jair Tovar evaluated Brazilian national parks against the background of Argentina's, which at the time had six times more park areas than Brazil, although being three times smaller. Tovar chauvinistically reported that Brazil was "making a comeback" and could "take the lead" thanks to its extensive territory and geographical diversity.[12]

Maria Tereza Jorge Padua considers that Alceo Magnanini, Darcy Azambuja, Jose Candido de Melo Carvalho and other members of the Federal Forest Service in the 1930's and 1940's were responsible for putting Brazil's first national parks on the map. They had access to first-echelon authorities and extensive first-hand knowledge of many stretches of the Brazilian landscape. In an important park service policy statement to be examined in detail later in this chapter, Alceo Magnanini openly admits to be following the guidelines of a U.S. National Park Service publication, because of America's "exceptional tradition" in park

issues. In his text he cites America's pioneer position in national parks and Andre Reboucas' reference to them.[13]

In 1945 Raymundo Ottoni de Castro Maya, who was then directing the restoration of a future national park area (Tijuca), criticized the incipient Brazilian park service and policy. In 1937 he says that he proposed a "National Park Department" through legislation inspired in Argentinean statutes. National parks should be dedicated to "leisure", with hotels, pools, sport facilities, fishing, hunting, "like in America and South Africa". His proposals had been rejected by the Department of Agriculture's Secao de Parques Nacionais, on the grounds that national parks should be "simply forest preserves", without hotels or other facilities. Maya insisted that national parks should be plotted in "picturesque" areas with "good climate", attractive to visitors seeking leisure.

The Secao de Parques Nacionais, through Paulo de Souza, its head, responded immediately. Brazil's three young national parks were considered as grand as those of "America, Canada and South Africa", an absurd comparison, of course. Iguacu National Park's hotel was being completed (true) and hotels in Serra dos Orgaos and Itatiaia would be built (they never were), "like the ones in Canada and America". Paulo de Souza concluded saying that his office was in "constant" contact with America's National Park Service.[14] The major point in mentioning this exchange is that both Maya and Souza referred to the foreign park scene to support their not radically different positions.

The first comprehensive text published about Brazilian national parks, written in 1947 by Wanderbilt Duarte de Barros, long time director of Itatiaia National Park, starts out precisely by showing how Brazilian parks were part of an international trend. His introduction mentions park policies and parks created in the US, Canada, Mexico, Argentina, Chile, Cuba, Santo Domingos, Uruguay and Venezuela. He stressed that Brazil was among "the last" Latin American nations to create a national park, although he does not present a reason for it. Barros concluded that Brazilian national parks were a result of "cultural exchange" with other nations.[15]

In summary, nothing indicates that national parks in Brazil resulted from an independent source of preservation ideas and concepts. Classic Brazilian writers with environmental concerns continue to be known in other capacities, mainly as political activists or social reformers. Even though, they sharply pointed to the inevitable environmental disasters caused by the combination of slavery, large holdings and export agriculture. Park proponents and officials invariably refer to foreign concepts and examples. However, much more research is needed on this issue, particularly on the role of the Federal Forest Service and the Federal Forest Council, which shaped the first decades of Brazilian park policy.

The Instituto Brasileiro de Desenvolvimento Florestal (IBDF)

Chapter 2 gave an outline of Brazilian environmental agencies and laws. Most of the basic legislation relating to parks, biological preserves and to some of the other types of publicly

protected lands in Brazil was mentioned. The remaining of this Chapter will analyze the Instituto Brasileiro de Desenvolvimento Florestal (IBDF, or Instituto). The Instituto deserves this distinction for being the legal administrator of Brazilian national parks and national biological preserves, the main subject of this text.

The Instituto, as stated before, belongs to the Agriculture Department, which in 1986 ranked 8th in budget appropriations for the 27 existing Departments. It was created by Decree-Law 289, February 28, 1967, in a reshuffling of several agencies of the Agriculture Department: the Office of Renewable Natural Resources (with its National Park Section), the Hunting Division and the Federal Forest Council. Also absorbed by the Instituto were two agencies formerly located in the Labor Department: Instituto Nacional do Mate and Instituto Nacional do Pinho, which carried government incentive programs for developing tea and pine plantations. The Instituto was established as an "autarchy", an autonomous type of federal agency. It was mandated to "formulate forest policy and to direct, coordinate and execute...the necessary action for rational use, protection and conservation of renewable natural resources and for the forestry development (sic) of the country".

The Instituto should dedicate itself to forestry and reforesting with "economic, ecological, tourism and landscaping" ends. Its mission was to guarantee a "balance between forest reserves and the consumption of forest products and sub-products,

aiming towards the perpetual satisfaction of the consuming markets". Another mandate was to manage a system of fiscal incentives for reforestation. The agency was also explicitly mandated to manage national parks, national forests, national biological preserves and national hunting parks, besides Rio de Janeiro's Botanical Garden.

Pinchotian principles of rational use, sustained yield, and tree cultivation, rampant throughout the law's text, are further celebrated in article 10 with the institution of the career of "forest engineer" (forester) in government's civil service cadres. Besides budget and special appropriations, the Instituto would survive on revenue obtained from "exploring and selling forest products", from transactions with lands under its jurisdiction and from all fines it was mandated to enforce.[16] As its name clearly spelled out, the Instituto was similar to the U.S. Forest Service, involved primarily in forest conservation or development, not in <u>preservation</u> of forests or, for that matter, any other type of Brazilian landscape.

This was clear again in Decree 62018, December 29, 1967, which defined the Instituto's internal statute. Listed last (and least?) in the agency's 16 "objectives" was the administration of parks and preserves; all other 15 objectives were utterly conservationist or plainly commercial. In Article 9, "National Parks, National Biological Preserves, National Hunting Parks and Experimental Forestry Stations" were assigned to the Instituto's Regional Centers for Research and Nature Conservation, subordinated

to its Regional Offices. Revenue generating national forests, though, would be run from national headquarters. Therefore, national parks, 14 of which already existed in 1967, were not the concern of a single department or office in the Instituto's original national administration. This is clear evidence of the low priority of preservation in the Instituto ever since its inception.

Some years later, however, the Instituto's Department of Research and Nature Conservation was broken in two and a Division for Nature Protection was created in the new Nature Conservation Department. Later a Division for National Parks was created in the same Department. This Division was later promoted to the rank of Department, with the name Departamento de Parques Nacionais e Reservas Equivalentes (DPNRE, or Departamento), "National Park and Equivalent Preserves Department". This is the name and the status of Brazil's current park service.[17] Over the years, therefore, national parks and preserves pushed their way into the Instituto's national organizational chart, from which they had been excluded.

Between 1967 and 1974 the Instituto added only three national parks to the prior 14 and created only one national biological preserve (accepting provisional "custody" of other three preserves created by state government initiative). It seems that the Instituto, just like every other government agency in that period of high economic growth, got carried away with development policies. Only one official park policy statement was issued in the period, a shy one, as will be shown. Between November 1974 and

May 1979 not a single national park or biological preserve was created in Brazil, although a major policy proposal was elaborated and publicized. Between May 1979 and September 1984 that major policy was put into effect. Nine national parks were established, expanding the park area 3.8 times, from 22,292 km² to 85,990 km². Eight new biological preserves expanded the preserve area 53.3 times, from 372 km² to 19,844 km². Since 1984 only two parks and one preserve were created (See Tables 10, 11, 20 and 21, in Chapter 4). This is only a first glance of the Instituto's record as park creator and administrator. This record will be explored in more detail in the following sections.

A Time for Planning: IBDF Park Policy Statements, Proposals and Activities, 1967-1974

The park and preserve policy prior to 1967 will not be discussed at length. Suffice it to say that it yielded a relatively poor heritage. In 1967, 30 years after Brazil's first national park was created, the Instituto inherited only 14 parks protecting a minimal .12% of the national territory. No national biological preserve was officially established. Some of the parks amounted to no more than the original decrees. Warren Dean is correct when he suggests that the conservationist impulse behind the 1934 Forest Code had been stifled. Many suggestions for new national parks and other preserves presented at the time were never implemented.[18]

The first major Instituto document on the park and preserve

situation was published in 1969. As if illustrating the tentative merge of park policy with land reform issues, mentioned in Chapter 2, the text was co-written by the Instituto and the Instituto Nacional de Colonizacao e Reforma Agraria, the land reform agency. This document naturally contains the Instituto's view of its park heritage. The very title called for a "review" of the park policy. It was drafted by a task force assembled by the Department of Agriculture to "review" park and preserve policy. Harold Edgard Strang, a Soils Engineer involved in conservation, drafted the final report, with the help of Henrique Pimenta Velloso, another conservationist. In their "explanatory note", they point out that this was the first time government officials visited all parks and preserves. They were ordered to evaluate the units, suggest transformations, extinctions and areas suited for new units.

The report was carefully enthusiastic about the park heritage and decisively critical about its lack of management. After 180 days of travelling and drafting, the group recommended "persistent work" by the Department of Agriculture to secure the "exceptional heritage" of national parks and other preserves. They suggested other types of conservation units, citing examples in several countries, including the US. They gave vivid, updated details about the situation of each unit. The picture was grim. The most serious problem - a chronic one, as will be shown throughout this text - was the land ownership situation. None of the 14 parks were fully under government property, allowing for private and public development or invasions. Some parks were limited to the original

decrees. Park personnel was insufficient in size and qualification; high school and university graduates were lacking. Park directors, when extant and residing in the parks, were thus overwhelmed with administrative and public relation tasks, which jeopardized their "true roles" of scientific research. The report suggested hiring "superintendents" who would care for administrative routines, liberating directors for scientific pursuits. Lack of equipment, vehicles, infra-structure and research activities was also noted.

The task force considered that only the three oldest parks, created in the late 1930's, operated in an acceptable manner. Abandonment had precluded the establishment of some parks and caused "irrecoverable losses" in areas to be preserved. The absence of parks in the Amazon region was criticized. Scientific research in parks should be stimulated, but executed by specialists not linked to the Instituto.[19] Although this was a detailed and carefully drafted document, it is more properly read as a revealing report. Its suggestions were timid and almost defensive, specially when compared to later Instituto documents. No major policy shift was even suggested. In fact, no clear policy was stated at all, except the obvious need to save the park heritage.

Two Instituto staff persons published that very same year - 1969 - an extensive article in an environmental group's journal. They revealed further details on the park situation as seen by the Instituto. Maria Tereza Jorge Padua - who was to become Brazil's highest authority in national parks and preserves - and Alceo

Magnanini, already an expert in the matter, pointed to land acquisition as "problem number one" of Brazilian parks. They classified Brazilian parks in three categories for description and evaluation purposes. First came "established, developed and maintained" parks (Itatiaia, Iguacu, Serra dos Orgaos, Tijuca and Brasilia); second came those only "partly established" (Aparados da Serra, Caparao, Sete Cidades and Monte Pascoal); third came those in "initial phase of planning" (Ubajara, Araguaia, Emas, Chapada dos Veadeiros and Sao Joaquim). Significantly, the authors excluded two parks, one extinguished and the other on the verge of extinction (Paulo Afonso and Sete Quedas). From other sources it is clear that in the last category very little or nothing at all had been done to establish the five parks. Therefore, in 1969 more than two thirds of all parks were in initial or even crude stage of development, according to the informed opinion of two Instituto insiders.

Magnanini and Padua gave precise figures on land acquisition. As of December 31, 1968, the decreed areas of the 14 NP's, 31,422 km^2, had been reduced by more than 50%, to 15,207 km^2 "estimated as necessary" by the pre-Instituto park administration. But the Instituto effectively owned only 2,959 km^2, or 19,5% of actual park lands. In other words, more than 80% of park land was either private, or public but not under Instituto control. This occurred not only in the 11 parks created between 1959 and 1961, which could

criteria for any area aspiring to be a national park according to standards set by the International Union for the Conservation of Nature. The authors were aware of this and worried about the possibility of the land ownership problem becoming a chronic one. Unfortunately, it did become chronic.

In 1970 Alceo Magnanini wrote and the Instituto published a text that perhaps was the first lengthy policy statement for parks and preserves in the Instituto era. Even though, it was long overdue and could easily be attributed to the 1940's or 1950's because of the absolutely basic nature of its contents. Magnanini was consciously pulling together what 30 years of park management should have forged as second-nature knowledge or at least the institutional sub-culture of all park service personnel. So crude was the state of park management that Magnanini had to start from a scratch. He informed park personnel - to whom the document was addressed - that parks should have their own research projects and support other researchers, have museums and herbariums, have "defined limits", have public recreation areas and camping grounds.

He was therefore stating the obvious. Parks should have "lodging facilities" for staff and tourists and should establish public visitation routines. All parks should be "zoned" for recreation and preservation and the main management rule was to "perpetuate all natural resources". Magnanini could not avoid listing "direct use" activities prohibited in parks, such as agriculture, grazing, hunting, fishing, logging, draining, irrigation and hydroelectric power generation. Magnanini had to

be so basic because in his opening paragraphs he pointed out that the Instituto "lacked any directives" for park administration.[21] Magnanini's apparent simple-mindedness, writing as if his intended public were logging or mining companies, was really an adaptation to the crude stage of park policy inside the Instituto. Indeed, Magnanini was at the time one of the ranking park experts in Brazil and his document did include brief references to more advanced topics such as fauna management, master plans, public hearings and scientific research proposals.

Preservation continued to have low priority inside the Instituto. This was revealed in a speech by a new agency president in 1974. He considered the park and preserve system as "incipient" and that parks, preserves and even national forests "lacked identity" inside the agency. He proposed bringing them into the mainstream of the Instituto's work and making them "functional". About a year later, the Brazilian scientific community acknowledged its concern about the same issue. The 27th Annual Meeting of the Brazilian Society for the Advancement of Science issued a resolution recommending that the Instituto's duties should be restricted to forestry. Parks and preserves should be transferred to the Department of Interior and fauna protection to another agency inside the Department of Agriculture.[22] This suggestion is still valid after a decade, as will be shown.

A Time for Groundwork, 1975-1979

Only in 1975 emerged an ambitious and consistent policy

proposal for Brazilian parks and preserves. This was due mainly to a younger group of Instituto technicians, rising through the ranks and dedicating themselves exclusively to park and preserve issues. They were the founding members of the Instituto's national park and preserve office, the Departamento de Parques Nacionais e Reservas Equivalentes. Their leader was Maria Tereza Jorge Padua, a Soils Engineer dedicated to conservation and preservation. Her name has already come up and will continue to do so throughout this text. A career staff at the Instituto, she was head of the park office from 1974 to 1982.[23]

The first published statement by this group came out in 1975. It is ambitious, realistic, highly technical and well informed about park problems all over the world. It starts by pointing out how Brazil ranked low by international standards, with its 65 preservation and conservation units covering 187,202 km², only 2.2% of the Brazilian territory. This area included national forests and forest preserves. For parks and preserves proper the figure was a meager .28%. Comparisons were made with the USA, where 715 units preserve 15.95% of the territory and Japan, whose 23 national parks protect 7.3% of the country.[24]

The modest Departamento stated its high aims: consolidate existing parks and preserves and create new ones; make reforestation compatible with "ecological imperatives"; train park and preserve personnel, specially technicians and rangers; promote environmental awareness; draft "management plans" for parks and preserves; acquire private lands in several units; establish at

least six new parks, nine new preserves and even a novel "road-park" on a stretch of the Transamazon road being built at the time.[25]

The document proposed working together with a wide number of public and private organizations, which meant still more work for the tiny Departamento. At the time, it had a staff of only four; 21 was its own estimate of its ideal staffing, including non-existent Foresters, Botanists, Ecologists, Architects, Biologists, Zoologists, Museologists and Communication experts. A crucial proposal to clear the way for registering park land owned by the Instituto in the government's Property Office (Servico de Patrimonio da Uniao) unfortunately was not accomplished.

Land acquisition was still a serious problem. In 1975 only 13.1% of the land of 18 national parks were owned by the Instituto, against 19.5% in 1968. Preserve land was only 30.3% owned by the Instituto. In 1975 **Monte Pascoal** was <u>the only park fully owned by the Instituto</u>. It had originally been a state park donated to the federal government, not really requiring any land acquisition effort by the Instituto. Three small state created biological preserves in Espirito Santo were also owned by the Instituto. The area of the four only units entirely owned by the Instituto represented only 1.83% of all park and preserve lands.

With the Fundacao Nacional do Indio, the indigenous peoples bureau, the Departamento proposed to work out solutions for the borders between parks and indigenous territories in some areas. The Departamento wanted weather observation facilities installed

in all parks and preserves, which meant contacting the weather authority in the Agriculture Department. The International Union for the Conservation of Nature and the World Wildlife Fund would be asked to help fund research in parks and preserves. Embratur, the federal government tourism company, was to be contacted for devising ways to attract tourists to national parks. Government's road building agency would be informed about future parks and preserves that were not to be cut by new roads.[26]

This fresh set of ideas and proposals went much beyond what the Instituto as a whole could absorb and, possibly, tolerate. Coincidence or not, the truth is that from mid-1974 (when this document was probably drafted) until mid-1979 no national park or preserve was created. Existing ones were not significantly consolidated. In terms of results, park policy stagnated for five years.

Undaunted, the small Departamento kept on its "internal" work. In 1977 it promoted the first and still the only park management course in Brazil. Between October 17 and 29, the "First Administration and Management Course for National Parks" was staged in Brasilia, the national capital. Attending were a few dozen park and preserve personnel and other Departamento and Instituto staff. Padua and her team brought together the "best specialists" available. They wrote up their contributions and lectured about the following topics: management plans, nature trails, park regulations, park development, leisure, dealing with visitors, conservation and preservation laws, ecology, animal habitats, land

policies, land reform and conservation units in Latin America.[27] By any standards, it was an excellent course in scope, in quality and in teachers' qualifications.

The Departamento's staff kept on working, although no parks were being created. A 1978 reinstatement of the 1975 policy document sensed that a new phase of park policy was about to start. Natural resource conservation and preservation was coming out of a "profound hibernation" caused by "political swaying", "administrative abandonment" and "lack of funding and staffing". An updated listing of park and preserve problems sounded like the 1969 report mentioned above. It cited lack of trained personnel and rangers, little infra-structure, isolation and difficult communication with some park areas, no visiting rules and many land acquisition problems.[28]

Personnel problems were becoming as chronic as land acquisition. The only parks with an adequate number of rangers in 1978 were Iguacu and Tijuca, because their directors had hired out guards from private security companies. Some parks had no protection at all. An "ideal" staffing of 857 rangers for all parks and preserves was contrasted by the reality of only 138 actually hired and working, a deficit of 719. This was far below even the stipulated "minimum" of 533. When park and preserve directors, administrative personnel and scientists were included in the ideal staffing figures, the deficit of 719 rose to 934. Funds were short for hiring new personnel.

Only three parks had fire control services; only five had

long-distance radios. All parks had vehicles, not necessarily adequate for the local terrains, but no preserve had its own vehicles, depending on borrowed ones from other Instituto offices. A intended "receipts versus costs" study of the 18 parks had to settle for only three with consistent financial data for the 1975-1977 period. Itatiaia, Iguacu and Serra dos Orgaos were all in the red, although being the three oldest and best equipped parks and among the most visited.[29]

Land acquisition had improved some. In 1978 the Instituto effectively owned 36.9% of the 24,575 km² of parks and preserves, as compared with 19.5% a decade earlier. Still, the figure was low. But the Departamento was straightforward in stating that "...[the Instituto] does not have budget resources to run a broad acquisition program". It would take "30 to 40 years" to complete such a program on budget money alone, and even then only currently existing parks and preserves would be secured. The Departamento preferred to negotiate case-by-case special credits with the powerful Planning Department than to inflate its budget with requests for costly and uncertain land acquisition appropriations.[30]

Administrative creativity played an important role in alleviating this problem to a significant degree. In late 1978 Maria Tereza Jorge Padua spotted a large unused fund in the Instituto's revenue: the Fundo de Reposicao Florestal (Forest Restoration Fund). It was made up by contributions from industrial and commercial consumers of lumber not interested in doing their own reforestation projects. Padua asked the Instituto's Attorney

General to rule whether this fund could be used for acquisition of private lands inside park and preserve lands. He found it to be a "legitimate use" for the fund. Padua says that the Departamento had "unlimited access" to the fund and that 12,000 km² of park and preserve land were bought between 1979 and 1983.[31] This represented almost 50% of all park and preserve land acquired between 1937 and 1978, a major victory of her administration and the last significant acquisition of park lands by the Instituto to date.

The same 1978 document reported on recent Departamento activities. It mentioned the publication of an illustrated book on the Brazilian fauna, aimed at students, probably the only of its kind ever made in Brazil. Posters, leaflets and booklets on parks, reserves and fauna were also published, also for the first time. Foreign organizations (International Union for the Conservation of Nature, World Wildlife Fund and New York Zoological Society) donated publications and money for preservation projects, fauna studies and the drafting of management plans for parks and preserves. Exchanges were made with several other Brazilian government and non-government organizations.[32] These activities and exchanges were unheard of before Padua's administration.

An unpublished text by Padua and Jose Manuel C. Vasconcellos, probably from the same year of 1978, focused on how national planning standards had incorporated new ideas - developed by the Departamento itself - about nature conservation and preservation. They mention provisions of Brazil's pretentious five-year "Second

National Development Plan", for 1974-79. One "national objective" mentioned in the plan was to "promote development without destroying the population's life quality and, particularly, without devastating the country's natural resource heritage". Indeed, the preservation of this heritage was considered by Brazilian planners as "part of the country's development" and required the "prior definition of areas reserved for National Parks, National Forests, Biological Preserves and Hunting Parks".[33]

The official development plan included numerical goals of such areas to be set aside: 10% of the Amazon Region (360,000 km²) and 5% (250,000 km²) of the rest of the country. The authors contrasted this grand proposal of 610,000 km² with the scant 24,000 km² of existing conservation units. They considered that the plan's goals could be tuned down respectively to 185,000 km² and 50,000 km² without compromising qualitative conservation goals. Padua and Vasconcellos worried about the creation of more parks on an ad hoc basis. This would forge a system both "expensive" to manage and "inefficient" in the protection of the country's ecosystems.

Anyway, Padua and Vasconcellos were not feeling comfortable about the situation. They criticized the way current parks and preserves were managed, considering them "static" and "defensive", with no visible benefits to the community. They pointed out the "international technical consensus" about the need for urgent action by the Brazilian government if a solid conservation unit system was to be established. The rapid occupation of many

stretches of the country's frontier areas was raising land prices at fantastic rates. One example of this, stemming from a recent Departamento experience, was cited. In the State of Mato Grosso, extremely remote swamp lands evaluated at 50 cruzeiros per hectare in 1970 were bought for 1,500 cruzeiros in 1976 (they were later included in the Pantanal Mato Grossense NP).[34] Being in the national development plan was not enough for Brazilian parks. A sense of urgency is conveyed by this document.

A Time for Action: Expanding the Park and Preserve System, 1979-1984.

A new chapter of Brazilian park policy and action started in 1979. A major policy proposal was issued by the Departamnento, entitled "Plano do Sistema de Unidades de Conservacao do Brasil", roughly "Conservation Unit System Plan". It pulled together years of groundwork by the Departamento staff and scientific personnel linked to a private conservation group called Fundacao Brasileira de Conservacao da Natureza, the most important of its kind in Brazil. It is a master plan for park and preserve creation, classification, management, research and consolidation. Brazil never had such a serious, dense and long range proposal for dealing with parks and associated preserves. It was to be developed in five stages. Only two have been executed so far and, unfortunately, only in part.[35]

The plan stated its "basic concept": "nature conservation can be represented by the rational use of natural resources, with the

objective of a continuous production of the renewable ones - soils, flora, fauna - and the maximum yield of the non-renewable ones". This could only be achieved by "careful management" for conservation purposes and by "non-direct use" for preservation purposes. A "planned development" of resource use could make these "apparently antagonistic" objectives compatible with each other. The plan proposed to (1) select areas with potential conservation or preservation value, (2) point out "gaps" in the current park and preserve system, (3) use technical and scientific criteria for selecting areas, (4) revise management objectives and (5) propose priorities for creating and managing conservation units.[36]

The existing park and preserve system was classified as "poor" in the representation of the country's ecosystems. Land ownership was deemed as the major threat to the system's survival. The existing legal framework was considered narrow because it allowed only national parks, national biological preserves, ecological stations (indirect use) and national forests and hunting parks (direct use). Legislative review was considered necessary to "expand" the scope of conservation units. Areas nominated for new units were selected after "five years of field work". They were still considered "unsatisfactory" in number, area and ecosystem representation, even though their selection was guided by "new technical and scientific criteria".[37]

The results of the "first stage" (1979-1982) were impressive. Of 13 areas proposed in 1979, nine had been created until mid-1982. The 24,000 km^2 of parks and preserves created

between 1937 and 1974 had been expanded in 80,000 km² between 1979 and 1982. From .28% of the Brazilian territory in 1974, parks and preserves now rose to 1.2%. Just as important as the much needed physical expansion, the 24 national parks and 10 national biological preserves of 1982 were now "more representative" of the rich Brazilian tropical territory, flora and fauna.[38]

The Departamento and environmentalists engaged through the Fundacao Brasileira de Conservacao da Natureza and other institutions presented suggestions for future preservation and conservation units. For the "second stage" 30 new units with a combined area of 60,000 km² were proposed, some of them under new headings to be legally created, such as wildlife refuges, natural monuments, road parks and natural parks. The success in the creation of the nine new units and their favorable impact in "international scientific and conservationist communities" are mentioned.[39] This crucial policy proposal will be mentioned again several times. Needless to say, its proposals and results were a revolution in Brazilian park history.

The success or, at the very least, the impact of the 1979 park expansion plan, had its background in many years of anonymous work by the Instituto's small park staff. Part of this work was mentioned in the previous sections. Other parts deserve special attention. The "planos de manejo", or management plans, are the first. Since 1972 Maria Tereza Jorge Padua published her concerns about the importance of what she then entitled "master plans" for parks and preserves. She proposed that they be drafted by

"scientific teams" comprised of professionals familiar with nature conservation, ecology, landscaping, biology, geography, economy, park and preserve planning, natural resource management, engineering, architecture, archeology and history.[40]

Each park area should be painstakingly studied. Ecosystems, rare or endangered species, access, land ownership, land use history, leisure and lodging should be analyzed to create successful parks. Each park was to be zoned, according to standards adopted in American national parks, which Padua had observed personally in an intensive study-travel course in Park Management in the US. Scientific institutions, scientists and private citizens would be consulted or involved in drafting the master plans. Padua admitted, though, that they were still in a very elementary stage at that moment.[41] Considering the state of the art of park management at that time this probably seemed pure fantasy to many inside and outside the Instituto.

Nine years later, in 1981, Padua announced the conclusion of 20 Management Plans, some of them already published and being applied. The Fundacao Brasileira de Conservacao da Natureza was co-author and co-publisher of all plans. Overall, 87 professionals of many different areas had participated in the research, field work and drafting of these texts, over a period of five years (1976-1981). They were drafted in a consistent format. All have the same general outline, with comparable chapters, tables, maps and lists of sources. Padua today views them as "extremely well done", but also "very expensive". Instituto budget money and

foreign contributions through the Fundacao Brasileira de Conservacao da Natureza helped support large teams that travelled around the country, sometimes for weeks, or cover publication costs. Considering that many plans were not applied at all, Padua says that today she would spend that money on "short range" or "urgent" measures.[42]

For the general public, for the concerned citizen and even for the researcher, the Management Plans, even outdated in some aspects, are still the most complete and available source of information on parks and preserves. In fact, for the first time in 40 years of park policy, park authorities disclosed a broad set of publications about the parks. Most regrettable indeed was the non-application of some of the plans, sometimes because of the lack of qualified personnel in the parks, sometimes for their innovative character, but mostly for lack of funding. If they were not used as administrative tools, it certainly was not because of the lack of quality. The truth of the problem is that the Management Plans were, in this author's view, at least a decade ahead of the administrative capability and funding possibility of the Instituto.

Decree 84017, September 21, 1979, which set a "Statute for National Parks", was mentioned in Chapter 2. This was another result of Padua's groundwork in park policy and administration. The statute called for management plans and for the zoning of each existing park "in five years". Zones were named and defined, again based on American standards: (1) "closed", pristine areas to be secluded and left solely to "natural evolution"; (2) "primitive",

with minimum human impact, limited to scientific research and wilderness experiences; (3) "extensive use", a buffer around zones 1 and 2, with limited facilities for recreation; (4) "intensive use", altered for visitors, with visitor centers, museums, nature trails, leisure and environmental education facilities; (5) "special use", for administrative and maintenance facilities and staff.

Land fills, slope containment, fertilizing and soil reclamation were prohibited, together with dams, hydroelectric plants, dikes and flood control. Collection of animal and floral specimens and introduction of exotic species were also prohibited. All scientific studies in parks would need Departamento clearing. Proposals for new parks were to be "preceded by studies with scientific and technical arguments and socio-economic reasons".[43] Although specific effects of this management code are unclear, in 1979 the park system finally gained a set of sound rules for management, public enjoyment and scientific research.

At least one more aspect of the Departamento's innovative park policy must be mentioned and evaluated: its procedure and criteria for selecting areas to be preserved with parks and other preserves. Almost any Brazilian with experience in travelling around the country could easily conclude what was the dominant factor in the selection of national park areas from 1937 to 1974 - <u>scenic beauty</u>. Itatiaia has awe-inspiring and unique mountains, boulders and meadows; Iguacu has a world renown waterfall; Serra dos Orgaos has ragged peaks visible from the city of Rio de Janeiro; Ubajara

contains a vast cavern; **Aparados da Serra** has a section of the rim of Brazil's Southern Plateau region, with beautiful canyons 400 m deep; **Araguaia** is on the largest fluvial island in the world, surrounded by crystal clear river waters; **Caparao** has what until the late 1960's was considered Brazil's highest peak, called **Bandeira**, an impressive formation for Brazilian standards; **Sete Cidades** has internationally famous erosion patterns on massive rock formations; **Sao Joaquim** is on a high forested ridge in the only region of Brazil where it snows regularly; **Monte Pascoal** combines a beautiful stretch of beach with the forested slopes of the first mountain sighted by Portuguese sailors. Even the extinguished **Sete Quedas** and **Paulo Afonso** contained impressive river canyons, subsequently flooded or impaired by hydroelectric plants.

Obviously, many of these scenic beauties are located in important ecosystems and associated with unique plant and animal species and communities. In 1947 Wanderbilt Duarte de Barros suggested 14 specific sites for new national parks, most of them out of their scenic value alone; two of his suggested sites later gained park status. Barros states that "exceptionalism" of a landscape should be the most important criteria for locating parks. In 1969 the Instituto's first statement about parks revealed a trend towards ecological criteria. 55 areas were listed as potential sites for national parks, preserves, forests or monuments, most of them based on "representation of ecosystems", "fauna and flora protection" and, curiously, "areas studied by pioneer naturalists". The authors of the 1969 report noted that

most park areas had been chosen solely for their "remarkable" characteristics. They thought the remoteness of many of them justified only a status of "preserve for future designation". This type of preservation unit did not exist legally.[44]

Maria Tereza Jorge Padua's administration, without discarding scenic considerations and the associated aspects of tourism and environmental education, followed the trend of the 1969 report and developed decidedly more ecological criteria for locating new parks and preserves. In 1975, a detailed study was started using all the currently available instruments and sources. Padua explained how this was done:

> 19 thematic maps were used in order to avoid any possible interference [with national parks] by agriculture, cattle-raising, roads, indigenous populations, mineral deposits, etc.[45]

The proposed parks and preserves were plotted, as it were, between and around areas that might spark resistance. Padua states that because of this the proposed areas met "no resistance" from State governments and the federal agencies connected to road building, indigenous populations, mining, land reform and so on.[46] In this way Padua's group tried to avoid future confrontations which would threaten the new generation of parks and preserves.

Thematic maps allowed new park areas to be plotted according to "phytogeographic regions", "biogeographic provinces", "morphoclimatic regions", "drainage basins", "climatic

differences", indigenous peoples lands, prospective mining areas, "regional development projects", "limits of Legal Amazonia", political divisions, "geological and geomorphological areas", roads and, of course, existing preservation and conservation units.[47] Ecological variables and land use patterns could be inferred and cross-referenced with these maps.

But the Departamento had decided to give "more emphasis to the Brazilian Amazon region", where only one national park existed, created in 1974. This called in another important criteria. Four maps of a different kind gave a particular ecological blend to the Departamento's work. They were "pleistocene refuge" maps plotted for the Amazon region by recent scientific investigations done mostly by foreign biologists. These refuges were supposed to be major biological holdouts during several dramatic climate changes in the late Pleistocene era. In other words, they had been "islands" of biological diversity that survived adversities and managed to repopulate the Amazon Region to its present day levels. These refuges had "high probability of hosting endemic species". The four refuge maps referred to areas in which different sets of species saved themselves from extinction: selected birds, lizards, butterflies and plant communities. These maps were cross-referenced with each other and with all the others mentioned before.

A second phase was "field work", in which most of the refuge areas - nicknamed "forest islands" - were selected as "high priority potential sites" for parks and preserves; the second

highest priority was assigned to "unique floral formations". Of course, other areas, inside and outside the Amazon, were selected for other reasons. This was the first time in the world that park and preserve areas were selected with this type of criteria and evidence. Other countries followed suit, among them Peru.[48]

As all this remarkable preparation was going on, the Brazilian Amazon region had only one national park, no biological preserves and eight sizable but legally undefined forest preserves. The Departamento and the many scientists who were working to select areas for new units proposed 12 national parks, 16 national biological preserves and 21 ecological stations for the Amazon region alone. The conclusion was that none of the nine existing Amazonian conservation units protected first and second priority areas. The existing units, by the new standards, were therefore 100% peripheral. In biological terms, the "ideal" for the Amazon region was stated as the preservation of "three grand samples of each phytogeographic region, each one with 5,000 km^2, plus 24 units for "unique micro-habitats", each one with 1,000 km^2.[49] Brazilian national parks had taken from 1937 to 1974 to reach the Amazon region, but in 1979 they were being proposed in a massive scale and with wise ecological criteria.

Field work for final selection of the proposed areas, inside and outside the Amazon region, was done in 1977-1978 in collaboration with a score of local national, foreign and international institutions. At least 34 expeditions were done. Participating in field work were scientists from Federal and State

universities, Museu Nacional do Rio de Janeiro (a natural history museum linked to the origins of preservation in Brazil), Museu Goeldi (specialized in Amazonian natural history, anthropology and archaeology), Instituto Nacional de Pesquisas da Amazonia (specialized in Amazon region ecology), Superintendencia de Desenvolvimento do Centro-Oeste (a regional development agency), Fundacao Brasileira de Conservacao da Natureza, World Wildlife Fund, International Union for the Conservation of Nature and New York Zoological Society.[50] Through them Brazilian and foreign scientists participated intensely in this crucial chapter of park policy renewal.

The "Conservation Unit System Plan" credits individual proposals for park areas. Besides the institutions named above, the text mentions the Departamento itself, the Brazilian Society for the Advancement of Science, other universities, Fundacao Nacional do Indio (indigenous peoples bureau). As stated earlier, of 13 units proposed for 1979-1982, nine were created by 1982. Eighteen other units were proposed for a "second stage" which, as we will see, was not completed.[51]

Before proceeding any further with the analysis of park policy proposals and park selection criteria, it is now time to take a look at the national parks themselves, to evaluate the net results of these policies. It must be stated here that the "Conservation Unit System Plan" designed by Maria Tereza Jorge Padua's administration and launched in 1979 represented nothing less than a new beginning for the Brazilian park and preserve system. It was

the result of a decade of serious and innovative professional work by a small staff which apparently had to carve its own institutional niche inside the development-oriented Instituto Brasileiro de Desenvolvimento Florestal in order to dedicate itself to park policy. This staff also made the necessary connections with preservation and conservation scientists, in Brazil and abroad. It was certainly the park policy's best moment.

CHAPTER 4

Brazilian National Parks and Other Protected Areas: A Comparative Analysis

Protected Lands in Brazil

There is a surprisingly large variety of public protected lands in Brazil. Even Brazilians fairly informed about preservation and conservation have difficulty identifying all the different types of protected lands, their location, purposes, legal status and administrative fate. The first part of this chapter is basically a review of all identified types of protected areas. National parks and national biological preserves exist in a rather complex context of protected areas that must be clarified. They will receive a more detailed analysis later in this chapter. This summary of protected lands is certainly not complete nor totally correct, but still it goes way beyond all analysis available summaries and overviews.

Table 2 shows designation, legal basis, main objective and the approximate number of each type of protected area in Brazil. There are at least 20 types of preservation or conservation units,

some of them with unclear legal status and objectives. Each type will be briefly defined and evaluated.

Table 2

Types of Conservation and Protected Areas Existing in Brazil, with Respective Legal Basis and Objectives, as of 1988

Designation	Legal Basis	Objective[1]	Number[2]
National Parks	Law 4771,9/15/65	Preservation	28
State Parks	"	"	28
Municipal Parks	"	"	1
National Forests	"	Conservation	16
State Forests	"	"	?
Municipal Forests	"	"	?
National Biological Preserves	Law 5197,1/3/67	Preservation	15
State Biological Preserves	"	"	17
Municipal Biological Preserves	"	"	1
National Hunting Parks	"	Sport Hunting	?
State Hunting Parks	"	"	?
Municipal Hunting Parks	"	"	?
Ecological Stations	Law 6902,4/27/81	Preservation/ Monitoring	27[3]
Environmental	Law 6938,8/31/81	Land Use/Zoning	11[4]

Protection Areas			
Ecological Preserves	"	?	4
Areas of Relevant Ecological Concern	"	?	9
Special Areas of Tourist Interest	Dec 86176,7/6/81	Tourism	?
Areas of Tourist Interest	"	"	?
Union Protective Forests	?[5]	Erosion Control	23[6]
Forest Preserves	?[7]	?	9

Notes

1 - Preservation includes scientific research, environmental education and, in the case of parks, public visitation and recreation; conservation allows for multiple-use; monitoring includes purposefully induced changes; zoning includes land-use restrictions and preservation; erosion control applies to second-growth and primitive forests on unstable slopes.
2 - Indicates only existing areas positively identified by the author; question marks indicate imprecise number or unknown number.
3 - Only federal ones.
4 - Only federal ones.
5 - Not specified in the 1965 Forest Code.
6 - Only the ones created in the State of Rio de Janeiro.
7 - Same as 5.

Sources: Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986. Maria Tereza Jorge Padua. Interview. Brasilia, May 18, 1988. Maria Tereza Jorge Padua. Unidades de Conservacao. Brasilia, 1988. [typewritten]; Departamento de Parques Nacionais e Reservas Equivalentes, IBDF. Harold Edgard Strang et al. Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas Mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982. [mimeographed]. pp. 8-10.

a - National, State and Municipal Parks

The 1965 Forest Code is the statute for these three units, although older ones were created under the authority of its predecessor, the 1934 Forest Code. The 1979 "Conservation Unit System Plan" defines national parks as areas larger than 10 km^2 with "spectacular or unique natural traits", terrestrial or marine. They must also have "representative samples of ecosystems" and be manageable in a "natural or almost natural state". They must allow for visitors, tourists and environmental education.[1] 30 National Parks have been created in Brazil. Two of them were extinguished and two are expected to be created in 1988. Specific tables and further comments about national parks will follow later in this chapter.

Census data puts the number of state parks at 44, but further research revealed that some are not parks, but other kinds of non-identified preserves, ecological stations and leisure areas. Table 3 groups 103 state units identified in 1982 by three experts in Brazilian parks, in a pioneer and still unique study. Only 28 of them are officially called state parks, although there is no assurance that they were all created under the 1934 or 1965 Forest Codes. The authors used state government reports and documents, but relied on their own travels and field work experience and even on verbal communications to complete the listing. They are the first to consider it provisional. Their search is certainly more reliable than Census data, though. Therefore 28 is a safer

estimate for the number of state parks existing in Brazil.

Table 3

State Parks and Equivalent Preserves in Brazil: Number and Approximate Composite Percentage of State Area, as of 1982[1]

State	Number of Units	% of State Area
Espirito Santo	5	.47
Minas Gerais	18	.15
Rio de Janeiro	10	1.36
Sao Paulo	34	2.88
Parana	12	.43
Santa Catarina	4	1.02
Rio Grande do Sul	14[2]	.20
Distrito Federal	2	1.82
Goias	3[3]	.02
Mato Grosso do Sul	1	-
Total	103	

Notes
1 - Denominations found: Forest Preserve, Biological Preserve, Forest Park, Ecological Station, State Park, State Leisure Area, Biological and Archeological Preserve, State Preserve, Ecological Preserve and Municipal Park.
2 - Only 6 out of the 14 areas had available area measurements.
3 - Only 2 out of the 3 areas had available area measurements.

Source: Harold Edgard Strang et al. Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982. [mimeographed]. pp. 8-10.

Some comments on the 103 units in Table 3 should be made here.

They are all concentrated in only nine States and the Federal District. Brazil's other 14 States and two Territories have none. Sao Paulo, Rio de Janeiro and Minas Gerais alone have 62 of the 103 units. The only other non-coastal state besides Minas Gerais in the table is Goias, with three units. No Amazonian or Northeastern State has a state park or similar unit. Even though concentrated in a few states state parks are considered "extremely deficient" for the purpose of protecting local ecosystems. A reasonable 2.88% (Sao Paulo) is the largest section of any single state protected by these units. Notice also that nothing less then 10 different designations for these 103 units were found by the authors. Geographical concentration, scarcity of information, unclear legal status and variation of names all point to a very bad situation of the system of state parks.

As stated in Chapter 1, few states have enough revenue to pursue autonomous policies. State parks are certainly not a priority. Sao Paulo, Brazil's richest state, has a not surprising leadership in state protected areas. Incidentally, only one national park affects Sao Paulo territory. If the situation of Rio de Janeiro's state parks serves as an illustration, though, one can suppose that state parks all over Brazil are the most precarious preservation units in the country. Rio de Janeiro's state parks will be briefly evaluated in Chapter 7. As for municipal parks, only one was found with that name. Available information did not allow to check if it was created under one of the Forest Codes. It is Gama Municipal Park, in Brasilia.[2]

b - National, State and Municipal Forests

Also based on the 1965 Forest Code, these units are defined by the Departamento as "extensive areas, well forested, with commercial lumber and watersheds, besides wildlife and recreational possibilities". They are to be managed for "multiple use" (forest products, water, recreation, environmental education, wildlife management and esthetics), with "sustained yield" as the overall objective.[3]

Five decrees created five national forests in 1946, 1959, 1961, 1974 and 1984. Three national forests were thus created before the 1965 Forest Code, the first to establish the category. The decrees referred them to the "productive" forest category of the 1934 Forest Code. Maria Tereza Jorge Padua mentions 16 national forests extant in 1986, including four of those mentioned above. Therefore Table 4 considered 16 national forests as currently extant, although decrees creating the 11 ones independently mentioned by Padua were not found. National forests are managed by the Instituto Brasileiro de Desenvolvimento Florestal.

The transformation of eight huge "forest preserves" created in 1961 into national forests was recommended in the 1969 report that evaluated the Instituto's park heritage. This transformation was not done. The same report proposed that a "minimum of 10%" of the Amazon region should be put under national forest status. Each one should be extensive enough to contain "biological

preserves" with 500 km². This was not done, either. Tapajos National Forest, for example, was established by Decree 73684, February 19, 1974, with 6,000 km²; "biological preserves" and "tourist areas" were to be created in it, but were not.

Table 4

Brazilian National Forests: Name, Location, Date of Creation and Approximate Area, as of 1987

Name	Location (State or Territory)	Date of Creation	Approximate Current Area (km²)
Araripe-Apodi	Ceara/Piaui/ Pernambuco/ Rio Grande do Norte	2/25/46	-
Jaiba	Minas Gerais	5/26/59	2,000
Caxiuna	Para	11/28/61	2,000
Tapajos	Para	3/19/74	6,000
Jamari	Rondonia	9/25/84	2,150
Mario Xavier	Rio de Janeiro	-	-
Capao Bonito	Sao Paulo	-	-
Passa Quatro	Minas Gerais	-	-
Passo Fundo	Rio G. do Sul	-	-
Canela	Rio G. do Sul	-	-
Sao Francisco de Paula	Rio G. do Sul	-	-
Tres Barras	Santa Catarina	-	-
Chapeco	Santa Catarina	-	-
Cacador	Santa Catarina	-	-
Ibirama	Parana	-	-
Irati	Parana	-	-

Sources: Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Maria Tereza Jorge Padua. Unidades de Conservacao. Brasilia, 1988. [typewritten]

Maria Tereza Jorge Padua considers that the area of national forests in the Amazon region is very small: only 10,150 km², none of them in the State of Amazonas, Brazil's largest and most densely forested. She thinks this is surprising because national forests are "more easily accepted" than parks and preserves by local authorities and populations, as they are expected to bring investments and jobs.[4] No specific references to existing state or municipal forests were found. Some state units listed in Table 3, however, are called "state forest preserves", but their precise legal status remained unclear. No information about the management of national forests appeared in available sources. They are probably under very loose control by the Instituto, just as national parks and preserves.

c - National, State and Municipal Biological Preserves

The 1967 Animal Protection Law is the legal basis for these units. The Departamento defines them as "areas essentially not disturbed by human activity" created to protect "scientifically significant" species of flora and fauna. They should be managed to "preserve representative ecological samples" and maintain "genetic resources". They do not have to be extensive and should not attract visitors. All human activities in their area should be vetoed; scientific research should be stimulated, but controlled.[5]

The 15 existing national biological preserves will be assessed

in detail later in this chapter. One preserve was extinguished but was incorporated into a national park. Table 3 includes 17 units called "state biological preserves"; nine others with the same name are said by Strang et al to exist in the state of Minas Gerais. But their "undefined situation" precluded them from being included in the list of state units summarized in Table 3. In 1988 Herbert Martins confirmed the existence of six "parks" and 13 "ecological preserves" in Minas Gerais, but could not positively identify their legal status. Brazilian Census data records 32 state biological preserves. As in the case of state parks, this Census information is probably incomplete or inaccurate. The 17 state biological preserves established by Strang et al seems the best estimate, even though the study is 6 years old. As for municipal biological preserves, at least one exists in the outskirts of the city of Rio de Janeiro with the name **Jacarepagua**. It will be evaluated briefly in Chapter 7.[6]

d - National, State and Municipal Hunting Parks

Considered by the Departamento as an "additional" type of conservation unit, hunting parks are for "rational direct use of resources, with sustained yield". Their legal basis is the 1967 Animal Protection Law. In contrast to the units so far analyzed, hunting parks can be either government-owned or owned jointly by government and private citizens; they might help conserve resources, but that is not a "priority".[7] No reference to officially created hunting parks in Brazil was found in available

sources. Although sports hunting is not a widespread habit in Brazil, this type of unit could help diminish poaching in preservation units proper.

e - Ecological Stations

Ecological stations are a more recent type of conservation unit, created under the authority of Law 6902, April 27, 1981. They are defined as "... representative areas of Brazilian ecosystems in which basic and applied ecological research, natural environment protection and environmental education are to be developed". 90% of the area of each ecological station are to be "fully preserved", while the remaining 10% are to be used for research and experimentation that intentionally "change the local ecosystem". The objective is to allow for "comparative studies" of natural and altered ecosystems. The Secretaria Especial de Meio Ambiente is the agency responsible for their creation and management. Article 5 mandates "federal agencies supporting research projects" to dedicate "special attention" to proposals involving ecological stations.

Interestingly, Paulo Nogueira Neto, head of the Secretaria, admits that he arrived at this concept of simultaneous research and preservation during his experience as Vice-President of United Nation's "Man and the Biosphere" Program, in 1979. He understood that human induced changes, like fire and overgrazing, should be included in ecological research. Society's land and resource use patterns can thus receive scientific feedback. Originally

ecological stations were conceived strictly as preservation units. This concept of integrated management is unique in Brazilian preservation policies and is in this author's view extremely well adapted to a country of vast natural resources, rapid economic growth and enormous social problems. The presumption of controlling induced changes, though, is obviously a prime example of arrogant humanism.[8]

Ecological stations are the most modern and well conceived conservation units in Brazil and they deserve further attention. Table 5 shows the 27 ecological stations created, being created or proposed by the Secretaria since 1978. Some of them were established before Law 6902 but most of them came after. A few proposed ecological stations are not in the table, for lack of information. These units are always listed in Secretaria sources according to their "macroecological domain" or "morphoclimatic domain" and "phytogeographic regions" established by Aziz Ab'Saber, a ranking Brazilian Geographer; this criteria was retained in Table 5. Ecological stations are therefore located according to scientific criteria not entirely dissimilar from the ones developed between 1975-1979 in the park service's Departamento. The common trait is the search for "ecosystem representation". Ecological stations have been deliberately plotted throughout Brazil's four tropical and two sub-tropical domains or in "transition areas" between them.[9]

Several other reasons besides the criteria for location and integrated management objectives make ecological stations a more

Table 5

Brazilian Ecological Stations Created, Being Created and Planned by SEMA: Names, Location, Date of Creation and Areas, Per Ecosystem, as of 1987[1]

Name	Location (State or Territory)	Date of Creation	Approximate Current Area (km²)
1 - "Forested Lowlands of the Amazon Region"			
Anavilhanas*	Amazonas	6/2/81	3,501
Maraca*	Amapa	-	700
Rio Acre+	Acre	6/2/81	775
Juami-Japura#	Amazonas	-	5,726
Jari+	Para	4/12/82	2,271
Cunia+	Rondonia	4/12/82	1,000
Caracarai-Niquia*	Roraima	6/3/85	2,886
Maraca*	Roraima	6/2/81	920
Ique-Juruena*	Mato Grosso	6/2/81	2,000
Urucui-Una*	Piaui	6/2/81	1,350
2 - "Northeastern Intermontane and Interplateau Semi-Arid Depressions"			
Aiuaba*	Ceara	1/16/78	130
Serido+	Rio G. do Norte	5/31/82	350
Raso da Catarina*	Bahia	-	2,000
Itabaiana+	Sergipe	-	30
3 - "Forested Hills"			
Mamanguape+	Paraiba	-	30
Praia do Peba#	Alagoas	-	30
Tamoios#	Rio de Janeiro	-	-
Pirai+	Rio de Janeiro	1980	40
Jureia*	Sao Paulo	-	300
Guaraquecaba+	Parana	5/31/82	136
Carijos+	S. Catarina	-	-

4 - "Tropical Interior Plateaus Covered with Savannas and Penetrated by Gallery Forests"

Parapitinga+	Minas Gerais	-	100
Coco-Javaes#	Goias	-	370
Serra das Araras+	Mato Grosso	5/31/82	287
Taiama*	Mato Grosso	6/2/81	120

5 - "Sub-Tropical Plateaus with Araucaria augustifolia"

Aracuri-Esmeralda*	Rio G. do Sul	3/7/77	2.7
Taim*	Rio G. do Sul	1978	320

6 - "Sub-Tropical Hills with Mixed Prairies"[2]

Notes
1 - * = Created; + = Being Created; # = Planned.
2 - No ecological stations were created yet in this ecosystem.

Sources: Eugenio Camargo Bruck et al. "Unidades de Conservacao". Revista do Servico Publico, 111(4):21-27; Secretaria Especial de Meio Ambiente. Programa de Gerenciamento das Unidades de Conservacao. Brasilia, 1986; Secretaria Especial de Meio Ambiente. Estacao Ecologica de Jureia. Brasilia, 1984; Secretaria Especial de Meio Ambiente. Estacao Ecologica de Taim. Brasilia, 1984. Legislcao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

modern type of unit. One striking aspect is research. Besides the "special attention" they should receive from research support agencies, ecological stations were included in the Second National Development Plan for 1974-1979. More important, research in them is supported by the National Plan for Technological and Scientific Development, which manages massive public financial aid for all types of scientific research in Brazil.

what is being done in operational units, then it seems that almost all basic ecological research in Brazil`s preservation and conservation units is being done in ecological stations. In Jureia ES, on Sao Paulo's coastline, 12 research projects have been concluded and 24 others are in progress. Instructors and students from several Sao Paulo universities received grants and scholarships for these projects, allotted by the Secretaria through negotiations with two major federal government research support agencies. The same is happening in Taim ES, in Rio Grande do Sul, with 14 concluded projects and 15 in progress. All studies are in natural history, biology, geology, hydrology and soils. Research grants are for individuals or institutions, Brazilian or foreign. Jureia ES seems to have received research support also from Nuclebras, Brazil's major nuclear energy agency, on account of its "co-localization" with projected nuclear plants.[10] In contrast, research activities in national parks and preserves are very poor, as will be shown.

A last trait of the ecological stations reveal how elaborate is their conception. The Secretaria creates and manages another type of unit called environmental protection areas. Among other things, environmental protection areas have been located around some ecological stations and managed as "buffer" zones. This combination of protected lands has a great potential for obtaining effective results.

In 1983 Paulo Nogueira Neto said that the Secretaria was aiming at 40,000 km² of ecological stations before 1985 was over.

By the end of 1987, however, the total reached only 25,400 km². Considering that ecological stations are not defined as necessarily extensive units, 40,000 km² was not a small ambition. In fact, the combined area of existing ecological stations is actually large. In about 10 years they amounted to 30% of what national parks did in 50 years and 10% more than national biological preserves in 20 years.

A Secretaria staff member was probably right when in 1979 he said that ecological stations were the "main instrument of the Secretaria's action". More recently, through the National Environmental Policy Act of 1981, the Secretaria was entrusted with many other tasks and means of action in environmental policy. But the ecological station program seems to have retained its momentum.[11] The land ownership situation of ecological stations is not mentioned by available sources. It must be just as complex as in national parks and preserves and is just as crucial for obtaining effective results.

Ecological stations are much like national biological preserves are <u>supposed</u> to be, except for induced changes and monitoring activities. Maria Tereza Jorge Padua agrees that they are "similar" and considers this a "regrettable" case of duplication of activities by different agencies. Probably inter-agency competition influenced this development, but Padua says that Paulo Nogueira Neto, her "personal friend", was really trying to make ecological stations fill in for the Instituto's lack of initiative. The first national biological preserve was created

only in 1974. Between 1974 and 1979, as mentioned before, the Instituto did not create a single park or preserve. Considering this, Padua qualifies the ecological station program as "beneficial" to the cause of conservation in Brazil.[12]

Ecological stations can also be created by state and municipal governments, in agreement with the Secretaria. Besides one created in Minas Gerais, I found that at least one more was created in February of 1986 by the State government of Sao Paulo: **Jureia-Itatins.** This unit is located in the Southern coastline of the State, not far from the federal Jureia ES mentioned above. It contains one of the few extensive remains of the Atlantic Coastal Forest, besides some of the world's most productive and important mangroves, crucial for Atlantic Ocean marine food-chains. Its area was decreed as 820 km², of which 620 km² are private lands to be acquired. Jureia ES is located near four state parks and one state biological preserve, which compose a large protected area of this important and scarce landscape. Other ecological stations have probably been created by state governments but were not identified. No municipal ecological stations were recorded in available sources.[13]

f - Environmental Protection Areas

Created by the same law as ecological stations, environmental protection areas are on a borderline. They lie between conservation and land-use planning or zoning. They are legally designed to "...guarantee the welfare of human populations and

conserve or enhance local ecological conditions". They can also be created in all levels of government, upon agreement with the Secretaria.[14]

Table 6 lists environmental protection areas directly created and managed by the Secretaria. Their main objective is to "control land use, in public and private lands". This type of unit can be used for many purposes. It is certainly the most complex one in Brazilian legislation and policy. For one thing, they can and have been be created around ecological stations, to "protect" them, as mentioned earlier. But they can also have their own "wildlife zones", which might coincide with "permanent preservation" areas established by the 1965 Forest Code.[15] In other words, this type of unit can be used to protect areas already protected under other status.

Environmental protection areas are defined by the Secretaria as similar to Portuguese and English "Natural Parks" and West German "Landschaftschutz", but similarities are not described. A striking difference with other conservation units in Brazil, though, is land ownership status. Environmental protection areas intentionally "avoid the problems implied by land acquisition", which we have already seen to be a most difficult one for national parks and preserves. They are not intended to be publicly owned and managed areas. They aim at "adequate zoning and managing" to "conserve natural resources" according to local conditions, integrating decisions about private and public lands.

Table 6

Brazilian Environmental Protection Areas Created by SEMA: Name, Location, Date of Creation and Approximate Area, as of June 1986
(in order of creation)

Name	Location (State or Territory)	Date of Creation	Approximate Current Area (km^2)
Petropolis	Rio de Janeiro	9/13/82	440
Piacabucu	Alagoas	6/21/83	86
Bacia do S.Bartolomeu	Distrito Federal	11/7/83	841
Bacia do Descoberto	Distrito Federal-Goias	11/7/83	391
Cairucu	Rio de Janeiro	12/27/83	338
Guapi-Mirim	Rio de Janeiro	9/25/84	143
Cananeia-Iguape-Peruibe	Sao Paulo	10/23/84	2,028
Jericoacoara	Ceara	10/29/84	68
Guaraquecaba	Parana	10/31/85	2,915
Mantiqueira	Rio de Janeiro-Minas Gerais-Sao Paulo	6/3/85	4,025
Fernando de Noronha/Rocas de S.Pedro e Sao Paulo	Fernando de Noronha	6/5/86	-

Sources: Secretaria Especial de Meio Ambiente. Areas de Protecao Ambiental: Abordagem Historica e Tecnica. Brasilia, 1987; Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

Although the Conselho Nacional do Meio Ambiente sets "general rules" for all environmental protection areas and the Secretaria has a "National Coordination" for them, the crucial managing roles in each unit is supposedly played by a directive body of community and government agency representatives. This body decides about the

"installation of pollutant industries", the "opening of roads", "erosion causing activities", threats to water quality and preservation of rare or endangered species. The Secretaria appoints "Task Forces" to prepare the creation of each environmental protection area. The governing bodies are recruited from these groups. "Community participation" is now deemed as "important" by the Secretaria. It was not a priority for the first environmental protection areas.[16] The kinship with an integrated government-community planning authority is obvious. In sharp contrast with other preservation and conservation units, environmental protection areas are designed to be located exactly in areas where human presence and activity is intense or intensifying. Natural landscape or species preservation is not a priority and public ownership is not a requirement.

Piacabucu EPA, for example, was created as a buffer for Praia do Peba ES, in the state of Alagoas, on the mouth of the important Sao Francisco river. The objectives of the ecological station are to fix sand dunes, protect marine turtles who spawn there and save habitat for shoreline birds. The largest environmental protection area of all, Mantiqueira, protects high altitude forests and slopes in the mountainous region where the borders of Rio de Janeiro, Sao Paulo and Minas Gerais meet. Petropolis EPA, in Rio de Janeiro state, has two "wildlife areas". These three units have a more preservationist emphasis. Rio Sao Bartolomeu EPA, in contrast, was created to "protect the last watershed capable of supplying the future needs of Brasilia", the national capital. In this case

urban and rural planning and conservation dictated the creation of the unit.

Unclear situations occur, though, as when the mentioned **Piacabucu** EPA, created to protect an ecological station, is at the same time defined as an "area of relevant ecological concern" and, still, has its own "wildlife area", distinct from the ecological station.[17] The Secretaria here is overlapping four types of protection units, for reasons not at all clarified.

State and municipal governments can create their environmental protection areas, under the Secretaria's supervision. In Rio de Janeiro state, for example, three such units were created by the state government to protect natural characteristics of areas under siege of tourism and development. At least eight similar units were created by the city of Rio's government, inside city limits. In these cases, urban planning and enforcement of building codes are the rationales. Chapter 7 will deal briefly with Rio de Janeiro state and municipal environmental protection areas. Other states and **municipios** have probably created these units but no record was found in available sources.[18]

g - Ecological Preserves

Ecological preserves are defined by Decree 89336, January 31, 1984. All "permanent preservation areas" cited in Article 2 of the 1965 Forest Code are now considered ecological preserves. These areas, mentioned in Chapter 2, were river, lake and lagoon banks, watersheds, hilltops, slopes with 45° or more, sand dunes, canyon

edges and all floral formations above the altitude of 1,800 m. All these extensive areas were formerly under the (fictional) jurisdiction of the Instituto and were passed on to the Secretaria. This is one of those typical "generic" legal provisions, pointed out by Wanderbilt Duarte de Barros, that survive despite lack of applicability. By the Forest Code and now by Decree 89336, a large, scattered and utterly unmanageable portion of Brazilian territory is automatically considered as "permanent preservation areas". Their name was simply changed to "ecological preserves". No special decree or law is required to protect them.

But at least four ecological preserves were created in 1983 and 1984 by specific statutes. They are listed in Table 7. They are very different from each other. The extensive **Raso da Catarina** ecological preserve, with 997 km², created by Decree 89268, January 3, 1984, was said to be instrumental in the "establishment an Ecological Station". Indeed, an ecological station exists with that name. It can be deduced that ecological preserves can be used to set aside areas for further designation as preservation or conservation units, although neither the general nor the specific decrees mention this role. Another ecological preserve is **Ilha dos Lobos**, a tiny marine island with only 1.6 km², off the coast of Rio Grande do Sul. Its objective is to protect populations of sea-lions which use the small island in their migration.

The same status of ecological preserve was given to an immense area of 2,881.7 km² called **Jutai-Solimoes**, created by Decree 88541, July 2, 1983. The decree included the ominous provision that

mining deposits eventually discovered there will be exploitable with the permission of the President of the Republic. This was the first act creating any kind of Brazilian preserve to include such a proviso. On the same day, with the same proviso, Decree 88542 created Juami-Japura ecological preserve, also an immense area of 2,650 km². It is part of Juami-Japura ES, the largest unit created

Table 7

Brazilian Ecological Preserves Created by SEMA: Name, Location, Date of Creation and Area, as of 1987
(in chronological order)

Name	Location (State)	Date of Creation	Approximate Current Area(km²)
Ilha dos Lobos	Rio G. do Sul	7/4/83	1.6
Jutai-Solimoes	Amazonas	7/21/83	2842.8
Juami-Japura	Amazonas	7/21/83	2650.0
Raso da Catarina	Bahia	1/3/84	997.0

Source: Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

by the Secretaria. Again the agency overlapped different types of units, without a clarified reason. Both these huge ecological preserves are located in the state of Amazonas, Brazil's largest and most forested.[19]

The continuing non-management of all the immense non-decreed ecological preserves, the dissimilarities among the four only decreed ones and the conspicuous mining proviso really do not allow

for any conclusion about these units. The confusion is amplified when Article 1 of Decree 89336 says that ecological preserves can be public or private and when Article 4 says that the Conselho Nacional de Meio Ambiente will establish criteria for the "rational use of environmental resources". The "permanent preservation" status is grossly contradicted by both articles, which collide with the 1965 Forest Code. In summary, published Secretaria material and basic legislation do not furnish a real identity and purpose of ecological preserves.

h - Areas of Relevant Ecological Concern

Created by the same Decree as the ecological preserves, areas of relevant ecological concern are just as mysterious. They are supposed to be selected for "extraordinary natural characteristics" or "rare specimens of regional fauna and flora". They are to be preferably located in areas without human occupation and have 50 km^2 or less. But they can also be located inside environmental protection areas, not as "wildlife areas", as might be expected, but as "part of wildlife areas" (emphasis added). The Secretaria is responsible for these units. They would be very similar to national biological preserves if only their resources were not liable also to the same "rational use" proposed for ecological preserves.

The first areas of relevant ecological concern were created by Decrees 90791 and 90792, January 9, 1985, in Sao Paulo and Rio de Janeiro. Decrees 91884 through 99890, November 5, 1985,

created a new surge of similar units. They have a combined total of only 247.9 km² and are located in the states of Amazonas, Sao Paulo, Parana and Paraiba (see Table 8). The legislation gives

Table 8

Brazilian Areas of Relevant Ecological Concern Created by SEMA: Name, Location, Date of Creation and Area, as of 1987.
(in chronological order)

Name	Location (State)	Date of Creation	Approximate Current Area (km²)
Matao de Cosmopolis	Sao Paulo	1/9/85	1.7
Floresta da Cicuta	Rio de Janeiro	1/9/85	-
"Minimum Critical Areas of Tropical Rainforests"	Amazonas	11/5/85	32.9
Mata de Santa Genebra	Sao Paulo	11/5/85	2.5
Javari-Buriti	Amazonas	11/5/85	150.0
Queimada Pequena-Queimada Grande	Sao Paulo	11/5/85	.2
Pinheiro e Pinheirinho	Parana	11/5/85	1.1
Ilha do Ameixal	Sao Paulo	11/5/85	4.0
Rio Mamanguape	Paraiba	11/5/85	57.2

Source: Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

only one hint of why these areas were selected. In Amazonas, areas under research in the "minimum critical areas" of tropical rain forests were given relevant ecological concern status.[20] The objectives of this type of unit remained a mystery. An educated guess is that they are designed to preempt private activities in

selected areas preserving them for future classification.

Remarkable indeed is how the Secretaria acquired such a wide range of conservation and preservation responsibilities in little more than a decade. The older Instituto remained tied up with a narrow framework consisting only of national parks, preserves and forests. Besides ecological stations, the Secretaria has established environmental protection areas, ecological preserves (subtracted from the Instituto) and areas of relevant ecological concern. This is an impressive record for a young agency with so many other environmental policy responsibilities. Employing these different units separately, or lumping them together or still inside each other, the Secretaria has diversified significantly the scope of existing conservation units. The Departamento tried to do the same without success, as will be shown below. What remains to be seen is the Secretaria's ability to manage all these units, a subject that will not be explored here.

i - Special Areas of Tourist Interest and Sites of Tourist Interest

Special areas of tourist interest and sites of tourist interest were mentioned in Chapter 3. Created by Law 6513, December 20, 1977, they are not preservation or conservation units proper. The law's ambition however is to help consolidate protected areas eventually included in tourist areas and sites. These are defined, predictably, as "places of historic, artistic, archaeologic and pre-historic value", with cultural and ethnic

"manifestations", "remarkable landscapes", appropriate sites for "leisure and recreation", or with a "special climate". "Ecological preserves or stations" and other areas "protecting renewable resources" are also mentioned as desirable components of tourist areas and sites. These units would be managed by Embratur, the federal government tourism agency. The Instituto and the Secretaria would participate in all decisions pertaining to these units when created in the vicinity of their respective conservation units. Unclear limits are established to private ownership of areas and buildings with touristic value or potential.[21]

Embratur has no preservation or conservation authority but this law can help direct streams of visitors to existing protected areas and consequently help establish them as visible and self-sustainable units. This is the only reason to include them in this discussion. No evidence was found of the creation of any tourist areas or sites. Currently Embratur is stimulating travel agencies to organize "ecological tourism" travel programs around Brazil's less remote national parks, as will be shown in Chapter 5. It seems that these programs are not linked to these proposed areas and sites, though.

j - Union Protective Forests

Union protective forests are still another uncertain type of protected land in the Brazilian scene. They were created under the authority of the 1934 Forest Code, under the heading of "protective" forests. Union protective forest seems to be an

unofficial designation. The first such forest was created by Decree-Law 6565, June 7, 1944, in the outskirts of Rio de Janeiro city, then national capital. Its objective was to "guarantee the flow" of two small rivers that were part of the city's water supply network. A second protective forest was created by Decree 22287, December 16, 1946. This was a much larger area designed as a buffer around some borders of Itatiaia NP. This important fact was not mentioned in the decree, curiously. A third protective forest, created by Decree 28879, November 20, 1950, was established in Araras, in the municipio of Petropolis, next to Rio de Janeiro city. The decree includes the information that the area already belonged to the state government.

Between 1944 and 1964 at least 23 still extant protective forests were created in the state of Rio de Janeiro, some of them very near or inside Rio de Janeiro's city limits. All of them protect unstable slopes covered with second-growth or rare primitive forests along the Eastern faces of the Serra do Mar ridge, parallel to Rio de Janeiro's coastline. Their main purposes were erosion control and watershed protection of these slopes deforested by 19th century coffee plantations and left to successional second growth afterwards. Nine other protective forests were incorporated into Tijuca NP, in 1961. A new national park, Tingua, is scheduled to be created in 1988 in one of the 23 remaining protective forests in Rio de Janeiro. This would be Rio de Janeiro's fifth national park and the second one created in protective forest areas.

Strangely, the 1965 Forest Code does not mention the union protective forests, but they are extant and are managed by the Instituto. Other protective forests were created in Sao Paulo, Pernambuco, Mato Grosso, Santa Catarina, Minas Gerais and Rondonia, between 1949 and 1964.[22] The inconsistency and the vagueness of available data did not allow for a table with protective forests.

k - Forest Preserves

A last mysterious category concludes this discussion of existing yprotected lands in Brazil. Nine forest preserves were created by individual decrees, all dated July 25, 1961. They were located in Maranhao, Mato Grosso, Amazonas, Para, Roraima and Rondonia (see Table 9). Again the authority was the 1934 Forest Code. They were not incorporated into the 1965 Forest Code and survive until today based on the individual decree

Maria Tereza Jorge Padua says that they are "provisional" units, liable to redefinition or even extinction. The objectives of the forest preserves are not explained in the decrees, which mention only their general location, the existence of indigenous populations in the vicinities and the need to respect their rights. All areas were to be put under "permanent preservation" status. With the exception of one, all of these very large units were located in the Amazon region. Therefore, these forest preserves were the first conservation units to be created there in a massive scale. Their combined area was a very impressive 168,870 km², 21 times all the national park areas existing before 1961 and still

twice as much as current park areas. Surprisingly, no reliable updated information about the situation of these forest preserves is available.[23]

Table 9

Brazilian Forest Preserves: Name, Location, Date of Creation and Area, as of 1988

Name	Location (State or Territory)	Date of Creation	Approximate Current Area (km^2)
Jaru	Rondonia	7/25/61	10,850
Pedras Negras	Rondonia	7/25/61	17,610
Gurupi	Maranhao	7/25/61	16,740
Juruena	Mato Grosso	7/25/61	18,080
Rio Negro	Rio Negro	7/25/61	37,900
Gorotire	Para	7/25/61	18,340
Mundurucania	Para	7/25/61	13,770
Parima	Roraima	7/25/61	17,560
Tumucumaque	Para	7/25/61	17,930

Source: Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

In summary, national parks and preserves are far from being the only significant types of protected lands in Brazil. The other types are based on rationales that vary from preservation, conservation and erosion control to tourism and urban and rural planning. The precise roles and identity of some of these units are unclear. Some affect very large areas, larger even than many parks and preserves. Some also protect important natural areas near parks and preserves or far away from them. Unfortunately, the

management of all these types of protected lands is divided through many agencies, mainly the Secretaria and the Instituto, besides a score of state agencies. National parks are the oldest type of protected land but the lack of momentum in park policy has allowed the emergence of competing or complementary types of protected areas. This reflects bureaucratic fragmentation and inter-agency rivalries. This certainly puts a strain on the scant governmental energy available for managing public lands.

Other Types of Protected Lands in Brazil

Native American populations in Brazil claim considerable amounts of land all over Brazil as reservations or "indigenous territories". The legal status and the future of these lands are very uncertain but they are extensive areas where national society is not supposed to introduce its technologies and where native societies are expected to live more or less in their traditional ways, not as consumptive of natural resources. It is true that some Native American groups have shown interest in agriculture, mining and forest products, but they are still a minority in the less than 200,000 Native Americans of Brazil. Any land set aside for indigenous populations is, in this sense, liable to a much lower rate of exploitation than if opened to national society. The complex and bitter issue of Native American lands in Brazil cannot be summarized here, but the fact remains that about 10% of the Brazilian territory is being claimed by Indigenous nations. Many huge reserves have been legally secured.

On the anecdotal side of this issue, the relationship between preservation and indigenous lands is illustrated by the fact that a major Indigenous Territory, called **Xingu**, was by mistake created with the denomination of National Park, by Decree 50455, April 14, 1961. For years many people inside and outside Brazil thought this was a national park for landscape preservation purposes. On the serious side, some national parks and national biological preserves have had their borders successfully contested by Native American tribal groups. In some parks this problem is still extant.[24]

Decree-Law 4146, March 4, 1942, declared "fossil deposits" as "national property" and ordered that any fossil prospecting and excavation was to be authorized the Departamento Nacional de Producao Mineral, the powerful agency which grants permits for all mining activities in Brazil. Considering that some national parks, such as **Serra da Capivara**, have deliberately included archeological sites and cave paintings (constitutionally protected as "cultural heritage") inside their boundaries, the same might happen in the case of fossils.[25]

Proposed Protected Areas in Brazil

The Departamento's proposals for new types of conservation units, publicized along with its 1979 park policy and proposals analyzed in Chapter 3, give an idea of what is necessary for the adequate protection of the Brazilian landscape and the rational use of its natural resources. None of these categories were created by law, although the Secretaria at the same time managed to legally

create new types of protected areas. The Deapartamento's proposals are based on a publication by the International Union for the Conservation of Nature entitled Objectives, Criteria and Categories for Conservation Areas.

"Natural Monument" status was proposed for "nationally significant" natural areas", to be managed for recreation, environmental education and research. Such areas would not have to be extensive nor encompass a whole sample of an ecosystem; mentioned as examples are caverns or dunes. Ubajara NP, with only 5.36 km^2, is mentioned as a candidate for this status.[26]

"Wildlife Refuges" were proposed for areas designed essentially to protect species of flora, local or migratory fauna endemisms and unique biological resources. They can be private, public or jointly owned, with limited access for recreation, scientific research and environmental education. They should be small, limited to nesting grounds, lakes, swamps, etc.[27]

"Scenic Rivers" were to be "linear and continuous" units along rivers with outstanding scenic values, managed to protect islands, banks, slopes and canyons in their natural state. Alteration should be avoided and use for public education and recreation is permissible.[28]

"Road-Parks" were conceived as "linear and continuous" areas along both sides of roads with exceptional "scenic, cultural or recreational" value. Development, signs and billboards are forbidden in order to maintain a natural or semi-natural state for recreation and education. The Departamento proposed that a stretch

of the Transamazon Road be selected as the first Road-Park, but this was never implemented.[29]

"Natural Parks" were proposed as "relatively large areas with natural scenery of national importance", managed for outdoor recreation, as a rule located near cities and roads. The environment should be "semi-natural", with reclamation if necessary, including agriculture, animal farming and handcrafts industries. Although not designed for conservation, they can help conserve water, soils and other resources. They must be able to receive large numbers of visitors, have easy access and provide recreation. A Caraca Natural Park has been created recently in Brazil, comprising a pastoral setting typical of some parts of the state of Minas Gerais; although it lacks the legal status, it is "managed as a Natural Park".[30]

"Resource Preserves" or "Forest Preserves" were proposed to rescue the above mentioned forest preserves from legal oblivion. They are defined as "temporary" units, covering "extensive, non-inhabited, hardly accessible and pristine areas" about which little is known. They would serve to preempt any private occupation and buy time for future permanent designation.[31]

"Fauna Preserves" were suggested for fauna management in relatively extensive and preserved areas. Important species in regional diets, specially protein yielding ones, are to be bred and protected, by government or jointly by government and private land owners. They would also allow for visitation, environmental education and scientific research.[32] Some national biological

preserves have been developing the management activities designed for proposed fauna preserves, as will be mentioned later.

"Cultural Monuments" were to be selected by Brazil's National Historic and Artistic Heritage office. They should encompass areas with archeological, historic or cultural values, in government or private lands, for purposes of education and recreation.[33]

These units would certainly have helped an actively preservationist Instituto to develop a more encompassing preservation program. On the other hand, the Instituto's energies for national parks, preserves and forests waned after 1984. It is most doubtful that the new types of units would have made a decisive difference in the agency's performance in the field of landscape and species preservation.

National Parks

As seen, national parks are one out of almost 30 types of publicly protected areas existing or proposed in Brazilian legislation. More than enough context for an analysis of the Brazilian national park system has been given. The variety of protected areas competing for scarce funding and managerial capabilities will help understand some of the problems in which national parks are immersed.

Much of the basic information about the national park system has been organized in Tables 10 through 19. Table 10 has the names, the dates and the specific legal acts creating and/or altering all 28 existing parks. A first important aspect to be

analyzed is the extremely irregular time pattern of park creation in Brazil. The intervals almost call for a "generational" classification. A first generation includes only **Itatiaia, Iguacu and Serra dos Orgaos**, created in 1937-1939. A second one is composed by the next 11 parks created between 1959 and 1961. A third is composed of only three parks created between 1971 and 1974. The fourth and last generation is still in the making; it started in 1979 and includes the remaining 11 parks.

The intervals of 20, 10 and 5 years between the succeeding generations pull the average age of national parks much below than what could be supposed of a system born in 1937. The current average age of Brazilian parks is in fact only 20.4 years. The expected creation of two more parks in 1988 will bring this average down to less than 20. Therefore, the net administrative effort directed towards each park has an average span of only two decades. The park system is, therefore, quite young. This could be used as an argument for optimism about the situation of Brazilian national parks, but only if the older parks were considerably better off than the younger ones. This is not entirely true. It will become clear that some of the older parks in fact suffer chronic problems that longer years of administration have not soothed.

A second topic refers to the legal origin of Brazilian national parks. Executive decrees or decree-laws created and/or altered all parks. Contrary to park creation procedures in the US, for example, in Brazil parks do not go through any sort of congressional approval. This has at least two consequences worth

Table 10

Brazilian National Parks: Name, Date of Creation and Alteration, with Respective Legal Act (in chronological order)[1]

Name	Creation		Alteration	
	Date	Legal Act[2]	Date	Legal Act[3]
Itatiaia	6/14/37	1713	9/20/82	87586
Iguacu	1/10/39	1035	6/14/44	4587
Serra dos Orgaos	11/30/39	1822	8/2/84	90023
Ubajara	4/30/59	45954	4/26/73	72144
Aparados da Serra	12/17/59	47446	3/17/72	70296
Araguaia	12/31/59	47570	3/1/73	71879
Emas	1/11/61	49874	4/6/72	70375
Chapada dos Veadeiros	1/11/61	49875	5/11/72	70492
Caparao	5/24/61	50646	-	-
Sete Cidades	6/8/61	50744	-	-
Sao Joaquim	7/6/61	50922	-	-
Tijuca	7/6/61	50923	2/28/67	60183
Brasilia	11/29/61	241	-	-
Monte Pascoal	11/29/61	242	-	-
Serra da Bocaina	2/4/71	68172	6/8/72	70964
Serra da Canastra	4/3/72	70355	/74	74477
Tapajos	2/19/74	73683	1/18/5	90823
Serra da Capivara	6/5/79	83548	-	-
Pico da Neblina	6/5/79	83550	-	-
Pacaas Novos	9/21/79	84019	-	-
Cabo Orange	7/15/80	84913	-	-
Jau	9/24/80	85200	-	-
Lencois Maranhenses	6/2/81	86060	-	-
Pantanal M. Grossense	9/24/81	86392	-	-
Abrolhos	4/6/83	88218	-	-
Serra do Cipo	9/25/84	90223	-	-
Chapada Diamantina	9/17/85	91665	-	-
Lagoa do Peixe	11/6/86	93546	-	-

Notes

1 - Excluding two extinguished national parks: **Paulo Afonso**, created 11/24/48 (Decree 25865) and extinguished 6/2/65 (Decree-Law 605); **Sete Quedas**, created 5/30/61 (Decree 50665) and extinguished 6/4/81 (Decree 86071).

2 - All creation acts have been federal government Decrees, except for the case of the **Serra dos Orgaos** National Park, established by a Decree-Law.

3 - All alteration acts have been federal government Decrees,

except for the case of the Iguacu National Park, decided by a Decree-Law. For parks with more than one alteration only the first one is given.

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

mentioning. Congressional records are not the convenient source for gauging interest conflicts eventually arising with their creation. Proposals, controversies and negotiations are to be found in more widespread sources such as local press, politicians' correspondence, park agency files, executive documents and so on, harder to be gathered and studied.[34]

Another consequence of Executive creation does not affect the study of national parks. It is much more serious because it affects their very existence. Not having approved the creation of a single national park, Congressional houses have no special "affection" for them. This will soon become a more serious problem for Brazilian parks in the next few years. Congress's budgetary powers, severely cut since the mid-1960's, are scheduled to be restored in full as soon as the new Constitution is finished. National parks and even the Instituto have suffered budgetary shortages when the Executive power was deciding almost sovereignly

LOCATION OF BRAZILIAN NATIONAL PARKS AND BIOLOGICAL PRESERVES, AS OF 1988

NATIONAL PARKS

1	PICO DA NEBLINA N. P.	15	EMAS N. P.
2	JAÚ N. P.	16	BRASÍLIA N. P
3	AMAZONAS N. P.	17	PANTANAL MATOGROSSENSE N. P.
4	CABO ORANGE N.P.	18	SERRA DA CANASTRA N.P.
5	PACAÁS NOVOS N.P.	19	SERRA DO CIPÓ N.P.
6	LENÇÓIS MARANHENSES N.P.	20	CAPARAÓ N.P
7	SETE CIDADES N.P.	21	SERRA DOS ORGÃOS N.P.
8	SERRA DA CAPIVARA N.P.	22	ITATIAIA N.P
9	UBAJARA N.P.	23	SERRA DA BOCAINA N.P.
10	CHAPADA DIAMANTINA N.P.	24	TIJUCA N.P.
11	MONTE PASCOAL N.P.	25	IGUAÇÚ N.P.
12	MARINHO DOS ABROLHOS N.P.	26	SÃO JOAQUIM N.P.
13	ARAGUAIA N.P.	27	APARADOS DA SERRA N.P.
14	CHAPADA DOS VEADEIROS N.P.	28	LAGOA DO PEIXE N.P.

BIOLOGICAL PRESERVES

I	ABUFARI B.P.
II	RIO TROMBETAS B.P.
III	LAGO PIRATUBA B.P
IV	JARU B.P.
V	GUAPORÉ B.P.
VI	ATOL DAS ROCAS B.P.
VII	SERRA NEGRA B.P.
VIII	SALTINHO B.P
IX	UNA B.P
X	CÓRREGO DO VEADO B.P
XI	SOORETAMA B.P.
XII	COMBOIOS B.P.
XIII	NOVA LOMBARDIA B.P
XIV	POÇO DAS ANTAS B.P
XV	GURUPI B.P.

LEGENDA

- ● NATIONAL PARKS
- ▨ BIOLOGICAL PRESERVES

SOURCE: INSTITUTO BRASILEIRO DE DESENVOLVIMENTO FLORESTAL

Figure I

about appropriations. The Instituto is an Executive branch agency. Therefore, the situation tends to get worse if no congressional lobbying is done by the Instituto or whomever on behalf of the already impoverished parks.

A third topic raised by the data in Table 10 is the areas of national parks. What do the alteration dates listed in Table 10 tell us? 11 parks have been object of alteration decrees, issued on the average 17.3 years after their creation. These decrees have generally changed the size and/or relocated the proposed borders of each park. Three parks were expanded: Itatiaia, Iguacu and Serra dos Orgaos. Four were reduced: Araguaia, Chapada dos Veadeiros (twice), Tapajos and Monte Pascoal (without a specific decree). Other parks currently have expansion proposals: Aparados da Serra, Emas, Sao Joaquim, Brasilia and Monte Pascoal. Others still are liable to reduction: Serra da Bocaina, Pico da Neblina and Pacaas Novos.

Alterations have brought a net loss in decreed park areas over the years, as pointed out in Chapter 3. Even though a few individual parks were expanded, the park service gave up more than 50% of the total decreed areas. Alteration decrees bring the parks' original decreed limits closer to the reality of land ownership situations. Surely the original areas are calculated to suffer losses and, in this sense, are deliberately inflated statements of intention. The presence of indigenous populations has been one constant reason for reductions; the inclusion of expensive real estate in the original areas is another. Loosing

altered areas, developed sections or Native American hunting and fishing territories is not necessarily tragic. But loosing stretches of expensive ocean coastline, though, might mean a serious setback in a proposed continuum of habitats. Worst of all are the long battles for the definition of park borders and all the expensive field work and litigation that goes together with them. These disputes are a great drain on the Instituto's scant energies for development of the park system.

17 years on the average separate the first legal alteration or consolidation measures from the creation of each park. That is a lot of time for any agency to dedicate to one isolated facility or installation. This is specially true in the case of the Instituto, because its priority is not preservation. Several parks have been altered more than once, pulling up the average of 17 years which I computed using the dates of only the first alteration of each national park. The average age of Brazilian parks, 20.5 years, is therefore only slightly higher than the 17 years dedicated on the average to the consolidation of each one. It could be argued that Brazil's national parks have been managed almost exclusively for their mere physical consolidation, leaving little time and energy for their development as areas destined for leisure, recreation, research, education and preservation.

This pattern leads to a reflection about younger national parks. The entire fourth generation of parks, by far the one with the largest share of park area, still awaits alterations which will confirm or not their decreed areas. In the late 1970's the

Departamento's preference for plotting new parks in unoccupied public lands had this point in mind: it is always easier and faster to "clean up" the land ownership situation where private owners are non-existent or squatters lack proper titles.[35] Consolidation of national parks depends on the land ownership situation, to be examined below. In this crucial sense, all younger parks lack consolidation.

The decrees that created national parks and other sources mentioned in Table 10 yield background information relevant to the analysis of the park system. In many cases preserve or designated public land status have preceded the creation of national parks. Itatiaia, Brazil's first park, for example, originated from a "Biological Research Station" maintained in the area since 1914 by the Botanical Garden of Rio de Janeiro, which conducted or supported natural history research in the area. Part of Iguacu NP was set aside by the Parana state government in October, 1930. It was later donated to the federal government (public lands at the time were in the states' hands). Ubajara NP had its origin in an Experimental Forestry Station managed by the Agriculture Department.

Aparados da Serra NP was partially acquired and donated to the federal government by the state government of Rio Grande do Sul, in 1957. A federal union protective forest was created inside or in the vicinity of the present day park in 1952. Araguaia NP was also donated by the state government of Goias in 1958. Monte Pascoal NP was originally a state park, created in 1943 and donated

to the federal government. Tijuca NP was created by joining nine union protective forests with Tijuca Forest, in which the federal government had conducted a major reforestation for watershed protection between 1861 and 1887. Caparao NP was first a state forest preserve, created in 1948. Serra do Cipo NP was originally created as a state park in 1978. Sao Joaquim NP was indicated in 1958 for park status by the Agriculture Department's Forest Service, as representative of temperate forest with dominant conifers (Araucaria augustifolia, one of Brazil's two only native conifers). Brasilia NP was also indicated by the Forest Service to protect the integrity of the watershed that would supply the new capital's water supply.

Therefore, there is a pattern of prior research and/or conservation decisions giving a direction, or several directions, to the park system. This is specially true for the first and second generations of parks. Further inquiry is needed to evaluate this, but it is not altogether surprising. The long intervals between park creation acts, the slack administrative support for the older parks, the absence of criteria and the lack of institutional interest by the Instituto in its first years combined to put park policy on the haphazard trail of absorbing dispersed initiatives.

In reference to Table 10 the extinction of Paulo Afonso and Sete Quedas NP's deserves comments. Plotted next to scenic canyons of two major Brazilian rivers (Sao Francisco and Parana), both parks were subsequently erased by hydroelectric projects. Paulo

Afonso had part of its area flooded or taken for city development and Army barracks when a great dam was built in the vicinity. Apparently, no care was taken to spare the park, although its original decree mentioned that a section would be ceded for dam building. The 1969 Instituto report suggested the extinction of the park and the salvage of a national biological preserve consisting of natural caatinga (arid scrub) vegetation, besides a "national monument" status for the nearby waterfall. Extinction was the only suggestion enacted.

Sete Quedas - literally Seven Falls - was a Parana river white water rapids canyon, as it fell from the edge of Brazil's basaltic Southern Plateau. The rapids were flooded by the huge lake behind Itaipu hydroelectric dam, the largest in the world, built in the mid-1970's. By 1969, the park's situation was rapidly deteriorating. It was invaded by loggers, farms and Army barracks; the single park staff lived 200 km away; a small hydroelectric plant was operational inside the park's borders. The design of the dam deliberately included the flooding of Sete Quedas rapids, the only visitor attraction of the park. The feeble protest rising in the height of the military dictatorship did not affect construction plans.[36] It is not clear whether park authorities resisted the destruction of the sites of these two parks, although resistance must have existed. Both parks were fairly well known despite their relative remoteness from the more densely populated areas of Brazil's Southeast. The precedent was established, therefore, that national parks can be wasted in the name of progress.

Table 11 gives the location and approximate current areas of Brazilian national parks. A first important finding is that parks were created from the coastline areas towards the interior. Figure I helps visualize this fact, which has implications for the patterns of public visitation, a topic discussed below. With the exception of Iguacu NP, with its attractive waterfalls, the first five parks were less than 100 km away from the coastline, where the largest Brazilian cities were and still are located. The parks created in inland Goias state and Brasilia in 1959 and 1961 were the first ones located in Brazil's vast sertao (the popular name for the Brazilian hinterland). But they were clearly linked with the federal government's overall policy of "interiorizing" its action. This policy was symbolized by Brasilia, a huge Utopia of monumental buildings and avenues built in concrete on the Central Plateau, between 1956 and 1960, to be Brazil's new capital. This was the highest priority project in Juscelino Kubitschek's government (1956-1961). Those four parks were in part conceived as leisure areas for government workers who would be forced to move to Brasilia in the ensuing years.

Monte Pascoal NP, also created in 1961, was still another coastline park, in touristic Bahia state, with a particular historical coloring. Mount Pascoal, although not very high, was the first sighting of Brazilian territory by Portuguese sailors. Sao Joaquim NP was created in a relatively remote area of the South, but close enough to the coastline to attract many Brazilians to its yearly snowfalls, the only regular ones in Brazilian

Table 11

Brazilian National Parks: Location and Approximate Area, as of November, 1 9 8 6
(in order of creation) [1]

Name	Location (State or Territory)	Approximate Current Area (km^2)[2]
Itatiaia	Rio de Janeiro - Minas Gerais	300.0
Iguacu	Parana	1,700.8
Serra dos Orgaos	Rio de Janeiro	110.0
Ubajara	Ceara	5.6
Aparados da Serra	Rio Grande do Sul - Santa Catarina	102.5
Araguaia	Goias	5,623.1
Emas	Goias	1,318.6
Chapada dos Veadeiros[3]	Goias	600.0
Caparao	Minas Gerais - Espirito Santo	161.9
Sete Cidades	Piaui	62.2
Sao Joaquim	Santa Catarina	200.0
Tijuca[4]	Rio de Janeiro	31.9
Brasilia	Federal District	280.0
Monte Pascoal	Bahia	140.0
Serra da Bocaina	Rio de Janeiro - Sao Paulo	1,000.0
Serra da Canastra	Minas Gerais	715.2
Tapajos[5]	Amazonas - Para	9,940.0
Serra da Capivara	Piaui	979.3
Pico da Neblina	Amazonas	22,000.0
Pacaas Novos	Rondonia	7,658.0
Cabo Orange	Amapa	6,190.0
Jau	Amazonas	22,720.0
Lencois Maranhenses	Maranhao	1,550.0
Pantanal Mato-Grossense	Mato Grosso	1,350.0
Abrolhos	Bahia	913.0[6]
Serra do Cipo	Minas Gerais	338.0
Chapada Diamantina	Bahia	1,520.0
Lagoa do Peixe	Rio Grande do Sul	340,0
	Total:	87,850.4[7]

Notes
1 - Excluding two extinguished national parks: **Paulo Afonso** and **Sete Quedas.**
2 - In cases of conflicting figures the smallest was chosen. Areas proposed to be incorporated were not computed.
3 - Original name: **Tocantins.**
4 - Original name: **Rio de Janeiro.**
5 - Original name: **Amazonia.**
6 - Being a marine park, its area includes Atlantic Ocean surfaces.
7 - 1.02% of the Brazilian national territory.

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

territory. **Sete Cidades** NP, although only 150 km from the coastline, was plotted in a remote area. From **Tijuca** NP the fashionable beaches of Rio de Janeiro can very easily be seen. Ten years later, in 1971, **Serra da Bocaina** NP was created right on Rio de Janeiro's and Sao Paulo's coast, in an area of great tourism potential two hours away from Rio de Janeiro and three hours away from Sao Paulo, Brazil's largest cities. **Serra da Canastra** NP is a definitely inland park but it lies 200 km from Belo Horizonte, Brazil's third largest city. **Tapajos** NP, the first to be created in the Amazon region, was a spin-off of the national administration's enthusiasm about the never concluded Transamazon road. A national forest and a national park were set aside to

survive the wave of "progress" that was supposed to inundate that remote area.

It was only after 1979, as seen in the previous chapter, that "interiorization" of national parks became an independent policy or guideline for park location. Large parks and preserves were created in the Amazonian lowlands and along remote international borders. This resulted from an ecological approach that also yielded coastal parks such as **Lencois Maranhenses NP**, a remote sand dune area, **Cabo Orange NP**, an even more remote mangrove shoreline and even the first marine park, **Abrolhos NP**.

Therefore, it took more than 40 years for Brazilian national parks to systematically reach remote areas, including some on its 7,400 km Atlantic shoreline. In other words, landscapes not necessarily "attractive" or accessible to human eyes have been protected only very recently in Brazil. This affects the ecological quality of the park system in a negative way, as will be shown later.

Another striking "geographical" detail about Brazilian national parks is their total absence from the relatively small states of the Northeast (Sergipe, Alagoas, Pernambuco, Paraiba and Rio Grande do Norte). The prevailing criteria of "scenic beauty" left very little to be included in national parks in the area. The Brazilian Northeast was an early victim of extensive sugar cane plantations and mills, which ravaged the coastal forests for cropland and other forested areas for fuel. The Northeast is Brazil's most impoverished and arid region, with many stretches in

advanced stages of desertification. It is not exactly a place where Brazilians want to go for leisure and scenic beauties, with the exception of its hundreds of kilometers of attractive beaches, on which there is not a single national park. The only small stretch of Northeastern beaches inside a national park is in the state of Bahia, in **Monte Pascoal** park, far from the states mentioned above. The caatinga, an arid scrub environment characteristic of the Northeastern hinterland, is precisely the least protected type of Brazilian landscape.

As shown above, some ecological stations in the Northeast were located in sites undisturbed enough or with enough ecological importance to warrant protection and management. This probably resulted from the ecological criteria with which ecological stations were located from the beginning. The prevailing "scenic beauty" principle for national parks therefore shows out again in this virtual absence of parks from the Northeast's vast hinterland and coastline.

Table 11 has the areas for each national park and the total area of all national parks. The four generations of parks proposed by this analysis have a consistently rising score in created park area. The first generation set aside .02% of the Brazilian territory. This minute figure remained the same for 20 years. In 1959-61 the second generation pulled in .10% more. About ten years later the third generation added .13%. The fourth generation outdid the three others combined, by far, putting .77% into national park status. All this adds to the current figure of 1.02%

of Brazilian territory in national parks. This is a very low figure considering not only international standards but also recent official policy statements by the Departamento, the Instituto and even the all-powerful Second National Development Plan of 1974-1979.

The average area of a Brazilian park is an impressive 3,137.5 km². This average is larger than 21 of the 28 parks; obviously, this means that the three largest (**Jau, Pico da Neblina** and **Tapajos**) pull the average up in a disproportional manner. When they are excluded, the average for the remaining 25 parks drops sharply to 1,327.6 km². Before the surge of parks created from 1979 on, the average park size was very similar to this last figure: 1,311 km². The three large parks mentioned above are, therefore, the ones that really account for the physical greatness of the Brazilian park system. All of them lie deep in the Amazon region but their borders are not at all safe from encroachment. Their survival is, in more than one way, crucial for consolidating the progress in park policy represented by the first and second stages of the "Conservation Unit System Plan" issued in 1979.

Brazil's smallest national park is **Ubajara**, which is basically a small area with a remarkable cave and scenic flat top geological formations. As mentioned earlier, the Departamento suggested it to be Brazil's first national monument because it does not meet the international minimum size requirement for national parks, which is 10 km². Brazil largest national park is **Jau**, in Amazonian lowlands, reachable only by boat or small plane. The second

largest park, **Pico da Neblina**, is on Brazil's border with Venezuela. A Venezuelan park called **Serrania de la Neblina** adjoins it and they compose the second largest continuous protected area in the American Continent, second only to the vast wilderness and park areas created in 1980 in Alaska. According to Instituto sources, this park is subject to being reduced due to indigenous land claims in the area. Brazil's fourth largest park, **Pacaas Novos**, is also subject to reduction, because it lies entirely inside a proposed indigenous territory. Considering the criteria adopted by the Departamento to select non-conflictive areas for new parks, the plotting of this park in indigenous lands is intriguing. No explanation for this choice emerged.

The small size of some parks, the extension of others and urban or rural encroachment on both pose the issue of their permanence as protected lands. The federal government's record in controlling public lands in general is very weak, as discussed in Chapter 2. National parks are suffering and will continue to suffer from this. This brings up the crucial topic of the land ownership situation of Brazilian national parks. Table 12 is an attempt to summarize a very complex situation. Some explanations are needed to understand the meaning and the limitations of this table.

National park lands go through several stages before they are considered fully under public ownership, as required by Brazilian park legislation and by international park standards. After a

Table 12

Brazilian National Parks: Land Ownership Situation, as of May 1988 [1]

Name	% of Land Owned by IBDF[2]	% of Land Not Owned by IBDF[3]	Defined Limits[4]
Itatiaia	5	95	N
Iguacu	95	5	Y
Serra dos Orgaos	20	80	N
Ubajara	90	10	Y
Aparados da Serra	75	25	Y
Araguaia	0	100	N
Emas	90	10	Y
Chapada dos Veadeiros	0	100	N
Caparao	95	5	N
Sete Cidades	90	10	Y
Sao Joaquim	0	100	N
Tijuca	95	5	Y
Brasilia	100	0	Y
Monte Pascoal	100	0	N
Serra da Bocaina	30	70	N
Serra da Canastra	100	0	Y
Tapajos	0	100	N
Serra da Capivara	50	50	N
Pico da Neblina	0	100	N
Pacaas Novos	0	100	N
Cabo Orange	0	100	N
Jau	0	100	N
Lencois Maranhenses	0	100	N
Pantanal M.Grossense	100	0	Y[5]
Abrolhos	100	0	Y[6]
Serra do Cipo	50	50	N
Chapada Diamantina	0	100	N
Lagoa do Peixe	0	100	N

Notes:
1 - Percentages indicate only current estimated areas. All figures are provisional.
2 - Lands owned by IBDF, duly bought or donated and registered in Notary Publics.
3 - (1) Lands belonging to the public domain but not registered in Notary Publics and/or (2) private lands with acceptable titles and/or (3) **posses** (squatters settlements). The three types of land are not discriminated for all parks in any available source.

4 - Y = Yes; N = No. Yes indicates the existence of at least a provisional closed perimeter of land, i.e., a tentative borderline for the park and a more precise estimate of ownership situation.
5 - First and only national park created with 100% government owned land.
6 - Being a marine park, operated in conjunction with the Brazilian Navy, it can be considered as having defined limits.

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988. [typewritten]; Aureo Faleiros. Interview. Brasilia, May 24, 1988; IBDF. Observacoes Gerais [sobre a Situacao Fundiaria dos Parques Nacionais e Reservas Biologicas]. Brasilia, [circa 1985] [typewritten].

decree specifies the area of a park, generally giving only the names of the state and municipios and a round number of hectares, the Instituto must proceed to identify the area, establish its limits and mark out these limits. This is mainly topographic work, which can be difficult, costly and slow.

As limits become reasonably clear, the Instituto starts surveying properties to evaluate land and investments for later reimbursements to legal private owners. Decrees creating parks do not expropriate them. Public lands without squatters are "administratively" incorporated into Instituto holdings or, sometimes, into INCRA (the land reform agency) holdings, when

land reform decrees expropriate tracts inside proposed park areas. As the land reform agency also belongs to the federal government agency, there is no technical need for a transfer to the Instituto.

When specific private tracts are considered to be definitely inside proposed park boundaries the Instituto proposes prices for lands and other values to be acquired. The legal situation of private owners will expedite or retard this process. Good private titles are easily accepted by the Instituto and no litigation is necessary if the owner accepts its offer. Dubious titles have to be checked by the Instituto and eventually contested in a court of law, both processes demanding time. The most serious problem, though, is when two or more private parties present equally good (or equally dubious) titles to the same tract of land. This is exceedingly common all over Brazil, specially in recently settled areas. Anything might happen in this situation except a quick solution. The different owners might not want to sell or might not accept the Instituto's offer. The different owners might get into litigation among themselves, stifling Instituto action. One owner might decide to accept the agency's offer, while the others hold out. In these cases the Instituto will not buy, fearing further litigation for the same tract of land. This has happened more than once.

Deadlocks easily arise in many situations. Some become so entangled that the Instituto eventually gives up acquiring specific tracts. What happens then is that the tentative limits have to be redrawn in order to exclude the deadlocked area(s). More

topographic work, more title examining and more litigation might arise. After a reasonable area of contiguous land has been bought, donated or otherwise secured (in case of identified public lands), the Instituto must register its holdings in a Notary Public and await challenges, which happen rather frequently. Litigation or negotiations start again.

This complex process has its legal conclusion when the Instituto registers its uncontested holdings in the Servico de Patrimonio da Uniao, the National Government Property office. Not a single square kilometer of national park or national biological preserve lands had been registered by the Instituto in the government property office, as of May 1988. Although the Instituto has legal possession of a considerable percentage of total park land, it has not yet registered it as government property. No published Instituto material tells why this is so. An Instituto official responsible for following land ownership issues (in parks, preserves, national forests and reforestation projects) informed that the Servico de Patrimonio da Uniao is very strict about registering national park land as government property. It fears costs of possible litigation. The same official added that this problems applies to other types of conservation units and even to public lands with revenue generating reforestation plans.[37] In summary, federal government continues to lack control over public lands of all designations and national parks and preserves are no exception to the rule.

Now Table 12 can be properly assessed. The percentages of

land owned by the Instituto refer only to (a) private lands bought or donated and (b) public lands without squatters, both of which registered in Public Notaries. The percentages of land not owned by the Instituto refer to (a) public lands with squatters, or (b) private lands with acceptable titles to be bought, or (c) private lands with unacceptable titles in process of litigation or (d) private lands with multiple ownership. The percentages are updated to May 1988 and are the best estimates available at the Instituto's national office.

The first finding is that only five of 28 national parks are fully owned by the Instituto, corresponding to only 3.9% of park lands. This is an extremely poor record for 50 years of park policy. But even these few national parks are far from being in a stable situation. **Brasilia** NP needs to be expanded to protect watersheds, to guarantee adequate habitat for fauna and to include Rodeador peak (1,349 meters), on the pivotal divide between the three major Brazilian river basins (Sao Francisco, Amazon and Parana-Plate). The inclusion of this divide was one of the reasons for the park's location. Some ex-owners still await to de indemnified. **Monte Pascoal** NP also needs expansion to guarantee a continuous stretch of viable territory from its ocean shores to its mountain area. **Three private farms must be acquired.** **Pantanal Mato Grossense** NP was the first and only park to be created on 100% Instituto owned land. But it has a serious problem as far as management and public visitation is concerned. It is almost completely inundated in the long rainy season. Although typical

of this swampland region, the problem is that no high land exists in the park on which to build permanent buildings for staff, visitors or researchers. A new tract of land is needed.

Abrolhos NP could hardly be expected to have land ownership problems. It is an oceanic string of islands and reefs, owned by the Brazilian Navy. The area of this park was secured by prior ownership by the Navy, not by Instituto action. The conclusion is that only <u>one</u> Brazilian national park has an ecologically sound amount of land fully owned by the Instituto thanks to its own action: **Serra da Canastra**, wherein lie the headwaters of the Sao Francisco river. Even in this case, though, a few ex-owners are suing for further compensation. The other four parks entirely owned by the Instituto need to be expanded and/or were secured by another agency. All five seem secure, though.

Six other national parks are in the 90 or 95% category of Instituto-owned land. **Iguacu** is definitely Brazil's most consolidated park. It is the second most visited and the most famous internationally. The 5% of private lands are not a grave problem. **Ubajara** NP awaits a donation of extra land by Ceara state government but is also secured in the system. More serious than the 10% not owned by the Instituto is its size, far below minimum park standards. **Emas** NP also seems not to be seriously affected by the 10% of private lands and is actually subject to expansion. It seems secure as government property. **Caparao** and **Sete Cidades** NP's also seem secure despite still not being totally owned by the Instituto. **Tijuca** NP is not seriously affected by the

5% of private land inside its borders. Its many problems are generated by its immersion in a megalopolis, the city of Rio de Janeiro, as will be shown in Chapter 10.

Aparados da Serra NP comes next in the order of decreasing Instituto owned land. Its problems stemmed from the original identification procedure. By mistake, the first plotted area did not include a single section of the Itaimbezinho canyon, which was the main reason for creating the park in the first place. This most probably gave chance to speculation and drove up prices for additional areas along the canyon edge. **Serra da Capivara NP** is half owned by the Instituto. As the first national of the latter generation, this is not a bad record. The park lies in state public lands, although a small village lies within its boundaries. **Serra do Cipo NP** is also half owned by the Instituto and seems secured.

Rio de Janeiro's three other national parks have all been faced with serious and chronic land ownership problems. Less than 30% of their lands are owned by the Instituto. **Serra da Bocaina NP** ran into expensive real estate on its ocean border and unfortunately is being "redefined" to exclude a great part of the expensive but ecologically crucial shoreline areas it was designed to have. Squatters have actually resettled on Instituto-acquired land. **Serra dos Orgaos NP** seems to have met a deadlock with private owners and squatters on most of its borders. It is currently being "surveyed and redefined". **Itatiaia NP**, Brazil's oldest, has a chronic problem of resort houses and hotels inside

its borders. These private holdings are scheduled to be cut off from the park, but most of the non-Instituto land is actually owned by farmers and ranchers in other sections.

Eleven national parks are entirely out of Instituto control as far as land tenure is concerned. They account for a staggering 89.2% of park land. **Tapajos, Pico da Neblina, Pacaas Novos, Cabo Orange** and **Jau** are Brazil's five largest parks. Coincidence or not, the Instituto owns not one square kilometer of them. This is the gravest problem of the entire park system, not only because of the area of these parks but also for being exactly the five only Amazonian parks. Although created in supposedly unoccupied public lands, the historical record of government's lack of control over public lands is enough to erase any assurance that these five parks are safe from occupation and exploitation. Indigenous populations and/or squatters have been officially recognized by the Instituto as existing in all five of the parks. The undefined situation of these five parks is the single most serious threat to the Brazilian park system. If a valuable and viable park system is to survive, these five parks will be its backbone.

Araguaia and **Chapada dos Veadeiros** NP's, almost 30 years old each, have not seen their land tenure situation improve at all. On the contrary, their original areas were reduced. **Araguaia** forfeited lands to nearby indigenous peoples. **Chapada dos Veadeiros** was reduced <u>twice</u>, loosing <u>90%</u> of its decreed area to invading cattle ranchers. Recent Instituto documents show that indigenous populations and cattle ranchers are still extant inside

the reduced areas of both parks. Sao Joaquim NP, of the same generation, lies completely abandoned by the Instituto, although being almost a coastal park in Brazil's populated Southern region, where tourism is intense. The fact that its land is still entirely private speaks for itself. Its situation is so unstable that it is not included even in the parks considered to have good potential for tourism. Chapada Diamantina and Lagoa do Peixe, the youngest parks, can still be imagined to have time on their side.

Table 12 gives further evidence of unsatisfactory public ownership of Brazilian national parks. 18 of the 28 parks do not have even "defined limits", tentative perimeters that allow park authorities to at least visualize the amount of land that has to be bought or otherwise secured for the consolidation of each park. Six of the 14 oldest parks are among those still without defined limits. This gives a final measure of how slow land acquisition has been evolving or, more properly, stagnating. This overview of the land tenure situation furnishes the most discouraging note about Brazil's national park system. There is much reason to fear for the future of many national parks due to the federal government's inability to secure them as public property.

Public visitation of national parks could in itself be a source of pressure towards their physical and institutional consolidation. Besides scenic value, scientific research and environmental education, public visitation (generally dubbed "leisure" or "recreation") is the most widely mentioned rationale for creating Brazilian national parks. In a sense, the possibility

of receiving large amounts of visitors is the most important "public value" of a park system and policy.

Public visitation figures proved impossible to assess through Instituto and Departamento published materials. In order to obtain updated information on public visitation Brazilian in national parks, this author had to speak directly with Departamento personnel, in Brasilia. They compile visitation figures sent in annually from each park that (1) effectively receives visitors and (2) records their numbers. The following analysis benefited from a recent survey done by the Departamento about visitation conditions of national parks. This survey helped plan the "Ecological Tourism" campaign by which tourism companies are being stimulated to include national parks in their tour routes.[38]

Tables 13, 14 and 15 refer to 14 Brazilian national parks considered by the Departamento to have "some infra-structure" for visitation. The first remarkable detail is the absence of all fourth generation parks. This means that besides problems with land ownership, remoteness and lack of personnel, these parks will not be supported by significant public visitation in the short run, in the opinion of the Departamento itself.

The analysis will follow the order of decreasing number of visitors and illustrate what types of recreation each park allows for. Brazil's most visited national park, by far, is Tijuca. This is not surprising because it lies inside a major metropolitan area. The visitation figure was obtained by estimate because there is no control of public influx in this utterly urban park cut by numerous

public roads. Iguacu NP comes in second, with its internationally famous waterfalls. Although not too close to Brazil's larger cities, the core area of Iguacu NP is a mainstream national and international tourist attraction. Access to outlying park areas is all but prohibited.

Table 13

Brazilian National Parks in Good Conditions for Visitation (I): Management Plan, Yearly Visitation and Access, as of 1988 [1]

Name	Management Plan[2]	Yearly Average Visitation[3]	Access[4]
Sete Cidades	Y	16,840	Good
Serra dos Orgaos	Y	100,000	Good
Iguacu	Y	1,043,000	Good
Brasilia	Y	300,000	Good
Tijuca	Y	1,818,000	Good
Ubajara	Y	28,000	Good
Caparao	Y	10,000	Good
Emas	Y	600	Variable
Serra da Canastra	Y	5,000	Variable
Itatiaia	Y	72,000	Good
Araguaia	Y	-	Good
Tapajos	Y	55	Variable
Aparados da Serra	Y	21,000	Variable
Chapada Diamantina	N	-	Variable

Notes
1 - Ranked by the **Departamento de Parques Nacionais e Reservas Equivalentes** as having "some infra-structure".
2 - Y = Yes; N = No. 3 - Period not cited. 4 - Road Conditions.

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

Brasilia NP is third, much behind. Most of its visitors are weekend bathers and picnickers who drive 20 minutes on a good road to reach the crystal clear waters of a managed river beach. No hiking is stimulated in its plateau terrain covered with inviting savanna vegetation. Serra dos Orgaos NP, fourth, is only an hour away from downtown Rio de Janeiro on a good road and also receives many weekend visitors attracted by its river water pools. It has some very beautiful and demanding mountain trails that attract hikers and climbers. Rio de Janeiro city, on a clear day, is close enough to be easily seen from its ragged peaks. Serra da Canastra NP, fifth, is also reachable in about three hours of driving by automobile-owning inhabitants of Brazil's third largest city, Belo Horizonte, 200 km away. Camping is available, but no trails exist. The main attraction seems to be bathing in the headwaters of the Sao Francisco river. Next comes Ubajara NP, a regional tourist attraction with its intriguing cave. It is not at all remote for the motorized inhabitants of Fortaleza, Brazil's fifth largest city, about 220 km away.

Sete Cidades NP, seventh in number of visitors, is the first "remote" park on this list. It allows for a more characteristic experience in national park leisure. Although relatively near the coastline it lies in a isolated area of a sparsely populated state (Piaui). Its trails winding around awesome rock formations and its relative isolation are an invitation to camping and hiking. Aparados da Serra NP ranks eighth in number of visitors. It too is a relatively remote area not far from the coast. Trails are

available to lead the visitor to the edges of beautiful Itaimbezinho canyon, part of the edge of Brazil's basaltic South Plateau. On the top of the canyon there are temperate coniferous forests; on the bottom, subtropical Atlantic coastal forests. Caparao NP, ninth, is also relatively remote, although accessible through good roads. It propitiates more characteristic park leisure, as do the two prior ones. The relatively easy walk-climb up to Bandeira peak, 2,890 meters high, is a big attraction for adults and young. 60% of its visitors, in 1979, came from small cities in the vicinity; only 20% came from other states or abroad. The average stay in the park was short, between one and two days.

Only two definitely remote parks are on this list of "visitable" national parks, but they receive only a trickle of visitors. **Emas**, located deep in Brazil's Central Plateau, is apparently void of trails through its inviting savanna-covered, flat or gently waving terrain. **Tapajos**, deep in Amazon region territory, has little infra-structure. Both lie far away from large cities and have relatively difficult access.

3.4 million visitors a year is the average for these 14 national parks for a non-mentioned period, probably very recent. No averages for earlier periods were available to allow comparisons. Departamento personnel consider park visitation to be "on the rise" and are disappointed with the fact that some parks cannot receive visitors for lack of personnel or infra-structure, or both. They are optimistic about the growing interest of Brazilian and foreign travellers in parks but are very unsure as

to how parks will be able to respond to the increased demand.[39]

The conclusion is that these 14 national parks allow mostly for an almost urban park experience or for day trips out of big cities. Nature trails, museums, bird-watching, hiking, backpacking, mountain climbing, camping and more demanding activities such as wilderness experiences are possible in a few parks but not at all possible or stimulated in most. 3.4 million visitors a year is a meager figure for a population of 144 million, specially when so many parks are close to large cities. Brazilian national parks are, therefore, still very far away from constituting an alternative for leisure and recreation even for the small part of the general population which can afford to reach them in private automobiles. A constituency of park visitors is still to be formed in Brazil.

One high ranking park official considers that increased visitation will be a positive pressure for securing parks. But she also admits that recently several parks were closed for lack of personnel to guarantee that visitation remained "compatible" with conservation. As far as societal interests go, national parks will for long be defended almost exclusively by environmental activists, a handful of hiking and mountain climbing groups and concerned natural scientists. In this sense, nothing could be more alien to Brazilian national parks than the problem of "over-visitation", so frequently mentioned as a problem for American national parks, for example.[40] In this respect, it is more proper to say that Brazilians "ignore their parks to death", in

contrast with Americans who seem to "love their parks to death".

Table 13 tries to correlate the existence of Management Plans with minimum conditions for visitation. Indeed, 13 out of the 14 listed parks have published Management Plans, although they are not necessarily being applied. A few of them are "updating" the plans. All plans, incidentally, have detailed prescriptions for handling and stimulating visitation. Chapada Diamantina NP, the exception, is one of the youngest and could hardly be expected to have a concluded plan. The correlation might be a coincidence but the truth is that most "visible" parks at least have the basic groundwork for adequate visitation management. This can help consolidate their streams of visitors and, preferably, expand them. Brazilian national parks need, almost desperately, to be visited and their Management Plans seem to be helping in this.

National parks need infra-structure to attract significant number of visitors. Tables 14 and 15 present a summary of man made features that can attract visitors to the same 14 national parks. As can be easily seen, the infra-structure of even the most visited parks is at most fair, and in general humble or poor. Again the analysis will follow the order of their visitation figures. Tijuca NP, only 20 minutes from downtown Rio de Janeiro, could hardly be expected to have lodging and camping grounds. But its visitor center is really an unofficial gathering of snack bars, restaurants and souvenir stands. The absence of nature trails - a constant in all Brazilian parks - is almost unbelievable. After all, the park's flora, fauna, geology and social history are very well known

and studied.

Table 14

Brazilian National Parks in Good Conditions for Visitation (II): Lodging, Camping, Picnic and Visitor Center Facilities, as of 1988 [1]

Name	Lodging[2]	Camping[3]	Picnic Areas[4]	Visitor Center[5]
Sete Cidades	CC	Y	N	Y
Serra dos Orgaos	PC/O	Y	Y	Y
Iguacu	PC/H	N	Y	Y
Brasilia	N	N	Y	Y
Tijuca	N	N	Y	Y
Ubajara	PC	N	N	Y
Caparao	N	Y	Y	Y
Emas	O	N	N	N
Serra da Canastra	N	Y	N	Y
Itatiaia	CC/PC/H	Y	Y	Y
Araguaia	PC	N	N	N
Tapajos	O	N	N	N
Aparados da Serra	PC/H	Y	Y	N
Chapada Diamantina	N	N	N	N

Notes
1 - Ranked by the Departamento de Parques Nacionais e Reservas Equivalentes as having "some infra-structure".
2 - CC = Collective cabin(s); H = Hotel; N = None; PC = Private cabins; O = Other. Does not refer to outlying facilities.
3 - Y = Yes; N = No. 4 - Y = Yes; N = No. 5 - Y = Yes; N = No.

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

Table 15

Brazilian National Parks in Good Conditions for Visitation (III): Hiking Trails, Nature Trails, Published Literature and Food Facilities [1]

Name	Hiking Trails[2]	Nature Trails[3]	Pub. Lit.[4]	Food Fac.[5]
Sete Cidades	Y	P	R	Y
Serra dos Orgaos	Y	N	Y	N
Iguacu	Y	P	R	Y
Brasilia	N	P	R	Y
Tijuca	Y	N	Y	Y
Ubajara	Y	N	Y	Y
Caparao	Y	N	Y	N
Emas	N	N	Y	N
Serra da Canastra	N	N	Y	N
Itatiaia	Y	N	Y	N
Araguaia	N	N	Y	N
Tapajos	N	N	Y	N
Aparados da Serra	Y	N	N	Y
Chapada Diamantina	N	N	N	N

Notes
1 - Ranked by the Departamento de Parques Nacionais e Reservas Equivalentes as having "some infra-structure".
2 - Y = Yes; N = No. 3 - N = No; P = Planned. 4 - Y = Yes; N = No; R = Revision needed. 5 - Y = Yes; N = No. Restaurants and/or Snack Bars

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

There is not a single tree or plant with even common name identification in this densely forested and heavily visited national park located right in the heart of a city that prides itself of being Brazil's "cultural capital". The park does have

a small museum with samples of local fauna and flora. The museum is located outside park limits, though. A "social history museum" is being proposed by Carlos Manes Bandeira, an Archeologist who unearthed many artifacts that illustrate the history of human occupation of the area. Hiking trails, very steep, can take more hardy visitors to several scenic peaks. But a great part of Tijuca NP visitors in fact see no more than the famous statue of Christ, the Redeemer. All they do is ride a very comfortable tram up and down, which is not even an urban park experience proper.[41]

Iguacu NP is the best equipped in Brazil, with a visitor center, a major hotel, private cabins, picnic areas, restaurants, but it lacks camping grounds and trails for hikers. As a mainstream tourist attraction, it is excessively "manicured" in its core area. Outlying park areas are closed to visitation, though. Trails into its native sub-tropical forests would certainly appeal to hikers not satisfied with strolling around the amazing stretch of waterfalls. The same public would demand camping grounds. Brasilia NP could develop trails, lodging facilities and camping grounds for the hiking public, too. Its recently inaugurated visitor center is hopefully the first step toward making the park more than a day trip resort area for motorized picnickers and swimmers.

Serra dos Orgaos NP is the second best equipped park in the country. It has a visitor center, lodging, camping grounds, picnic areas, natural swimming pools, hiking and mountain climbing trails, a natural history museum and food facilities. Nature and

wilderness experiences are possible here, but a nature trail is called for in a section of its almost pristine Atlantic Coastal forest areas. Itatiaia NP is also well equipped and allows for hiking and mountain climbing, but its natural history museum and all the scientific studies over the last 160 years should by now have generated good nature trails.

Ubajara NP is fairly well equipped but camping grounds are necessary to hold of hikers overnight. A chairlift installed by the Ceara state tourism company, who used to co-manage this park, was closed by the Instituto on account of "scenic impairment". Opinions were divided by this measure and reopening of this equipment, which has not been taken apart, is possible. Aparados da Serra NP, lacking a visitor center, could easily attract more visitors, mainstream tourists and hikers alike. Sete Cidades NP is another easily improvable park. Additional lodging and an interpretative trail along its unique geological formations would probably be enough for a major improvement. Caparao NP needs lodging and better camping grounds, besides a food facility, because hotels and restaurants are very scant and modest in the nearby small cities. Maybe its new visitor center and picnic areas are a first step towards substantially improved visiting conditions.

Serra da Canastra NP also needs lodging, better camping grounds and a food facility, besides trails, if it is to become more than a day trip park. Emas and Tapajos NP's are still adventures even for hardy backpackers. They have no camping

grounds, no trails, no visitor center and no published information. Why Chapada Diamantina NP was included in the list of parks with good conditions for visitation is a mystery, because it lacks all eight items under consideration. The only plausible reason for the inclusion of this park in the list is its location in the state of Bahia, which has the second tourist trade in the country. Although 400 km away from Bahia's coastal beach resorts on dirt roads with variable conditions, maybe the Departamento considers that some tourists can be convinced to take a quick glimpse at one edge of this remote park deep in state territory.

Six other Brazilian national parks are considered by the Departamento to have "potential" for visitation. Data in Tables 16, 17 and 18 allow a similar analysis of these parks. Only one has a concluded and published management plan. Four of them have no visitation figures and the other two receive only a trickle of visitors. Access is considered "good" for three of them, and "variable" for another. Jau NP can only be reached by boat, which is not necessarily an attraction considering the virtual absence of dependable and safe river boats in the Amazonian region that are not also extremely expensive. Abrolhos NP, a marine park, has the same problem. The Departamento recommends that prospective visitors choose "carefully" boats contracted for visiting that remote island and reef area, about 100 km away from the Southern coast of Bahia. Of these six parks only Monte Pascoal has a visitor center and any published information. Lodging and camping are precarious or non-existent in all six parks. No hiking and

nature trails are available. Serra do Cipo NP is only 100 km away from Brazil's third largest city, Belo Horizonte, and close to a mainstream tourist attraction, a string of ex-colonial mining towns with baroque art and architecture.

Table 16

Brazilian National Parks with Potential For Visitation (I): Management Plan, Yearly Visitation and Access, as of 1988 [1]

Name	Management Plan[2]	Yearly Average Visitation[3]	Access[4]
Monte Pascoal	Y	3,000	Good
Serra do Cipo	N	-	Good
Serra da Bocaina	N	5,000	Variable
Abrolhos	N	MD	-
Jau	N	-	Fluvial
Chapada dos Veadeiros	N	MD	Good

Notes
1 - Ranked by the Departamento de Parques Nacionais e Reservas Equivalentes as having "no infra-structure".
2 - Y = Yes; N = No.
3 - Period not cited. MD = "much demand".
4 - Road conditions, except for Jau National Park; Abrolhos National Park is marine and its access is not mentioned.

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

Table 17

Brazilian National Parks with Potential for Visitation (II): Lodging, Camping, Picnic and Visitor Centers Facilities, as of 1988 [1]

Name	Lodging[2]	Camping[3]	Picnic Areas[4]	Visitor Center[5]
Monte Pascoal	O	N	Y	Y
Serra do Cipo	N	N	N	N
Serra da Bocaina	N	Y	Y	N
Abrolhos	N	N	N	N
Jau	O	N	N	N
Chapada dos Veadeiros	N	Y	N	N

Notes
1 - Ranked by the Departamento de Parques Nacionais e Reservas Equivalentes as having "no infra-structure".
2 - N = No; O = Others (different from Collective Cabins, Hotels, Private Cabins). Does not refer to outlying facilities.
3 - Y = Yes; N = No.
4 - Y = Yes; N = No.
5 - Y = Yes; N = No.

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

The conclusion is that these six parks have difficulty in attracting even the most rugged hikers and backpackers, not to mention mainstream tourists. Their potential is in fact great but much work has to be done to really attract larger numbers of visitors.

Table 18

Brazilian National Parks with Potential for Visitation (III): Hiking Trails, Nature Trails, Published Literature and Food Facilities [1]

Name	Hiking Trails[2]	Nature Trails[3]	Pub. Lit.[4]	Food Fac.[5]
Monte Pascoal	N	N	Y	N
Serra do Cipo	N	N	-	N
Serra da Bocaina	N	N	-	N
Abrolhos	N	N	-	N
Jau	N	N	-	N
Chapada dos Veadeiros	N	N	-	N

Notes
1 - Ranked by the Departamento de Parques Nacionais e Reservas Equivalentes as having "no infra-structure".
2 - N = No.
3 - N = No.
4 - Y = Yes.
5 - N = No.

Sources: Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia, February 1988 [typewritten]; Secretaria Especial de Meio Ambiente. Projeto Nacional de Meio Ambiente. Brasilia, 1988. [typewritten]

Eight national parks are missing from these two listings. Some comments apply. **Lagoa do Peixe** NP, being the youngest, could hardly qualify for visitation, even more because the local population has been actively resisting the park. **Pantanal Matogrossense** NP, although extremely remote, is located in an

ecosystem that has begun to attract scores of visitors from Brazil and the world, the Mato Grosso Swampland. There are two problems with visiting this park. First, it lies in a remote corner of the vast swampland. Second, there is the already mentioned problem of most of its land being under water for about four months out of the year. No permanent buildings nor campgrounds can be established. Some sort of floating facility must be figured out or, alternatively, a stretch of non-submersible land must be acquired to solve this problem. Lencois Maranhenses NP apparently has no administrative or visitation facilities at all but its coastal location and unique dune-beach-mangrove landscape have great potential for attracting beach-addicted Brazilians. Incidentally, this park needs to expand its decreed area in order to secure a viable stretch of coastline. Serra da Capivara NP is a definitely remote park still unprepared for visitors.

Pico da Neblina, Pacaas Novos and Cabo Orange parks are on the extreme of the park remoteness scale. For many years they will suffer from Brazilians' little enthusiasm about going to the Amazon region in general. They are in frontier territory that even mining and logging companies have difficulty in hiring stable workers for. Only the most rugged field naturalists can be expected to do scientific research in these parks. Finally, there is Sao Joaquim NP, almost 30 years old and still practically fictional. Most of the time it has no rangers. Even park directors live far away. This is Brazil's most abandoned park, considering its age and its coastal location. Consisting of private lands and lacking

visitors, its future is indeed uncertain.

These eight units add a significant potential for the development of a visitor constituency for national parks, particularly **Pantanal Matogrossense** and **Lencois Maranhenses**. But they are still going through the preliminary stages of Brazilian park evolution. Their lands are still to be secured; at least two require crucial expansion; management plans are still to be drafted. It is more realistic to work and hope for their physical consolidation than for their immediate or medium range attractiveness to the general public.

Table 19 illustrates a very different manner of evaluating Brazil's national park system: ecosystem representation. It was composed with data collected and analyzed by Maria Tereza Jorge Padua. She broke down the Brazilian territory into six major ecosystems and estimated the percentage of their respective areas. She then added up the areas of four types of conservation units (national parks, national biological preserves, ecological stations and national forests) in each of the six ecosystems. Finally she computed the combined percentage of protected areas in each ecosystem. Her objective is to correlate conservation units with different ecosystems and to check for a balance.

She finds the six percentages in the "b/a" column as "excessively discrepant" among themselves, besides flagrantly "insufficient" in themselves. The cerrados, a dry savanna landscape with surprisingly rich biological diversity, interfacing with the more fashionable biological treasures such as Amazon rain

forests and Atlantic coastal forests, occupy about a quarter of

Table 19

Approximate Combined Areas of Brazilian Federal Conservation Units, Per Type of Ecosystem, as of 1988 [1]

Ecosystem	Approximate Extension and % of Braz. Territory (km²) (a)	%	Approximate Area of all Local Cons. Units (km²) (b)	Approximate % of Ecosystem in Cons. Units (b/a)
Amazon Basin Tropical Forests	4,681,050	55	109,000	2.3
Savanna (cerrado)	2,127,750	25	10,000	.46
Dry Scrub (caatinga)	936,210	11	3,120	.32
Atlantic Coastal Tropical and SubTropical Forests	348,951	4.1	3,000	.85
Mato Grosso Swampland (Pantanal)	187,242	2.2	1,480	.79
Southern Plateau	229,797	2.7	3,200	1.39

Note
1 - Includes only national parks, national biological preserves, ecological stations and national forests.

Source: Extracted from Maria Tereza Jorge Padua. Unidades de Conservacao. Brasilia, 1988. [typewritten] Provisional figures cited with permission. Some computations are my own.

the Brazilian territory. They deserve much more than a mere .46% of protected areas. The richest zoological province in the Americas, the Mato Grosso Swampland, is also under-protected, with only .79%. The caatinga, composing 11% of the Brazilian territory, is extremely under-represented, with only .32%. The remains of Atlantic Coastal Tropical and Subtropical forests, considering the amount of destruction suffered over centuries and the generally dense population, are in Padua's opinion almost adequately protected. There are many small protected areas but surely a few more are needed.[42]

Therefore, it is clear that if the Brazilian conservation unit system in general, and the park system in particular, is to be fairly representative of the country's diversified landscapes, climates, ecosystems and biological forms, a considerable number of new units is necessary. Some of them have to be huge units in remote areas. Others can be smaller and less remote. Others still should serve to expand the protected areas of specific landscapes. Therefore, much basic work of creating parks and other preserves remains to be done to give the Brazilian conservation system a quantitatively adequate expression and a qualitatively ecological profile. The 1979 "Conservation Unit System Plan", interrupted in the middle of its second stage for all practical purposes, is being redrafted for a "third stage". It contains dozens of areas suggested for parks and preserves. Those suggestions are still sound.[43] What remains to be seen is the Instituto's commitment and momentum to implement the second-priority park and preserve

policy, not to mention its first-priority forest development policy.

National Biological Preserves

An analysis of some aspects of Brazil's 15 national biological preserves will conclude this chapter. As they are also managed by the Instituto Brasileiro de Desenvolvimento Florestal, they allow a more immediate comparison with the park system. Tables 20 through 23 have most of the data needed to analyze Brazil's biological preserves. Biological preserves, it should be recalled, are designed to preserve and protect unique or important populations of floral and fauna species in areas secluded from any human activities, including public visitation.

Table 20 has the names and creation decrees of all national biological preserves and the alteration decrees of five of them. Creation dates in these cases give a mistaken impression that must be corrected. The first four national biological preserves were not created as such. The federal biological preserve policy actually started only in the 1970's, not in the 1940's. **Sooretama, Augusto Ruschi** and **Corrego do Veado** were originally created by Espirito Santo State government acts. The first originated as a unique "Refuge for Wild Animals" and the other two others as "Forest Preserves". To this author's knowledge, no other "refuge for wild animals" was created in Brazil. The legal basis of **Sooretama** was the 1943 Hunting Code. The two "forest preserves" were based on the 1934 Forest Code. The three still contain

Table 20

Brazilian National Biological Preserves: Name, Date of Creation and Alteration, with Respective Legal Act
(in chronological order) [1]

Name	Creation		Alteration	
	Date	Legal Act[2]	Date	Legal Act[3]
Sooretama	9/21/43	14977	9/20/82	87588
Augusto Ruschi[4]	9/20/48	55	6/5/86	92573
Corrego do Veado	9/20/48	55	4/23/84	89569
Serra Negra	6/7/50	28348	9/20/82	87591
Comboios	1953	-	9/25/84	90222
Poco das Antas	3/11/74	73791	-	-
Atol das Rocas	6/5/79	83549	-	-
Jaru	7/11/79	83716	-	-
Rio Trombetas	9/21/79	84018	-	-
Lago Piratuba	7/16/80	84914	7/10/84	89932
Una	12/10/80	85463	-	-
Abufari	9/20/82	87585	-	-
Guapore	9/20/82	87587	-	-
Saltinhos	9/20/83	88744	-	-
Gurupi	1/12/88	95614	-	-

Notes
1 - Excluding the Cara-cara National Biological Preserve, extinguished and incorporated into the Pantanal Mato-Grossense National Park.
2 - All creation and alteration acts are federal government Decrees, with the exception of the first three creation acts, which were Espirito Santo state government Decrees.
3 - Only the most recent alterations for each preserve.
4 - Original name : **Nova Lombardia**

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria

Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Instituto Brasileiro de Reforma Agraria et Instituto Brasileiro de Desenvolvimento Florestal. Parques Nacionais e Reservas Equivalentes no Brasil: Relatorio com Vistas a uma Revisao da Politica Nacional nesse Campo. Rio de Janeiro, IBRA-IBDF, 1969. [mimeographed]; Instituto Brasileiro de Desenvolvimento Florestal. Reserva Biologica de Comboios. Brasilia, 1984. [typewritten]; "Exposicao de Motivos" [Criacao da Reserva Biologica de Atol das Rocas]. [Brasilia], April 1979. [FBCN Files].

untouched samples of Atlantic coastal forest, otherwise depleted in the late 1960's in Espirito Santo State.

Sooretama NBP was "donated" to the federal government in the same year it was created, 1943. It resulted from the efforts of Alvaro Aguirre, a pioneer Brazilian conservationist. On September 19, 1945, Agriculture Department ordinance 322 considered it a "Wild Animal Preserve, Breeding and Protection Park". How it was handled after that remained a mystery. Only on January 6, 1969, Instituto ordinance 939 considered it a national biological preserve, although technically a Presidential decree was required. Another Instituto ordinance, number 2015, March 4, 1971, expanded the preserve's area. What is called in Table 20 "alteration decree" (87588, September 20, 1982) was technically the legal creation of Sooretama national biological preserve. All this spanned a period of almost 40 years.[44]

Augusto Ruschi NBP, originally called Nova Lombardia, went through a similar process. Created as a state "Forest Preserve" in 1948, a state government decree donated it to federal government

in 1955. Instituto ordinance 1414, April 17, 1970, considered it as a national biological preserve. Federal decree 87589, September 20, 1982, confirmed that status. Later, federal decree 92573, June 5, 1986, renamed it after its founder, who originally had established it a "Museu Nacional do Rio de Janeiro Biological Preserve".[45]

Corrego do Veado NBP followed the same trail: "Forest Preserve" in 1948, donation to federal government by the same 1955 state government decree, preserve status through an Instituto ordinance (1415, April 17, 1970), official recognition as a preserve by federal decree 87590, September 20, 1982. The alteration decree mentioned in Table 20 expanded the preserve.[46]

Comboios NBP, a coastal area of the same state of Espirito Santo, was also originally researched by Ruschi and protected by a 1953 state Decree. The Instituto made it a national biological preserve only in 1984. It includes spawning areas for several species of marine turtles, the most undisturbed restinga (a coastal scrub vegetation associated with dunes and lagoons) on the whole Brazilian coastline and undisturbed coastal tropical forests, which combine to form a superb ecological preserve site. The 1969 Instituto report mentioned it and suggested its "donation" to the federal government, which happened only in 1984.[47]

All Instituto published materials failed to inform more than the dates and decrees of these four preserves that seem to date the national biological preserve policy as beginning in the 1940's. The only exception was the 1969 Instituto report, which recommended

their transformation into national biological preserves, although without mentioning the **Augusto Ruschi** unit. Maria Tereza Jorge Padua informed that **Augusto Ruschi** and **Corrego do Veado** were direct consequences of decades of field work and environmental activism of Augusto Ruschi (1915-1986), a natural historian from the Museu Nacional do Rio de Janeiro. These two areas were originally researched and later plotted as preserves by Ruschi, who negotiated their creation and their transfer to the federal government through the Museu Nacional do Rio de Janeiro with several state governors. He fought for their official national biological preserve status when later state governors started granting logging rights near or inside the three preserves. By then he was defending **Sooretama** NBP too. Accordingly, **Nova Lombardia** was renamed for Ruschi after his death, in 1986.[48]

Therefore, these four preserves were <u>not</u> the result of any park or preserve policy, federal or state, but an outgrowth of the scientific work of individual researchers - Aguirre and Ruschi - who happened to settle down long enough in one place to create and personally protect the preserves. These units today contain most of what remained from the lush tropical forests that until the mid-1960's still covered considerable areas of Espirito Santo state. The Instituto capitalized on these initiatives when it granted federal preserve status to these units decades after their actual creation.

Another "pre-historic" biological preserve is tiny **Serra Negra**. Together with **Saltinho** NBP, also very small, it is the only

conservation unit of any kind recorded in the important Northeastern state of Pernambuco. In 1950 it was created as a union protective forest. The preserve was carved out of this unit. It followed the same route as Espirito Santo's units: an Instituto ordinance, 1416, April 17, 1970, considered it a national biological preserve and a federal decree in 1982 made that condition official. Very little information is available about this unit. It is a rare "island" of tropical coastal forest in an ocean of caatinga landscape.[49]

The first national biological preserve actually created by the Instituto was **Poco das Antas**, in the State of Rio de Janeiro. This happened only in 1974. It was an outgrowth of a scientific project, namely the attempt to manage an endangered species population. Ever since the late 1960's, a group of biologists linked to the Fundacao Brasileira de Conservacao da Natureza was seeking a site for a long term project of managing the few dozen remaining specimens of a small primate, Leontopithecus rosalia, known in English as golden marmoset or golden tamarin. Endemic to the dwindling coastal forests of the state of Rio de Janeiro, this animal was in extreme danger of extinction. At first a "Biological Bank" was located inside Tijuca NP for L. rosalia breeding and research. Later scientists plotted an area in central Rio de Janeiro state covered with second growth forests to develop an integrated project of breeding and reintroduction into the wild. Several zoos from all over the world donated specimens for expanding the genetic pool of the managed population.

The Instituto responded to the project's need of a fairly large area under permanent preservation status and created the preserve in 1974. The agency is to be commended for this and is partially responsible for the project's success but once again scientists were two steps ahead. They were plotting out reserves through their field work and, as it were, giving the Instituto the cue. **Poco das Antas** NBP has been managed with funding by the Instituto, the Fundacao Brasileira de Conservacao da Natureza, Rio de Janeiro's Primatology Center, the Smithsonian Institution and the World Wildlife Fund.[50] Therefore, the first five national biological preserves were outgrowths of scientific efforts or prior preservation efforts with which the Instituto originally had nothing to do. Its own scientific research projects are almost exclusively in forestry, as indicated by the contents of its journal Brasil Florestal, as will be seen below.

As with national parks, the Instituto developed firm criteria for plotting national biological preserves only through the same groundwork that prepared the 1979 "Conservation Unit System Plan". This document included specific requirements for biological preserves. A major innovation was the creation of the sixth preserve on a string of marine islands, coral reefs and shallows called **Atol das Rocas**. This formation lies off the coast of Rio Grande do Norte, in Brazil's Northeast. It is supposedly unique in the whole of the Atlantic Ocean. Three huge biological preserves - **Jaru, Rio Trombetas** and **Lago Piratuba** - were created in 1979 and 1980 in remote and pristine areas in the Amazon region.

These preserves followed the trend of the new Amazonian national parks created in the same period.

Una RBP, by its turn, came in the footsteps to **Poco das Antas** RBP. It was designed to guarantee forest habitat for wild and extremely endangered populations of another endemic species of marmosets or tamarins, **Leontopithecus chrysomelas**, called golden-faced in English. Two other huge Amazonian preserves followed: **Abufari** and **Guapore**. **Saltinho** NBP came next. It had origin in an "Experimental Forestry Station", of which the Instituto has many throughout the country. **Gurupi**, the youngest preserve, was plotted inside a union protective forest created in 1960.

As far as areas are concerned, the Departamento's new 1979 policy determined more than 97% of all preserve lands. Considering individual units, though, scientific research and prior conservation initiatives determined nine out of the 15 national biological preserves. Therefore, Instituto initiatives or directives have <u>not</u> been consistent enough to allow for the conclusion that a specific preserve policy was effectively pursued before 1979.

Table 21 has the location and area of each national biological preserve. The average area is 1,555 km², just under 50% of the average national park area. This average is larger than nine of the 15 preserves and is considerably pushed up by the five huge Amazonian preserves created after 1979; without them, the average plummets to only 475 km². Before 1979 the average was a tiny 74 km². This pattern is similar to the national parks. The

Table 21

Brazilian National Biological Preserves: Location and Approximate Area, as of January,1988 (in order of creation) [1]

Name	Location (State or Territory)	Approximate Current Area (km²)[2]
Sooretama	Espirito Santo	242.42
Augusto Ruschi	Espirito Santo	44.92
Corrego do Veado	Espirito Santo	23.92
Serra Negra	Pernambuco	11.00
Comboios	Maranhao	8.33
Poco das Antas	Rio de Janeiro	50.63
Atol das Rocas	Rio Grande do Norte	362.49[3]
Jaru	Rondonia	2,681.50
Rio Trombetas	Para	3,850.00
Lago Piratuba	Amapa	3,570.00
Una	Bahia	114.00
Abufari	Amazonas	2,880.00
Guapore	Rondonia	6,000.00
Saltinho	Pernambuco	5.48
Gurupi	Maranhao	3416.50
	Total	23,261.19[4]

Notes
1 - Excluding the Cara-Cara National Biological Preserve, extinguished.
2 - In cases of conflicting figures, the smallest was chosen. Areas proposed to be incorporated were not computed.
3 - Being a marine preserve, its area includes Atlantic Ocean surfaces.
4 - .27% of the Brazilian national territory.

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria

Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Instituto Brasileiro de Reforma Agraria et Instituto Brasileiro de Desenvolvimento Florestal. Parques Nacionais e Reservas Equivalentes no Brasil: Relatorio com Vistas a uma Revisao da Politica Nacional nesse Campo. Rio de Janeiro, IBRA-IBDF, 1969. [mimeographed]; Instituto Brasileiro de Desenvolvimento Florestal. Reserva Biologica de Comboios. Brasilia, 1984. [typewritten]; "Exposicao de Motivos" [Criacao da Reserva Biologica de Atol das Rocas]. [Brasilia], April 1979. [FBCN Files].

Amazonian preserves are the youngest and are the ones that really inflate area figures to impressive levels.

It should be recalled that biological preserves are not necessarily defined as extensive units in international or in Brazilian park policy terms. They should have only the size necessary for protecting certain species of plants or animals. Anyway, when the Departamento decided to create the large Amazonian preserves and proposed others just as large it was consciously taking land ownership and ecological criteria into consideration. The crude state of knowledge about the preservation of biological diversity in tropical forest areas more than justifies the decision of establishing these and other huge preserves.

Land ownership is a serious problem for national biological preserves. Table 22 is analogous to Table 12. All explanations given about Instituto land ownership problems and criteria are valid for national biological preserves. Eight preserves are totally owned by the Instituto, representing a dismal 3.2% of preserve land. Seven of these were forged by scientific

Table 22

Brazilian National Biological Preserves: Land Ownership Situation, as of May 1988 [1]

Name	% of Land Owned by IBDF	% of Land Not Owned by IBDF	Defined Limits
Sooretama	100	0	Y
Augusto Ruschi	100	0	Y
Corrego do Veado	100	0	Y
Serra Negra	100	0	N
Comboios	100	0	Y
Poco das Antas	100	0	Y
Atol das Rocas	100	0	Y[2]
Jaru	0	100	N
Rio Trombetas	90	10	N
Lago Piratuba	0	100	N
Una	50	50	N
Abufari	0	100	N
Guapore	0	100	N
Saltinho	100	0	N
Gurupi	0	100	N

Notes
1 - See Table 3, Notes 1,2,3 and 4 for IBDF ownership criteria.
2 - Being a marine Preserve, operated in conjunction with the Navy, it can be considered as having defined limits.

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Margarene Bezerra et Fabio de Jesus. Situacao Atual das Unidades de Conservacao. Brasilia,

February 1988. [typewritten]; Aureo Faleiros. Interview. Brasilia, May 24, 1988. IBDF. Observacoes Gerais [sobre a Situacao Fundiaria dos Parques Nacionais e reservas Biologicas]. Brasilia, [circa 1985]. [typewritten]

investigation and/or prior conservation measures. In this sense, national biological preserves are better off than national parks, because even older parks have serious land ownership problems.

The eighth preserve entirely owned by the Instituto is **Atol das Rocas**. Its situation is analogous to **Abrolhos** NP: it is a marine preserve, managed in cooperation with the Navy, and not liable to land ownership problems. **Rio Trombetas** NBP, one of the larger ones, has an encouraging 90% of its lands under Instituto ownership. 10% are under litigation with 150 squatters settled on the fringes of this remote preserve area. Next comes **Una** NBP, a small area in which the Instituto is facing serious challenges from local landowners and logging companies. The agency had to pay twice for some properties in this preserve because it made the mistake of buying out title holders whose documentation was later successfully challenged by other parties.

Five preserves are entirely out of Instituto control. **Jaru, Lago Piratuba, Abufari and Guapore** are four of the five Amazonian preserves, relatively young but crucial for the national biological preserve system. **Jaru** awaits only the registration of public lands; squatters were indemnified. **Lago Piratuba** has a small number of owners and squatters. **Abufari and Guapore** have an undetermined number of squatters. **Gurupi** is the youngest preserve but its area is threatened by the ominous information that it

confronts three indigenous reservations. This, as seen in the case of national parks, has been a recurrent cause for park land shrinkage.

Only six of the 15 national biological preserves have "defined limits", as described for national parks. Even **Serra Negra** and **Saltinho** have this problem, although considered to be entirely owned by the Instituto. This lack of a recognized perimeter is an invitation for private encroachment even on these apparently secure preserves. **Poco das Antas** NBP, although consolidated, is planning to expand, to guarantee habitat for the growing number of golden tamarin families. This is a positive kind of uncertainty, though. As might be expected, none of the Amazonian preserves have defined limits.

In summary, the land ownership situation of national biological preserves is just as bad as in the case of national parks. The only encouraging difference is that all older preserves are more secured than all older parks. Five of the six largest preserves, with 80% of preserve lands, are still completely beyond Instituto control.

Table 23 gives complementary information on the management situation of Brazilian national biological preserves. Only five have published Management Plans, although plans were partially drafted for some of the others. Only three have research facilities, which include nothing more than lodging for researchers, small offices and libraries, eventually vehicles or boats and little else. One park has only "minimal" research

facilities, which were not described.

Although the topic of research projects in preserves was not thoroughly investigated, very little is found about the subject in available sources. The Espirito Santo preserves, founded and defended by Ruschi, have continued field research in birds and flowers, through the Museu Nacional do Rio de Janeiro and the Museu de Historia Natural Mello Leitao (founded by Ruschi in the preserve which today carries his name). Poco das Antas NBP continues its golden tamarin management project. In all these preserves the Instituto gives unspecified support, probably lodging researchers and securing equipment and material for them.

Rio Trombetas and Comboios NBP's both have on-going management projects respectively for fresh water and marine turtles. In both cases, beach spawning areas are protected, hatchlings reared for decreasing predation rates and breeding is experimented. The objectives are the preservation of the species and the improvement of a rich source of animal protein for local populations. The Fundacao Brasileira de Conservacao da Natureza provides scientific personnel and the Institute funds these activities, apparently on its own. There are sparse references to a management and protection project for manatees (Trichecus inunguis and Trichecus manatus) in Lago Piratuba NBP, again with Fundacao Brasileira de Conservacao da Natureza personnel and funding and Instituto support. Both are extremely endangered aquatic mammals, one fluvial and the other marine. Their joint occurrence in that area was one of the reasons for creating the preserve.

Table 23

Brazilian National Biological Preserves: Management Plans, Research Facilities and Administrative Facilities, as of 1988

Name	Management Plans[1]	Research Facilities[2]	Administrative Facilities[3]
Sooretama	Y	Y	Y
Augusto Ruschi	N	N	Y
Corrego do Veado	N	M	M
Serra Negra	N	N	N
Comboios	N	-	-
Poco das Antas	Y	Y	Y
Atol das Rocas	N	N	N
Jaru	Y	N	N
Rio Trombetas	Y	N	N
Lago Piratuba	N	Y	Y
Una	N	N	N
Abufari	N	-	-
Guapore	Y	-	-
Saltinho	N	-	-
Gurupi	N	-	-

Notes
1 - Y = Yes; N = No. 2 - Y = Yes; N = No; M = "minimal".
3 - Y = Yes; N = No; M = "minimal".

Sources: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal; IBDF. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975]; Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao no Brasil. Brasilia, 1982; Secretaria Especial de Meio Ambiente. Projeto Nacional do Meio Ambiente. Brasilia, 1988 [typewritten]; Brasil. Leis e Decretos, etc. Legislacao de Conservacao da Natureza. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986; Instituto Brasileiro de Reforma Agraria et Instituto Brasileiro de Desenvolvimento Florestal. Parques Nacionais e Reservas Equivalentes no Brasil: Relatorio com Vistas a uma Revisao da Politica Nacional nesse Campo. Rio de Janeiro, IBRA-IBDF, 1969. [mimeographed]; Instituto Brasileiro de Desenvolvimento Florestal. Reserva Biologica de Comboios. Brasilia, 1984. [typewritten]; "Exposicao de Motivos" [Criacao da Reserva Biologica de Atol das Rocas]. [Brasilia], April 1979. [FBCN Files].

In summary, there is no evidence of even a timid Instituto policy of research or research support, neither in national parks nor in national biological preserves. It is very clear that the Secretaria Especial de Meio Ambiente is doing a better job in stimulating scientific research in its ecological stations. The secret here is obtaining financial support from appropriate government agencies, something that the Instituto does not seem to have done or even tried.

A search in the Instituto's quarterly journal Brasil Florestal, with almost 200 articles in 60 issues published over 15 years, yielded many dozens of articles on forestry science, but only five articles on park policy or park history and only four on park ecology. This is a dependable gauge on the Instituto's own research priorities. No major park or preserve research project will emerge easily in the forestry-dominated Instituto.

The following chapter will concentrate on the prospects of the park and preserve systems. The major conclusion of this chapter is that Brazil's 28 national parks and 15 national biological preserves are extremely vulnerable to all sorts of threats. The isolated squatter crosses their boundaries in search of land, gold or game. The powerful landowner lets his cattle and bulldozers into park lands. Many government projects, such as roads, dams and mining, do not acknowledge parks and preserves. The rightful demands of Native American peoples for homelands threat some units. Visitation is minimal and a constituency of park users is still in

the making. Parts of the park and preserve seem secure and established, but all younger, larger and ecologically unique areas are unsafe as public goods, for lack of government control over their areas. Even though these parks are not necessarily under immediate siege, the poor record of park management and public land policy is more than enough to make one worry about the prospects of Brazilian parks and preserves. The overall quality of the parks and preserves as public goods is very low and this definitely compromises their often good quality as natural or ecological units.

CHAPTER 5

Park Policy, Park Service and the Park System: Prospects, Conclusions and Proposals

This chapter will conclude my analysis of the Brazilian park system and discuss its prospects. Some policy proposals will be added. A consistent park policy was formulated in Brazil only in the mid-1970's and executed for five or six years between 1979 and 1984. This corresponds to the 1979 "Conservation Unit System Plan", studied in Chapter 3. Most of the remaining analysis will therefore apply to the more recent years of park policy.

Criteria for Locating and Creating Parks

The 1979 plan established for the first time adequate and explicit criteria for locating parks and preserves. It was a much belated definition because it came more than 40 years after the first national park was created. In another sense, though, it came just in time to guarantee adequate preservation in the Amazonian and Mid-Western regions, as the economic frontier was rapidly moving towards them.

The fourth generation of parks and the preserves created after

1979 (which were actually the first preserves to be created by Instituto initiative) were plotted with a keen sense of ecological significance, political realism and managerial viability. Maria Tereza Jorge Padua is right when she says that "random criteria" adopted earlier were responsible for the large gaps between park creation, park establishment, land acquisition and park consolidation. Scenic beauty, isolated scientific investigations and scattered preservation initiatives were the three forces that shaped the park system until 1974, when Tapajos NP was deliberately designed to be set aside from the intended consequences of the Transamazon road.

Padua considers the 1979 as a "new stage" in Brazilian park policy, reflecting the maturation of park service personnel's effort to consolidate a viable system. In 1975 that group felt that Brazil had about "two decades" to do so, working simultaneously to salvage existing units and to create new ones.[1] In fact, in this author's view the 1979 plan was not a new stage but actually the first consistent Brazilian park policy proposal, a long overdue relinquishing of an ad hoc non-policy. Scenic value was now integrated with ecosystem representation. Scientific investigation was incorporated into park service routine. All this was cross referenced with political and administrative viability. The result was a sound, long term plan for a serious preservation effort.

Much of the knowledge necessary to put the 1979 plan together was available some time earlier, inside and outside Brazil. But

the subordination of preservation policy to forest development policy retarded the tapping of this knowledge by park service personnel. Overall, the Brazilian park system, including all older parks, should be managed and expanded as a precious natural and national heritage. The 1979 plan is still the only adequate managerial tool for this.

Unfortunately the 1979 plan was abandoned not long after Padua's resignation from the direction of the park service in late 1982. She resigned as a protest against a decision by the Secretary of Agriculture to allow a road through one of the new Amazonian parks. This was a first step towards the suppression of the 1979 plan. Its second stage was never completed. Padua mentions that the plan was personally approved by Brazilian President Joao Figueiredo in 1979. But its status remained that of an administrative plan designed by a second echelon office (the Departamento) of a third echelon agency (the Instituto) belonging to a second class Department (Agriculture). The current intention to redraft the 1979 plan and proceed towards a third stage is commendable but still unclear in its precise meaning.2

Whatever the content of a possible third stage, its original basis, the 1979 plan, remains the only existing, technical and politically viable proposal for a long term park policy in Brazil. Actually, a shift to a new and more aggressive mode is needed too. The Departamento, currently reduced again to a staff of only four, as in 1975, is overwhelmed by the task of caring for existing units. Significantly, since 1984 no new published information has

been issued about parks and preserves and only two parks and one preserve were created.

Ecological Quality of Brazilian National Parks and Preserves

Because scenic value was the overriding consideration in the establishment of most Brazilian national parks, their quality as ecological sound units must be discussed. Scenic landscapes are not necessarily viable biological units. Two expert Brazilian field Biologists, active in the only recorded Instituto-sponsored fauna management project, remarked the following in 1971: "Almost all parks and preserves in Brazil...suffer from having areas too small for preserving their fauna...[because] [t]hey were chosen for their scenic value". They were working in Tijuca NP, particularly unsuited for wildlife management because of its location inside the city of Rio de Janeiro. This has happened in American national parks, like Everglades, Olympic and Grand Teton: political limits of a park not coinciding with biological or ecosystem limits.[3] Although this does not occur in most parks and preserves created after 1974 it still plagues many of the older units. It is a serious problem for the preservation of endemic species, in particular. This is why it was so important to create huge units in the Amazon region. The intention was to avoid units incapable of supporting the scarcely studied biological diversity of the region.

In 1984 Maria Tereza Jorge Padua and Antonio Audi did a detailed search relevant to the topic of preservation capability

of Brazilian parks and preserves. The compared the Instituto's official list of Brazilian endangered animal species (established by ordinance 3481, May 31, 1973) with recorded or "probable" occurrence of these species in 25 national parks and 13 biological preserves. Well informed about conservation biology issues, they pointed out that adequate fauna protection requires units with "minimum areas", "migration areas" and predators. This means, of course, that the mere occurrence of a species in one or more units does not by itself guarantee its protection from extinction.

They concluded that 72 of the 86 endangered species were probably or positively resident in at least one park or preserve. Far from rejoicing, though, Padua and Audi pointed out threats like hunting, fishing, road building and introduction of domestic animals.[4] In conclusion, the park and preserve systems seem to have a good potential for helping in the preservation of endangered animal species, an indicator of good ecological quality.

Currently, the park and preserve systems are more representative of Brazil's ecosystems than before 1979. Some important blanks continue to exist, though. The Northeastern caatinga hinterland, the Atlantic coastline in general and the Mato Grosso swampland require much more protected areas, for example. The 1979 plan had in mind the better representation of the country's ecosystems in the parks and preserves. Pantanal Matogrossense NP, for example, is one of the two only protected sections of the vast swampland, considered to be the "major fauna concentration in the Americas". 21 of Brazil's 86 endangered

species are found there. **Lencois Maranhenses** NP is a unique combination of sand dunes, mangroves and ocean beaches in constant reshaping. **Una** NBP, besides being the only known habitat of the golden-faced marmoset or tamarin, contains samples of Southern Bahia's tropical rain forests, extremely rich floral formations.

Other examples of ecosystem representation must be mentioned. **Jau** NP and **Jaru** NBP are located deep in the Amazonian rain forests. **Pacaas Novos** NBP contains cerrados, open and dense rain forests, riverine areas and transitions between all of them. **Lago Piratuba** NBP preserves coastal mangroves, open fields and dense rain forests in the lower Amazon basin. **Cabo Orange** NP has 200 km of beaches and mangroves, 2,000 km² of seashore, open fields, cerrado and dense rain forests, a rich combination of habitats for dozens of Amazonian mammals, birds and reptiles. **Rio Trombetas** NBP protects sandy river beaches used by several species of fresh water turtles for spawning. The small area of **Atol das Rocas** NBP hosts around 60,000 specimens of five species of sea birds and is a spawning area for rare marine turtles. **Serra da Capivara** NP combines a good sample of caatinga with ancient human dwellings and cave paintings.[5]

The success of some on-going management projects - marmosets, marine and fresh water turtles, manatees - in some preserves and the huge size of the Amazonian ones allow a qualified optimism about the ecological qualities of the Brazilian park and preserve systems. Some of the Secretaria's units - ecological stations, mainly - also try to combine location in different ecosystems with

ecological sustainability. The conclusion is that the situation is reasonably good in this respect. But new parks and preserves still have to be added to improve ecosystem representation and ecological quality. Also, field scientists should study the biology and ecology of parks and preserves in a thorough, systematic manner, with Instituto support. It is obvious that the ecological quality of parks and preserves needs to be supplemented by their political stability.

Relationship of the Park System with Economic Growth and Geographical Expansion

Scenic value, decentralized scientific research and scattered preservation initiatives combined for 40 years to shape the Brazilian park system. It could be expected, therefore, that the system's profile resulted utterly random. This problem is alluded by Maria Tereza Jorge Padua when she says that older parks were created "...in many cases...in a ad hoc manner, responding to local pressures, opportunistic situations arising from the enthusiasm of conservationists or, still, from aesthetic considerations".[6]

Brazilian parks and preserves have many contrasting aspects indeed, such as size, age, landscape, manageability, infra-structure, attractiveness to visitors and others. Could there be any logic in the development of the system? Angela Tresinari wrote the only available text that explicitly argues for a comprehensive logic in the shaping of the park system. She examines the park policy's results against the background of recent Brazilian

economic and social development and its consequences on frontier dynamics. Although she considers ad hoc factors, Tresinari proposes the existence of a guiding principle in the shaping of the park system. Her analysis will be summarized and this author's different views will be added at each point.

Tresinari's premise is that the "dates of creation" and "geographical distribution" of Brazilian national parks are "closely linked to different stages of the country's development". Basically, she sustains that the creation of parks "...precedes or coincides [with] the penetration of frontier waves into unsettled territories. The first stage of parks, in 1937-1939, is considered by her to be linked to the "more extensive knowledge" about scenic beauties and to the concentration of Brazilian population in the Southeastern region of the country. Indeed, 58.4% of all Brazilians lived in the South and Southeast in 1940 and the figure remained stable until 1980, at 58.7%. Ever since the mid-19th century coffee plantations commanded the national economy from the Southeast. More important and more contemporary with national parks, Brazil's largest cities and industrial sectors were concentrated in the Southeast.

Tresinari confirms what was stated in Chapter 4. Brazil's first parks were created close to populated, economically dynamic coastal areas. Paulo Afonso, deep in the Northeastern region, was an exception that time would delete. But the local waterfalls were a fairly well known feature of Brazil's important Sao Francisco river and, therefore, they easily qualified as scenic beauty. On

the other hand, though, Tresinari does not deal with the total absence of parks and preserves in the small Northeastern states which were in fact were historically the first areas to be hit the "pioneer" waves of Portuguese colonists. It could be argued that these states were devastated and that no natural areas remained to be preserved. But Rio de Janeiro state was devastated just as much and two of the first three parks were located in it. Therefore, Brazilian national parks skipped, as it were, the Northeast, Brazil's first frontier as a colony and nation.

What Tresinari calls the "second stage" of parks was, in her words, "influenced by the construction of Brasilia", the new national capital on the Central Plateau, on the edge of the vast Brazilian frontier. Chapter 4 mentioned the four parks created between 1959 and 1961 in the state of Goias and in the Federal District itself as a result of government's intention to secure recreation areas for its employees. But Tresinari does not notice that the forces active in the first stage were alive and well in the second one. Eight other parks were created in the same period, three in the South, three in the Southeast and two in the Northeast. As pointed out in Chapter 4, all were coastal or nearly coastal, a few hours away by car from Brazil's largest cities. This continual "coastal bias", not acknowledged by Tresinari, was actually tipping the balance of parks away from the frontier of the Brazilian West, contrary to her basic premise.

Tresinari's "third stage" parks, created between 1971 and 1974, are not argued as having a joint meaning, probably because

they were so different from each other. It is safer to consider them a case of randomness, although not forgetting that one of them - **Serra da Bocaina** - was still another coastal unit plotted midway between the nation's two largest cities, again far away from the frontier.

Tresinari's "fourth stage" is the one created under the inspiration of the 1979 "Conservation Unit System Plan", with which she was involved as an Instituto staff. The encroachment of national society on the core of the frontier regions brought about, as she was writing, four new parks and five new preserves. They resulted from a deliberate policy to protect significant samples of ecosystems. This policy was spelled out not only by the park service but even in a well publicized military government plan called National Integration Plan, mentioned also by Tresinari. This plan proposed 15 grand "development poles" for the Amazon region. Inside each there should be national parks, preserves and forests, besides indigenous territories.[7]

This grand development plan may have been an independent source of inspiration for the 1979 park service plan. This hypothesis need further research. But it is important to stress that the "national integration" plan slowly expired as the 1970's waned. That was exactly when the park service 1979 plan began to be implemented. In other words, the park service policy had its own momentum while the mega-projects of the military dictatorship were reaching their last years of dynamism. This is another point not noticed by Tresinari.

A simple, "logical" explanation of the Brazilian park system is too much to demand from Tresinari. Anyway, this author must add two further criticisms. She does not deal at all with two important and related issues: (1) why did Brazil create parks so late when compared to other Latin American nations? (2) why did Brazil's parks take so long to reach deep frontier regions, when other countries' examples show that this has been a general priority in park policy?

In this author's view, the Brazilian park system was forged by a complex combination of (1) foreign influences (including the idea of national park itself), (2) scenic beauty considerations, (3) scientific research findings, (4) scattered preservation initiatives and (5) a belated park policy (1979). The first four factors shaped a larger number of preservation units but the last factor, combined with more systematic scientific research, shaped much larger preservation areas. The generally ambivalent attitude of Brazilians towards the Amazon region - boasting about it but loathing to go there - has certainly been a diffuse and independent factor for holding the park system away from the region for so long. It is a cultural factor acting on park policy, worthy of specific research.

Management Problems

Angela Tresinari points to four central problems of park and preserve "consolidation": administration (lack of personnel), finances (lack of funding), land acquisition and management

plans.[8] As all these problems were analyzed in Chapter 4, only brief comments remain to be made.

Personnel

The latest information on park and preserve personnel shows a definitely deteriorating situation. Deficits mentioned in Chapter 3 are larger and growing. As of May 1988 28 national parks had only 289 permanent staff. Only 23 of them had university degrees. 15 biological preserves had only 74 permanent staff. This total of 363 employees for the 43 units is grossly insufficient and "50% lower" than the already low level of 1984. Recent decisions by the federal government have restricted or banned temporarily the hiring of new public employees for all branches of government. Even substitutions have been restricted. According to a well informed park service official, rangers and manual laborers are quitting the parks for two main reasons: (1) better salaries in neighboring cities, farms, mines and logging operations and (2) fear of violence, as they have no police authority to confront armed invaders, speculators and poachers.9

Therefore, the Instituto cannot hold on even to its most humble and lowest paid employees, such as rangers and manual laborers. Salary levels in the Brazilian interior are systematically lower than urban salaries, but Instituto park personnel, as government employees, have "urban" salaries, generally considered good even in remote regions. For the poor all over Brazil, working for the federal government and taking care of

a local permanent preservation unit is certainly a good job. Private farms or logging and mining companies may eventually pay much higher salaries, but lay-offs, turnover, itinerancy and harsh working conditions are conspicuous drawbacks.

On the other hand, being a lowly ranger in a semi-abandoned park without clear boundaries or adequate titling is a very dangerous position if poachers, powerful landowners and speculators are present. Rangers lack police authority, permission to carry guns, authority to identify violators and other prerogatives that should be a natural part of their jobs. Confronted with the private power of landowners and speculators, federal government once again fizzles in its public land policies, in this case park and preserve policies. Rangers and other staff are left to act at their own risk or to look the other way.

The situation grows even worse in the case of administrative, technical and professional personnel. Brazilians in general resist leaving their home regions and cities. Middle and upper class are the least mobile. Jobs in remote parks and preserves are simply not attractive to qualified Brazilians in terms of pay, working conditions, prestige and professional advancement. If there are no special incentives for attracting them to parks and preserves, this situation could go on for decades.

Two veteran conservation activists and professionals, writing in 1972, proposed an ideal curriculum of a university degree course to prepare top park personnel (directors, researchers and administrators). They considered programs in forestry, biology and

administration as insufficient. They suggested instruction in park policy and history, natural resources, economic geography, land use in parks and preserves, ecology, wildlife management, pollution, tourism, museology, journalism and planning.[10] If the jobs were attractive in the first place, such a program indeed would be adequate. As it is, though, this author considers that the difficulty of hiring qualified people would actually increase if such a course was to be demanded of prospective candidates.

Almost any professional administrator or natural scientist would tend to consider his resume impoverished by a lengthy stay in a Brazilian park or preserve. A field biologist who takes the chance can very well find himself cluttered with administrative work, litigation, visitation management or even social conflicts. Isolation in remote areas is feared. More than one park director has been known to live in cities hundreds of kilometers away from the parks. Without adequately prepared personnel, of course, a secure park system cannot exist, much less a system that supports research and attracts visitors. Even the toughest field scientists and backpackers need minimal information about trails, weather patterns and other details. Without true administrators and well-trained rangers basic information is hard to obtain.

Finances

No extensive comments will be made about financial shortages of parks and preserves. Research unearthed only sketchy and inconclusive data on park and preserve finances. Interviews with

park service personnel revealed that financial difficulties are not peculiar to preservation units. The Instituto itself has been in budgetary difficulties for some years. Low salaries, for example, have caused a net loss of over a thousand qualified employees since 1986.

News coverage confirms this. In mid-1986, Jayme Santiago, Instituto president, proposed a Department of the Environment comprising the Instituto, the Secretaria and the fisheries authority. He alleged that the three agencies had their "preservation" duties impaired by the "development priorities" of their respective Departments. Months later, Jordan Valladares, Instituto Special Programs director, said the same in other words. He stated that the Instituto had only 30% of the necessary personnel to protect national forests, parks and preserves. He added that the agency had only itself to blame for that because it "was more interested in development than in conservation".

In late 1987 another Instituto president, Antonio Jose Magalhaes, informed the recent loss of 500 out of 3,700 Instituto employees attracted to "private enterprise" by "higher salaries". He stressed that all applications for tax incentives for reforestation were withheld for the time being due to the lack of a single specialized forester to evaluate them. Approving such applications is a basic and revenue-generating Instituto duty. The same Magalhaes illustrated how bad the situation was with park personnel mentioning the example of Tapajos NP. Three of a staff of only six, all of them rangers, had recently quit their jobs and

the agency could not substitute them. In March 1988, the Instituto had less then 3,000 employees, down from 6,000 in 1982.[11]

It is in itself intriguing how the Instituto, which is mandated to make money out of each of the two million trees allegedly cut in Brazil every day, is running so bad in finances. It does not seem to care adequately even for its commercially oriented national forests. But searching for the reasons of the financial distress of the Instituto would conduct this analysis too far away from the main topic. The obvious conclusion is that preservation units will be hurt proportionally more than anything else in an ailing forest development agency such as the Instituto.

Land Acquisition

The last significant amount of park and preserve lands to be acquired by the Instituto were the 12,000 km² bought by Maria Tereza Jorge Padua's administration in 1979-1982. Even so, the Departamento's current policy on this matter is based on the assumption of the preemptive effects of park and preserve decrees. "It is worth creating new units even before consolidating the older ones because the decreed areas are protected from at least some activities which threat their ecology". These are the words of an experienced park service official.

She illustrates the point mentioning the procedure of the Departamento Nacional de Producao Mineral, the powerful prospecting and mining rights authority. It simply denies any permits in areas included in park or preserve decrees. She admits, though, that

land acquisition has progressed only "slowly" in the last years due to lack of funding. But she emphasizes that the 1979 policy decision to create new units in public lands will help solve the problem in the future. Maria Tereza Jorge Padua considers Brazil to have "one of the worst records" in public ownership of park lands in Latin America. But she adds that the problem is "serious" in all Latin American nations.[12] Therefore, everything indicates that land ownership will continue to be a serious problem for the Brazilian park and preserve system, unless a deep policy change happens. Otherwise the problem will linger on for decades, as predicted by the Departamento in the mid-1970's.

Management Plans

Writing in 1983, Tresinari witnessed the loss of momentum of park policy in general and, in particular, of the renewed management procedures codified in the Management Plans. This is why she emphasized the importance of the application of the recently concluded and published plans. Today, of course, these documents need to be updated. Their plain abandonment would be a most costly waste.

New National Parks and National Biological Preserves

There are much need and much room for new preservation and conservation units in Brazil. It is worth developing a simple numerical exercise to illustrate this. The 1974-1979 National Development Plan mentioned in Chapter 3 included a proposal of

610,000 km² of public protected lands in Brazil (7.2% of Brazilian territory). At the same same two experts in Brazilian park issues, Maria Tereza Jorge Padua and Jose Manuel C. Vasconcellos, considered 235,000 km² as a suitable and realistic goal. In 1986 Eleazar Volpato, a high ranking Institute official, suggested 500,000 km² as an "ideal" amount of natural areas to be protected by the federal government. All these figures include national parks, national biological preserves and national forests.

The confirmed area for these three types of units is currently 123,261 km². Adding the area of the mysterious forest preserves the total goes up to 292,131 km2. Ecological stations, although not strictly for preservation, can be included in this exercise. With them the new total is 324,083 km².

This total excludes state parks, state preserves, areas of relevant ecological concern, union protective forests and environmental protection areas, which either are not preservation units proper, or have only small areas or have undetermined areas. It includes some units that partly overlap. So, 300,000 km² seems to be a safe estimate of the current existing area of Brazilian preservation and conservation units, narrowly defined.

This is less than half of what the 1974-1979 development plan proposed but also more than twice the expectation of leading park specialists at the same time. Still, it represents only 3.5% of the Brazilian territory. As of 1986 Brazil was in this respect well behind countries such as Indonesia, Venezuela and Costa Rica, with respectively 16%, 8% and 8% of protected areas. Ibsen de

Gusmao Camara recently ranked the Brazilian percentage of protected lands as just a little above half the international average.[13] By official and park expert estimate alike, therefore, Brazil still owes itself at least 200,000 km² of protected lands, at the least. The consideration of the country's biological diversity would justify much more protected areas. New parks and preserves can and hopefully will help fill this quota. Many units suggested in the 1979 park service plan are still needed and their creation should integrate the agency's strategy for the near future.

As for now the Instituto plans to create at least two national parks in 1988: **Tingua** and **Fernando de Noronha**. **Tingua** NP, in Rio de Janeiro, with a proposed 500 km2, has been designed in the largest of the union protective forests. The area is supposedly an undisturbed remain of Atlantic coastal tropical forests on a **Serra do Mar** East-facing slope. It lies less than 80 km from downtown Rio de Janeiro. In recreational terms it will be another small, mountain slope, forested park plotted close to a major urban concentration. Ecologically it will be a needed replica of other national parks in the state, which consist mainly of forested slopes and mountain tops. **Fernando de Noronha** NP will be plotted around a string of small oceanic islands in the Atlantic. They have become a growing tourist attraction over the last decade. It would be Brazil's second marine park.

In Maria Tereza Jorge Padua's ranking, Brazil's park system presently comes in sixth place in the Latin American context. Her ranking considers quality, quantity and effective management.

Brazil comes after Chile, Costa Rica, Venezuela, Equador and Argentina.[14] As far as quantity goes, Brazil will not attain a better position in this ranking because no other national parks or preserves are scheduled for creation anywhere else in the country. It is clear that the Amazonian and Mid-West priority of the 1979 plan must be revived soon if new units are to be viable and Brazil is to reach a better position in term of international park standards. Therefore, it is more than time for a new aggressive drive in the establishment of new parks and preserves.

Public Visitation, Participation and Interest

The current "Ecological Tourism" program, managed jointly by Embratur (the federal tourism company), the Instituto, the Secretaria and the National Cultural and Historical Heritage Service, besides State Environment Departments, is maybe the beginning of a new stage in public visitation to Brazilian national parks. The motto is corny enough - "Learn about nature to Respect it" - but the program is indeed making national parks more accessible to Brazilians who do not own cars, a vast majority of the population. The program means little more than funneling bus tours to the parks that can receive visitors. The park ranking used in Chapter 4 was specially designed for this program. No special activities or improvements were planned in any park for the purpose of the program, though. The new public will see them in their current and not encouraging situation. Hopefully the campaign will over the years help Brazilian "become aware of

environmental preservation issues" and create a constituency of visitors and admirers of national parks. In their enthusiasm Embratur spokesmen included national biological preserves among the area to be visited, forgetting that they preclude public visitation.

Referring to the campaign, Embratur officials stated that "Brazilian nature is what attracts people to the country", hoping that foreign tourists will join the ranks of the nationals. They could be right about this. The theme of Brazilian nature as a part of its national identity seems to be on the rise in preservation minded groups, but it is still far away from being a widespread rationale for creating and adequately managing national parks and other preservation areas. There is a long tradition of "geographical chauvinism" in many Brazilian essayists, journalists and writers, but is has not come to the aid of the creation of a sound park system. Available sources contain no emphasis at all on the value of Brazil's distinctive natural heritage as an argument for parks and preserves.[15]

Brazilians could be attracted to national parks by participating in their creation. But only one instance of institutionalized citizen participation in the creation of parks was recorded by available sources. In 1977 the Departamento opened its "Priority List for Conservation Units in the Amazon Region" for a period of public comment. That was almost certainly the first time any public agency in Brazil did such a thing. The list was a vital part of the 1979 park service plan. Only 20 comments were

filed. Some of them came from foreign preservation groups. The rest came from Brazilian groups, research institutes or government agencies. All comments were favorable to the list. More recently the Departamento claimed that it receives many petitions and suggestions for creating parks. These requests are studied and the Instituto almost always suggests the creation of a state park, an intriguing procedure not at all clarified.[16]

Maria Tereza Jorge Padua says that only "eventually" have Brazilian parks been created by any type of popular demand. She mentions only three existing parks that had such support: **Caparao, Pantanal Matogrossense** and, more recently, **Fernando de Noronha**. In her evaluation, there has been "more resistance than support" on the local levels for proposed national parks.[17]

This issue of public support is related to the need and the possibilities of creating new protected areas in Brazil. According to Padua there is a gradient in the public acceptability of different conservation and preservation units. National forests are the "easiest" to create because local authorities and populations expect them to generate jobs, investments, profits and regional development, on a sustainable basis. "Less acceptable" are national parks. They do lend a type of "prestige" to host states and **municipios** but the amount of land set aside from development is always seen as a loss to be compensated only by uncertain streams of future visitors and tourists. The "least acceptable" are biological preserves, of course, because they withdraw land from development and attract no visitors. Benefits

like the "preservation of genetic pools" are too indirect and vague to be understood and accepted by locals. Consequently, Padua is tactically favorable to a considerable expansion of national forests, specially in the Amazon region, not precluding new parks and preserves.[18] Teaming national forests with parks and preserves is indeed a good way to expand the area of Brazilian conservation and preservation units up to the reasonable figure of 500,000 km² with less community resistance and more community participation.

The issues of environmental awareness and activism are too broad to be studied in depth here. Brazil is today an urbanizing nation. A widespread "longing for nature" is probably two generations away, at least. Right now most Brazilians are upgrading, developing or just muddling through urban lifestyles in rapidly growing cities. All available data shows that since the early 1980's Brazilian are on the average working more hours and making less money. Leisure time for travelling, camping, hiking and outdoor activities in general will continue to be scarce for many years.

Environmental activism is very much in the initial stages, as any type of citizen participation in Brazil. Some sectors of the environmental movement are extremely dedicated to park and preserve issues, like the frequently mentioned Fundacao Brasileira de Conservacao da Natureza. Other groups are more interested in alternative projects and lifestyles and prefer to remain aloof about public policy issues. Others, still, are more political and

support party and electoral activism through a recently created Green Party.[19] Overall, public support for the park and preserve system is small and has a very low profile.

Political Democracy

The possibilities of effective action by environmental groups is conditioned by the state of political democracy. The three types of environmental groups just referred have at least one common need: stable democratic institutions. A democratic process will allow their consolidation and bring about a clear picture of possible coalitions and inevitable cleavages. Since 1985 Brazilian society has been living through the longest period of political democracy since its industrial modernization started. Anti-democratic trends are still strong in civilian and military circles alike. But even though most Brazilians are not exactly enthused with the current civilian administration, the first in two decades, prospects of a return to outright authoritarian rule are small. If political modernization is ever to catch up with economic modernization, the largest and most important steps are being secured right now.

National parks are only one of many public policy issues that will be put to the test of expanded political participation. A nation of extremely poor people will certainly be more interested in other types of "public goods" to be secured through government policy. Housing, education, health care, public transportation and land reform are the most prominent on the current public policy

agenda. But genuine environmental issues such as sanitation, water and air quality, coastline management and pollution control score very high in public attention, specially in Brazil's crowded and deteriorated cities. In no sense are these secondary issues. But a widespread popular attention towards parks and preserves is still several curves down the road, in this author's view.

A consistent park policy will no doubt have to be demanded by societal groups, by a constituency of nature appreciators. Even in many present-day developed countries this is generally a small and segmented interest group. In Brazil this constituency is made up of (1) a handful of preservation-minded environmental groups, (2) part of the "deep ecology" groups, (3) part of the "Greens", (4) a few hiking, camping and mounting climbing associations, (5) scientific organizations and (6) local communities which have absorbed parks or want to host one. Foreign or international environmental groups can be included in this constituency, as so much attention is currently being given by them to whatever happens to the Brazilian environment.

This is the current societal basis for a park movement in Brazil. It is more potential than real. The enemy is gigantic and multifaceted. Its general name is "economic development", or "national integration". Fabio Feldman, the federal representative who pushed the environmental chapter through the floor of the Constitutional Assembly, includes government itself in the ranks of the enemies of nature conservation in Brazil: "...government is the first to trash protection areas, building roads through

them". In more general terms, the same Feldman says: "Environmental issues are more widespread in [Brazilian] society as a whole than in government...government authorities are downright ignorant about environmental issues". Although Feldman is correct, he is the first to acknowledge that government projects for economic development have widespread popular support.

As seen, even high ranking Instituto personnel mention publicly and in critical terms the agency's emphasis on forest development as a drawback for its preservation policies. Augusto Ruschi, the naturalist who carved out preserves in Espirito Santo fighting almost alone against loggers, pulp-mills, local politicians and Instituto forest policies, considered "inconceivable that forest economics and forest preservation be handled by the same agency".

One recent incident suffices to show how undependable Brazilian authorities can be when the issue is national parks. After months of constant pressure, Instituto president Jayme Santiago tried to put an end to Parana state governor Jose Richa's insistent requests for a permit to build a road through Iguacu NP. Santiago mentioned the "exhaustive" technical and legal work done by the Instituto when it denied prior requests. Santiago finally stated that there were "no reasons" to grant the permit.[20]

Recall that Iguacu NP is the most consolidated in the whole system. The mere insistence of such requests is a bad enough comment on the Instituto's weak stand in park policy. The Instituto's willingness to accept repeated requests and study them

thoroughly is even worse. Therefore, Brazilian nature appreciators and the incipient coalition of park defenders are on the safe side considering government as a whole as another name of their main enemy, at least for the time being.

It could be argued, however, that the Brazilian park and preserve system experienced its greatest expansion during the years of military dictatorship. This would contradict the need of political democracy that is being argued here. Indeed, the correlation between dates of park and preserve creation and recent military dictatorships seems to support the argument. But the truth is different. The first two general-presidents did not create a single national park between 1964 and 1969 and actually extinguished one. The third general-president created only three parks between 1969 and 1974. The fourth created none between 1974 and 1979. Only the fifth and last in the dynasty of four-star presidents can be credited with the creation of many parks and preserves between 1979 and 1985. But he tainted his record by extinguishing one and by allowing a road to cross another. Besides, his was the most feeble of the military governments.

Maria Tereza Jorge Padua admits that in Brazil and in other countries under military rule she has noticed that military officers have a professional bias towards parks and preserves. They tend to see conservation and preservation units as "strategic instruments" aiding in "territorial integrity". They are therefore prone to nod favorably to their establishment, specially in international borders. Padua mentions as examples, besides Brazil,

Chile, Argentina, Peru and Zaire. Al expanded their park areas considerably under military dictatorships. But she also emphasizes how Brazilian military dictators extinguished two national parks and created none between 1974 and 1979 (when the ruling general was oblivious to the issue).[21]

The military mind's sympathy towards preserves and parks as instruments of territorial consolidation is in this author's opinion - and Padua's - a poor argument for military rule. This sympathy does not necessarily contain ecological or preservationist feelings. The same border "defended" today by a park can later be better defended by settlement and development. Besides, most of the environmental movement would not support new military dictatorships, because the movement was in part originated to resist the military governments that ended in 1985. Actually, institutional disorder and disbandment of the organized citizenry are the more relevant considerations for evaluating policy prospects of any issue in military dictatorships, park policies being indistinct in this particular.

The conclusion is that continuing political democracy is still the best bet for consistent environmental policies. The young and small coalition of Brazilian environmentalists, scientists, nature appreciators, political activists and ordinary citizens who will comprise a social movement in favor of national parks will be better off in the vagaries of the democratic process than in the grim and ultimately false certainty of authoritarianism. The "economic growth coalition" has already shown its ability to thrive

under authoritarianism. It knows how to extract incentives, subsidies, exemptions and favors from irresponsible government officials. Last, but not least, it should be reminded that the physical expansion of parks in Brazil was parallel to their deterioration as public goods. In other words, park management standards plummeted in the last 20 years, even though the park system's area was in expansion.

Policy Proposals

The following proposals have been hinted or mentioned throughout the text. They are not necessarily original formulations of the author, who agrees with and supports all of them, though.

A central authority for protected lands should be established. The Instituto's preservation duties should be absorbed by the Secretaria. Departamento and park and preserve personnel would be transferred to the Secretaria. The Secretaria today has extensive preservation duties and is located in a slightly less development oriented Department. The Instituto can remain as a forest development agency and should strive for efficiency in this field. With existing and new national forests the Instituto would have its hands more than full. It might even create wilderness or roadless areas in national forests, two types of units still non-existent in Brazil.

Legislative creation of national parks and preserves should be required. Future parks and preserves should be created through

Congress, with adequate budget appropriations for personnel, land acquisition, equipment and installations. This would require a legal reform probably not very complicated. The loss of agility in the creation of parks by decree would be compensated by dependable funding and by political support. Other types of units, such as areas of relevant ecological concern, could still be created swiftly by decree and be used as instruments for temporarily preempting development or occupation of selected areas.

Personnel qualification should be enhanced. Qualified, university-degree administrators and researchers should be attracted to parks and preserves with incentives such as flexible tenures, research grants, research teams and adequate infra-structure. Administrative clerks and rangers should be recruited locally or regionally. All park personnel should have police authority inside park limits.

A consistent research policy should be devised. As ecological stations, national parks and specially biological preserves should try to link up with Brazilian and foreign institutions which support scientific research. The park service would not have to plan or execute research itself, but only allocate grants and furnish infra-structure for selected individual or institutional researchers. Allocation can be decided by a team of experts and environmental group representatives funded by the same sources.

Management Plans should be immediately updated and applied as funding and personnel allow. New parks and preserves should have plans drafted for them, using the existing plans as models.

Public visitation should be stimulated. A few less remote parks could be improved with relatively inexpensive additions such as hiking trails, camping grounds, collective lodges and food facilities. This would attract campers and hikers willing to go beyond day-trip experiences.

The park agency should try an aggressive drive to attract private investments or donations that allow tax breaks for private citizens or companies. Although parks and preserves must remain public, designated activities (educational, scientific, publications) and installations (labs, buildings, nature trails, museums) can be supported or donated by a pool of private benefactors. Legislation allowing for this already exists. Private funds can be funneled also through private foundations which receive tax-exempt donations for purposes of preservation, such as has happened through the Fundacao Brasileira de Conservacao da Natureza and the Fundacao Pro-Natureza.

New conservation and preservation units must be created. The third stage of the "Conservation Unit System Plan" should be redrafted and publicized, including comprehensive goals for creating parks in the next decade.

Finally, and most important, a new drive for acquisition of park and preserve lands must be started immediately. This the system's most urgent priority. Public funding will be needed for that but probably it will continue to be difficult to obtain necessary funds from the public treasury. Again a pool of private benefactors could build a fund large enough for significant

acquisitions over a relatively short period of time. But no further land should be acquired until at least a substantial part of Instituto-owned park and preserve land is finally registered in the government property office.

VOLUME II

PART II

National Parks in the State of Rio de Janeiro

CHAPTER 6

Paradise Lost, Found and Depleted: Human Occupation and the Natural Characteristics of the State of Rio de Janeiro

> Those who saw the Paraiba do Sul Valley in those times, proudly displaying the ocean of its coffee plantations, today see the desolation of its naked lands, the decline of its cities, the depreciation of its properties, the skeletons of its barns, the farm houses resembling bone yards, and they feel a great sadness in their hearts.
>
> Nilo Pecanha, 1904 [1]

Vision of Paradise: Native Americans in Brazil

The particular corner of the Earth which today is the seat of the ephemeral political entity called Rio de Janeiro state remained relatively undisturbed by Homo sapiens until late in the recorded history of humanity. This chapter will summarize the cumulative effects of human activities on the environment of the area. This will provide a background and a local context for the later chapters dealing with the four national parks located in the state of Rio de Janeiro.

Native Americans are believed to have arrived to current Brazilian territory many human generations after the original

populating waves crossed the Bering Straight into the territory of North America. Recent research, though, has discovered evidence that opposes the traditional theory of human population of the American continent. Some human dwellings and implements in the Brazilian Northeast have been dated back to 32,000 years ago. Based on this and other evidence, an independent source of population for some parts of the South and Central American sub-continents is currently being argued: Pacific Islanders who managed to reach their West coasts.

Even though, the difference between the extreme estimates of the presence of Homo sapiens in current Brazilian territory is not drastically large: from 6,000 years to 32,000 years ago. Still, the occupation of the Southern Brazilian coastline, where Rio de Janeiro state is located, would be more recent than any date settled upon for Northern regions, because penetration routes in both theories are supposed to have been Northern or tropical, originated from the Pacific Ocean or its coastline.

The impacts of Native Americans on the environment were a consequence of their numbers and technologies. Population estimates of Native Americans living in Brazil at the time of Europeans arrivals have varied considerably, with an upward trend. Early explorers were impressed by the Natives' numbers, knowledge of the territory, vigor and health. But their estimates of total Native population are today considered wild guesses based on strictly local observations. No centralized political organizations brought together even the Native groups with

linguistic and religious affinities. No centralized empire existed to yield a dependable head count of tribute-paying subjects.

All Natives in Brazilian territory lived in a primitive community mode. Village sizes varied from a few hundred to a few thousand individuals. Besides, many groups were nomadic or semi-nomadic. Portuguese estimates suffered also from a coastal bias. Current estimates of the total indigenous population in Brazilian territory in 1500 vary from 2 to 5 million. The upward tendency of estimates proceeds. Roger Stone mentions recent archeological research that pushed estimates of the Native population in the Amazon region alone to 3.6 million, or even 4.8 million.[2]

Warren Dean recently calculated with extreme care the possible human carrying capacity of a substantial part of current Rio de Janeiro state and a small part of current Sao Paulo state territories in the years immediately before and after 1500. He notes that the more recent **Tupinamba** peoples were more independent on agriculture and thus were more likely to have denser populations than the hunter-gatherers driven out of the area by them. His minimum and maximum density estimates are 4.8 and 5.3 inhabitants per km^2. Considering only coastal ranges, these densities translate into a population of 57,000 to 63,000 **Tupinamba**. His estimates do not include other populations, possibly as large, living in the rest of the Rio de Janeiro area. If his optimum population density estimate can be extended to neighboring areas, the total population could reach the impressive figure of 150,000, including the **Goiana** to the South and the **Goitaca** to the North.[3]

The Tupinamba, as many other Native groups, practiced "swidden" or "slash and burn" agriculture. They burned sections of the local forests, cleaned them, used them for agriculture during a few years and abandoned them for new plots. Although productive, this itinerant agriculture required a rather large amount of forest reserves for each village. Enough "burnable" second growth had to establish itself to make old plots useful again. If forest humus had not been depleted, three or four decades were probably enough for substantial second growth. Burning vegetation, original or not, was crucial for adding nutrients to the soil, adding to its initial fertility. As they were seemingly becoming more and more dependent on agriculture, Native Americans in the Rio de Janeiro area lived in part off the "climax forest's complex biotic stockpile", to use Dean's words.

The Native population was, therefore, large enough to impact the local environment and ancient enough for their agriculture to have affected any "pristine" ecological balance existing prior to their presence. Nonetheless, Tupinamba, Goiana and Goitaca were, in this author's view, far from being a disruptive factor to the local ecology. Their agriculture was still incipient. Their population was moderate and dispersed in villages with an average of less than 1,000 individuals. European diseases and enslavement subtracted many Natives from the ranks of consumers of local resources. Large stretches of territory, even on the more populated coastline, were disputed and not used systematically by rival groups.

The Natives' rich diet included renewable resources such as fish, shellfish, mammals, birds and reptiles, not to mentions ants. They gathered nuts, fruit and honey. Itinerant agriculture, the coivara, required only 20 km² per village to help support the estimated population with beans, maize, mandioc, yams, peanuts, pumpkins, pineapples and potatoes. Second growth areas, easier to clear again, were almost certainly preferred for new crops, reducing the destruction of original forests. The Natives knew no metal instruments and therefore could not control weeds on their plots. Second growth established itself faster on plots abandoned only after a few years of use.

There are still more qualifications to Natives' impacts on the local environment. Natives and their agriculture were concentrated on the Coastal Plain. Extensive mountainous areas were used only for sporadic hunting and gathering. There is no record of any resource being extracted or produced on a large scale for barter or commerce. Just as important, Native Americans in Brazil were mythical in their beliefs and relationship with the elements of the landscape. There were many cultural constraints on the use of natural resources, similar to the ones described by Frederick Turner for the Natives in Central and North America.[4] In summary, European sailors and colonizers did not find an untouched landscape in the Rio de Janeiro area. Nonetheless, to European eyes the Natives' impacts were subsumed in a rich and awesome tropical landscape.

Dean's conclusions about the environmental impacts of Native

populations in the Rio de Janeiro area are quite different than this author's. He argues that a peak hypothetical density of 9 inhabitants per km² over a period of five centuries might have caused the total clearing of coastal forests once every 110 years, not allowing for climax community restoration. In another text, though, about Sao Paulo's different and more extensive forests and fields, Dean calculates that only "5%" of the original landscape were transformed over five centuries by the swidden agriculture of numerous Natives before European arrivals.[5] In this author's view, Natives concentrated their impacts on the Coastal Plain, less than a third of the Rio de Janeiro area. Furthermore, a great part of these impacts was on renewable resources.

When the European sailors reached the Brazilian coast, in the year 1500, the sights, smells, tastes and sounds engendered in them the "visions of Paradise" they were seeking, to use the expression of a keen Brazilian Historian. They were impressed by the "pristine" condition of the landscape and all but ignored alterations caused by the Natives. From the Amazon delta to the Southern coast, Portuguese, Spanish, French, Italian, German and Dutch sailors and explorers were struck by the "paradise" of this lavish but "lost" land. They considered to be entering a biblical wilderness to be "conquered and subdued", in the name of civilization. Portuguese colonizers, merchants, farmers, military and priests proceeded to secure the land, search for riches and convert the heathen to Catholicism.[6]

Portuguese Colonization

The tiny country of Portugal colonized almost the entire Eastern board of South America. From this colonial enterprise Brazil emerged as a modern nation. Not only did Portugal secure the Eastern board but it expanded to the West, with a keen geo-political perception of the Spaniards' lack of interest in the heart of the South American mainland. Many reasons explain Portugal's success. For one thing, Portugal was on the cutting edge of sailing and exploring technology, as shown by Alfred Cosby in his instigating digression on the subject. Portuguese sailors accumulated vast experience in sailing the South Atlantic, around Africa, into the Indian Ocean and all the way to India, China and Japan. They developed a taste for the profits and adventures of long distance commerce. So strong was their attachment to marine exploration and commerce that Portuguese colonization was mainly coastal in Brazil for almost two centuries. From the coast highly valued commodities such as brazil-wood, peppers and mainly sugar were taken to be sold in Europe.

Another explanation for Portugal's colonial success was its religious content. Portugal and Spain remained bulwarks of traditional Catholicism amid the crisis of Reformation. The Roman Catholic church therefore gave its blessing and support to the overseas explorations of the two dependable Catholic nations. The Pope himself sanctioned the 1494 Tordesisles treaty by which Portugal and Spain divided among themselves all new lands to be found. Although futile in the long run, the treaty stimulated

Portuguese and Spanish exploration and kept mutual rivalries under control. The Portuguese were particularly strict about the presence of non-Catholics in their colonies. This became a permanent check on the size of the European population in Brazil and forced Portuguese colonists to mingle with Natives and with Black slaves. This formed a sizeable population of mestizos which engendered combinations of European, Native and Black cultures, including their ways of viewing nature.

The religious factor in Portuguese colonization is present in their urge to convert the numerous heathen. Portuguese Catholic authorities considered Natives Americans as an ideal compensation for the heavy losses in the ranks of European Catholicism due to the Reformation. The urge to convert in fact originated some Portuguese settlements, influencing the human geography of the colonization effort. This helped Native and Portuguese land use patterns to mingle and Portuguese adoption of swidden agriculture is a clear proof of this.

In summary, the Portuguese simply could not leave the Natives to their own ways. Mingling, preaching and conflicts with the large Native coastal population contributed to hold Portuguese colonization to Brazil's Atlantic seaboard. Catholic priests, specially Jesuits, were sometimes the first to put foot ashore in areas of lesser commercial or military interest but well populated with Natives who supposedly longed to hear the word of the Lord.[7] Those who did not hear the word of course received the sword.

Geo-politics and commercial opportunity also determined many

settlements, trading posts, ports and garrisons, of course. The Portuguese tried to secure the rather slender slice of South American territory that fell to them according to the 1494 treaty with regular sailing expeditions. Even though, in the early decades of the 1500's the Portuguese were more interested in their dealings with India and the Far East. This contributed to dilute Portuguese colonial efforts along Brazil's vast coastline and to hold them away from the interior.

The Portuguese made their first attempts at stable settlement in the Northeastern tip of Brazil, about 2,000 km North from the future site of the state of Rio de Janeiro. The coastal area between the cities of Salvador and Recife was closer to Europe and to Africa, simplifying commerce of colonial goods and Black slaves. The area had a continuous stretch of fertile soils close to the coast, propitious for sugar-cane plantations with which the Portuguese had experience. Sugar was a highly valued commodity in Europe.

By the mid-16th century Portuguese colonists established in the Brazilian Northeast the first permanent, large-scale and highly lucrative European enterprises on the American continent: vast sugar- cane plantations and mills. The rest of the colony remained less dynamic. Meanwhile, the Spaniards were making fortune with gold and silver mines and other European nations were still involved in internal strife or religious wars. The Portuguese were the first European to set foot on the American continent on a stable basis.[8] Therefore, the Portuguese started exploiting

Brazilian natural resources with large-scale commercial agriculture very soon in the 16th century.

Sugar cane plantations in Northeast were as ecologically destructive as they were lucrative. Their devastating environmental impacts were superbly expounded by Brazilian Sociologist Gilberto Freyre in Nordeste, a pioneering environmental history published in 1936. These plantations were also a matrix of Brazilian social structure. Basic Brazilian social traits were engendered in them: large land holdings, export monoculture, the extended patriarchal family, absence of smallholders, staunch if not devout Catholicism, Black slavery pervading field and home, displacement of free Natives to frontier areas and sexual intermingling between Portuguese, Blacks and Natives. Each of these traits had effects on environmental resource use.

Sugar-cane plantations, for example, were an "intensification" of Native swidden farming, as Warren Dean keenly puts it. Forests were burned, cleared and the soil was exploited until exhaustion because iron hoes could control weeds. Forest humus was thus depleted in many areas and successional processes retarded or totally frustrated.[9]

Brazilian Historian Sergio Buarque de Holanda, less enthusiastic than Freyre about the "agricultural civilization" of the Portuguese in Brazil, published in 1936 a classic text in which he keenly classified sugar-cane plantations as more akin to "mining" than to agriculture. Holanda noted that truly agricultural peoples have a class of land tenderers who struggle

to protect the soil from depletion, something that the Portuguese did not do at all in Brazil. The intense use of gang labor of Black slaves, the lack of smallholders and the availability of virgin land all conspired against the conservative use of the land. Shortage of workers made the adoption of itinerant agriculture "rational" for Portuguese colonists. Burning forests was an "economic" way of clearing the land and controlling weeds in conditions of scarce labor. However, the simple use of the plow, very rare anywhere in Brazil until late in the 19th century, could probably have enhanced labor productivity to a great degree.[10]

Whatever their disagreements, Freyre and Holanda both acknowledge the environmental impacts of sugar-cane plantations and their importance for the permanent occupation of Brazil by the Portuguese and the Blacks. The availability of virgin lands and the wastefulness of Black slavery gang labor ultimately led to extensive deforestation and eventual desertification of many sections of land in the Northeast. Significantly, not a single national park or biological preserve exists today in the Northeastern coastal region, for absolute lack of natural areas, preserved or naturally restored. The Rio de Janeiro area, as will be shown below, also had its own extensive sugar-cane plantations since early colonial days.

European Colonial Enterprise in the Rio de Janeiro Area

During the first 50 years of colonial exploration the entire Brazilian Southeast had a tertiary status for the Portuguese. A

few trading posts were established in the area to support passing vessels, such as in Cabo Frio (1502) and possibly Guanabara bay (1503). A new settlement was founded in Guanabara bay in 1511. These settlements stimulated the exploration of two local resources with good commercial value: native peppers and brazil-wood. Natives gathered these natural products and bartered them with Portuguese or French explorers.

Brazil-wood (Caesalpina echinata) was indigenous to Atlantic coastal forests and was valued for yielding a dependable red dye. Natives called it ibirapitanga. It is curious to note how the name Brazil prevailed over two official religious denominations of the colony: Island of the Holy Cross and Land of the Holy Cross. As Jose Augusto Padua puts it, the erasure of such "sacred" names was a triumph of the European mercantile view over its religious view.[11] It would indeed be naive to consider the prevailing name as a sign of "environmental" concerns of any kind. Brazil-wood was intensively exploited and became a very rare tree in the wild, even today in the few undisturbed remains of the coastal forests.

Geo-politics or colonial competition put the Rio de Janeiro area on the Portuguese maps with greater emphasis. In 1555 a French expedition invaded the safe port of Guanabara bay to establish an "Antarctic France", a projected haven for French Huguenots. No sizeable Portuguese settlement was there to resist the French. The inquisitional Portuguese catholic Church and Crown considered the occupation of the area by French Protestants simply intolerable.

A first Portuguese expedition disbanded the French settlement in 1560 but surviving French gathered again on an island inside Guanabara bay. Many **Tupinamba** Natives supported them. In 1565 a second Portuguese expedition arrived to destroy the remaining French settlement. At the time, the nearest Portuguese settlements lay 120 km to the North (Cabo Frio) and 130 km to the South (Angra dos Reis), both small trading posts.[12]

Two years of bloody fighting were necessary to defeat the well entrenched French and their **Tupinamba** allies. Some **Tupinamba** villages sided with the Portuguese. Winners and losers, the **Tupinamba** were thus involved in European rivalries and paid a heavy toll in lives, health, cultural integrity and land use rights. In 1575, the **Goitaca** around the Cabo Frio region, who also sympathized with the French, were exterminated or driven inland. By 1580, therefore, the Coastal Plain from Guanabara bay to Cabo Frio was void of hostile or independent Natives. They had been killed in war or by diseases, enslaved or led into non-tribal life in <u>aldeias</u> (villages controlled by Catholic priests).[13]

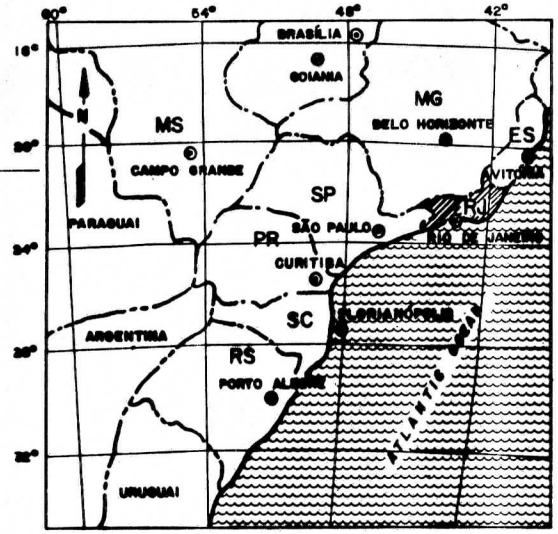
Alarmed by the French invasion, Portugal stimulated the occupation of the Rio de Janeiro area, although not relinquishing emphasis on Northeastern sugar-cane plantations. <u>Sesmarias</u> were leased around Guanabara bay as early as 1567, the year the French were finally disbanded. At this moment, the city of Rio de Janeiro, founded in 1565, had no more than 140 European inhabitants, much smaller than local Native villages, which averaged around 600.

Rio de Janeiro was now a port, a city and a region in the European sense, borne out of inter-European colonial and religious rivalries. Native American "geography" was deleted along with the Natives themselves. By 1570 a substantial portion of the coast of future Rio de Janeiro state was under Portuguese control. It was not a populous settlement but it proved to be a beachhead strong enough to guarantee future colonial expansion. European geography superceded Native geography. The validity of mythical descriptions of the landscape was totally lost on the Bible bearing Portuguese, such as with European colonists everywhere. Portuguese colonization in Brazil was another important chapter in the European effort to go "beyond geography".[14]

The Natural Geography of Rio de Janeiro

The natural geography of the Rio de Janeiro area is relevant to the study of its environmental history and to the understanding of its national parks, created in the 20th century. For the purpose of this analysis, the Rio de Janeiro area is a region between the Paraiba do Sul river to the West and the Atlantic coastline to the East, limited by latitudes 21° and 23° South and by longitudes 41° and 45° West. It lies on the Southern edge of the tropical zone. It is a rectangle about 400 km long and 120 km wide, with an area of approximately 48,000 km², set in a predominantly East-West direction (see Figure II). This area is roughly equivalent to the territory of the Province and later State of Rio de Janeiro, entities which emerged only in the 19th

NATIONAL PARKS LOCATED IN THE STATE OF RIO DE JANEIRO



MAPA CHAVE

NATIONAL PARKS

1 TIJUCA N.P.
2 SERRA DOS ORGÃOS N.P.
3 ITATIAIA N.P.
4 SERRA DA BOCAINA N.P.

STATE OF ESPÍRITO SANTO
ES

21°

CAMPOS

Paraíba do Sul River

STATE OF
MINAS GERAIS
MG

3

RESENDE

TERESÓPOLIS

PETRÓPOLIS

2

MAGÉ

MACAÉ

SERRA DO MAR

STATE OF
SÃO PAULO
SP

4

5

ANGRA DOS
REIS

1

RIO JANEIRO

CABO FRIO

ATLANTIC OCEAN

TROPIC OF CAPRICORN

PARATI

Figure X

century.

The local climate is a combination of tropical location, proximity to the Atlantic ocean, a Northward bound cold ocean current, intense solar radiation, relatively high and abrupt mountain ranges and tropical atmospheric currents. Technically, the Rio de Janeiro area has four different climates: hot, sub-hot, moderate mesothermal and medium mesothermal, according to altitudes. Altitudes vary from 0 to 2,787 m above sea level. Itatiaiacu, the state's summit, lies within Itatiaia National Park. For Brazilian standards the Rio de Janeiro area has a highly convoluted morphology, with extensive mountain and hill ranges. Rainfall varies from humid to super-humid, between 1.5 m to 4,0 m annually, with positive hydraulic balances. The extreme Southern coast of Rio de Janeiro has in fact the highest recorded average rainfall in the country.

Rio de Janeiro's geology shares with the generally ancient condition of Brazilian geology in general. Medium and late Pre-Cambrian rocks are the predominant feature, in metamorphic, migmatite, gneiss, charnoquit and granite forms. There are also magmatic-alkaline rocks from the Tertiary Cretacean. The Coastal Plain is constituted mostly by Quaternary coastal and fluvial deposits.

Sixty million years ago, seismic activity derived from the formation of the Andes caused the collapse of immense sections of the **Serra do Mar** into the Atlantic ocean. More to the interior, the same forces opened a breach between the **Serra do Mar** and the

Serra da Mantiqueira, eventually forming the Paraiba do Sul river valley. Therefore, this seismic event was responsible for giving the Rio de Janeiro area the basic forms by which it became known to humans.

Three basic "topographical provinces" are discernable: the Coastal Plain, the **Serra do Mar** mountain range and the Paraiba do Sul river valley. The Coastal Plain is a mostly flat area between the ocean shore and the **Serra do Mar** foothills, formed by Quaternary coastal and fluvial deposits. In the Southern coast the plain is very narrow and frequently deleted by the mountains' Eastern intrusion all the way to the shoreline. The most common landscape of the Southern coast are granite and gneiss outcrop cliffs stranded between narrow, arc-shaped beaches, which in their turn are squeezed against nearby foothills.

The plain widens considerably behind Sepetiba and Guanabara bays, reaching an average of 50 km in width. To the North it proceeds with an average of 30 km in width. From Sepetiba bay to Macae the plain was shaped by fluvial deposits from the Paraiba do Sul river. There are many coastal lagoons, sand bars, sand beaches. Inside Guanabara and Sepetiba bays, extensive mangroves were an important feature of the landscape. Near the mouth of the Paraiba do Sul river the Coastal Plain fuses with the river's lowland deposits and with extensive fresh water lagoon deposits. The fusion is called Baixada Campista and the plains penetrate 60 or more km into the interior. Several isolated hills and mountain ranges exist in the Coastal Plain area, specially around Guanabara

and Sepetiba bays.

The **Serra do Mar** ("Ocean Range") is the continuation of a massive coastal mountain range. It starts in the Eastern edge of the state of Santa Catarina and proceeds North through the states of Parana, Sao Paulo and Rio de Janeiro, where it dies off. In the Rio de Janeiro area it forms an "impressive" mountainous barrier" parallel to the coast and always visible from the Coastal Plain. Its Eastern face resulted from the collapse occurred 60 million years ago. The average altitude of the main ridge in the Rio de Janeiro area is around 1,000 m, with impressive peaks like Pedra do Sino (2,263 m) and Caledonia (2,284 m). As the ridge proceeds North of latitude 22°, in again approaches the coast, but average altitudes fall sharply and mountains spread out, until the ridge is definitely severed by the lower Paraiba do Sul valley.

The Paraiba do Sul Valley is a thin string of mountain squeezed between the Western slope of the **Serra do Mar** and the Eastern slope of the Serra da Mantiqueira. The Paraiba do Sul river is the mightiest to empty into the Atlantic Ocean in Southern Brazilian territory. Born outside the area, in present day Sao Paulo state, the Paraiba do Sul reaches Rio de Janeiro as a large river. It receives many short tributaries from valleys on both sides.[15]

Early descriptions and evidence produced by studies in biology, climate and geology allow specialists to estimate that the present territory of Rio de Janeiro state was once covered from 95 to 97% with tropical rain forests. These forests were part of a

much larger floral formation broadly called "Atlantic Coastal Tropical and Sub-Tropical Rain Forest", which once ran continuously from the state of Rio Grande do Sul to the state of Rio Grande do Norte, about 3,300 km, from latitudes 29° to 6°. This grand coastal forest had varying widths and different floral communities, according to latitudes and altitudes. Even its meager remains, estimated today as only 5% of the original formation, contain striking contrasts and local endemisms. This immense floral formation owed nothing to Amazonian rain forests in terms of biological diversity. It hosted a grand number of species of trees, shrubs, lianas, epiphytes, grasses and other vegetation forms and a wide variety of fauna, with numerous confirmed and suspected endemisms.

In the Rio de Janeiro area these forests covered most of the three "topographical provinces" described above. The remaining 3 to 5%, on the Coastal Plain, were covered with mangroves or with a formation called restinga, a coastal scrub associated with lagoons, dunes, sand bars and beaches.[16] In the extensive "tropical paradise" uncovered to European eyes in the early 16th century, the Rio de Janeiro area was certainly among the most awesome landscapes. Towering forests with compact canopies covered the coastal plains and the clearly visible mountain slopes. Forests sometimes came very close to the beautiful coastal lagoons and clear water beaches, the privileged point of view of early sailors and chroniclers. It was indeed a "vision of paradise".

Portuguese occupation of the Rio de Janeiro area was limited

until 1565 to a few small coastal settlements or trade posts, such as Cabo Frio, Rio de Janeiro and Angra dos Reis. In 1565 a new settlement called Rio de Janeiro was established inside Guanabara bay, the best port in the area. By 1585 the village of Rio de Janeiro still had less than 800 European inhabitants, being only slightly larger than the average Native American villages that preexisted in the area.

Right after the French were pushed out the Portuguese crown leased several sesmarias in the Guanabara bay area. In 1627, Portuguese colonists known as the "Seven Captains" leased huge sesmarias between Guanabara bay and Macae, introducing sugar-cane plantations and cattle. In the beginning of the 17th century, therefore, there already were some large plantations in this section, known as Campos dos Goitacazes. In 1650 a traveller counted 40 sugar mills in the area. Deforestation for cropland, grazing areas and fuel drastically altered the Coastal Plain landscape in many of its sections. For many decades these sugar-cane plantations were the most important economic activity in the area. The ports of Rio de Janeiro, Angra dos Reis and Parati offered the only other dynamic settlements in the area.[17]

The Serra do Mar range would lay for 200 years as a steep frontier cut only by a few trails leading to the interior. The Paraiba do Sul Valley remained almost totally unsettled by Europeans for 250 years, with the exception of its delta. Therefore, the overall coastal pattern of Portuguese colonization in Brazil prevailed in the Rio de Janeiro area almost until 1800.[18]

The mountain range and the river valley remained a lavish local frontier for the small Portuguese, Black and Native population centers established on the more inviting Coastal Plain. As a textbook cliche puts it, the Portuguese stuck to Brazil's coast "like crabs scratching the sandy beaches". The first 250 years of Portuguese colonization in Rio de Janeiro illustrates this.

Sugar-Cane Plantations and Mining Routes in the Rio de Janeiro Area

Besides selective logging for brazil-wood, fuel and housing, pepper extraction and cattle raising, the ecology of the Rio de Janeiro area was radically altered by three distinct European economic enterprises. First came the sugar-cane plantations in the Campos dos Goitacazes regions, the North. Then came mining supply routes between port areas and inland mining regions. Third came coffee plantations. These three enterprises were largely responsible for the patterns of resource use and population distribution that would ultimately condition the selection of national park areas in the 20th century.

The first Portuguese and French settlers in the Rio de Janeiro areas depended on the Natives for their food supply. They would have starved if not for the food cultivated, hunted or gathered by the Natives. Portuguese colonists immediately adopted Native staples in their subsistence crops, such as mandioc, corn and beans. In fact, Portuguese diets did not differ very much from the Natives', much to the disgust of many a European traveller.

The high value of sugar in Europe naturally led colonists to

concentrate their agricultural efforts on sugar-cane. Another motivation was the mistaken belief that consuming sugar could prevent or cure scurvy, a common ailment in sailors. Sugar-cane plantations required full clearing of the forests and other floral covers. Sugar mills required timber for fuel. Scattered plots of sugar-cane appeared in all coastline settlements, although Campos dos Goitacazes concentrated the largest and most durable ones. Its flat terrains, high humidity and temperatures and rich alluvional soils were propitious for this introduced plant. Until today sugar-cane plantations are the main economic pursuit of the area.

In 1705, for example, a solid 20% of all sugar exported from Brazil was produced in the Rio de Janeiro area. As in the Northeast, plantations were associated with cattle raising, because the animals furnished much of the energy necessary to prepare land and to process cane. Donkeys, mules and horses were needed for transportation. So, considerable areas were needed for grazing. Like croplands, most grazing areas were cleared from their original forest condition.[19] Very few natural pastures existed in the original landscape of Rio de Janeiro.

Sugar-cane plantations had, therefore, three direct effects on original floral communities and associated landscapes: (1) clear-cutting for monoculture of an introduced species, (2) clear-cutting for timber and new crop lands and (3) clearing pastures for domestic animals. Extensive draining of wetlands had other indirect effects on flora and fauna.[20] Although forest humus was eventually depleted in plantations and pastures, flat terrains

precluded massive soil erosion. Periodical flooding maintained the fertility of large sections at a satisfactory level. Sugar-cane plantations have thus gone through almost four centuries in the Campos dos Goitacazes region.

In the late 17th century Portuguese explorers found gold and precious stones in a vast perimeter of the colony's backlands. The area was accordingly called Minas Gerais, literally "General Mines". Although located more than 200 km West of the Paraiba do Sul river, Western limit of the Rio de Janeiro area, the mining district affected the patterns of human occupation in coastal Rio de Janeiro. For one thing, throughout the 18th century the coastal ports of Rio de Janeiro, mainly Parati, Angra dos Reis and Rio de Janeiro city itself, benefitted from an intense traffic of gold, precious stones, mining equipment, animals, supplies, Black slaves, miners, merchants and government officials.

Salvador and Recife, the important sugar ports of the Northeast, started loosing their edge in colonial affairs with the gold rush more to the South. Rio de Janeiro city was closer to the mining district and had a good port. By 1763 it was important enough to be elevated to colonial capital, substituting Salvador. Rio was by then still smaller than Salvador, but it was growing fast and became Brazil's largest city around 1800. Angra dos Reis and Parati had their days of glory in the mining period, but Rio's better geographical position and port would eventually drive them out of the port business in the 19th century. Therefore, mining in Minas Gerais had the effect of establishing Rio de Janeiro and

other coastal cities as major ports.

The Serra do Mar and the Paraiba do Sul Valley were affected also. They were finally transversed, although not occupied or settled, by a number of trails leading towards the mining areas. "Donkey trains", sometimes with more than a hundred animals each, were the only means of transportation between the coast and the mines. A few stopover areas and trail junctions developed into small permanent settlements. Blacksmith services, grazing areas and small emporiums provided logistical support for the "donkey trains" on their long and harsh trips. Trails were from 400 to 500 km long and daily progress was rarely more than 20 km. Grazing areas required by donkeys, mules and horses were human made. Small subsistence crops supported the stopover areas' populations. Some of the most important cities on the Serra do Mar ridge and in the Paraiba do Sul Valley originated in these small settlements. The "donkey train" trails also laid out the basic design of the modern roads that connect Rio de Janeiro's coastal areas to the interior of the state and the country.

Another way in which the mining surge affected the Rio de Janeiro area was the draining of Black slaves away from sugar-cane plantations in Campos dos Goitacazes. Mine owners and operaters offered better prices for new slaves. Besides that, slaves ran away from plantation areas to try a shot at becoming free workers or even mine operators, something quite common even though the bulk of the work force in the mines was composed of slaves. In 1720, for example, 8,000 Black slaves entered Rio de Janeiro ports and

went to mining areas, against only 5,600 entering Salvador and Recife for the vast local sugar-sane plantations. Plantations in Campos dos Goitacazes probably did not recede, but stagnated for several decades due to lack of workers and bad prices for sugar.[21] This helped retard the depletion of remaining forests and other floral covers in the area.

There was still another way in which mining operations affected the occupation of the Rio de Janeiro area. When the first coffee plantations reached sections of the Paraiba do Sul Valley, around 1790, most of the new farmers were ex-mine operators and owners. They were escaping the depletion of gold and precious stones. Mining peaked between 1741 and 1761. The bulk of Minas Gerais mines started to decline in the 1770's. As bust followed boom, some of the more successful and smart operators transferred their fortunes, slaves and entrepreneurship to coffee cultivation. Coffee farms were already growing rapidly around the city of Rio de Janeiro. Ex-mine operators naturally chose to settle along the "donkey train" trails in the Paraiba do Sul Valley.[22] In a true sense, therefore, the valley was invaded and colonized partly by Europeans coming from East to West.

Coffee Plantations: Origins and Expansion in the Rio de Janeiro Area

Coffee plantations were the single most important human activity to shape the Rio de Janeiro area's landscape. Compared to coffee, only the more local sugar-cane plantations in Campos dos

Goitacazes had environmental effects at all considerable. Even though, Charles Darwin was thrilled to cross stretches of the Coastal Plain in Rio de Janeiro province in the late 1830's, in the vicinity of sugar-cane plantations and grazing areas almost 200 years old. Although far from pristine, the complex of streams, rivers, freshwater and salt lagoons, marshes, foothills and ocean beaches still made a strong impression on Darwin's sensitivity to biological diversity.[23] As will be shown, coffee plantations left no such samples of original ecosystems in its vicinities.

The combined effect of brazil-wood logging, pepper extraction, fishing, hunting, city and port development, fuel consumption and subsistence agriculture on the environment was all but obliterated by the impacts of the "green wave of coffee" as it hit the Rio de Janeiro area in the 1760's. This was almost exactly when the mining activities were loosing momentum. Therefore, an adequate view of Rio de Janeiro state's environmental history demands a more detailed analysis of coffee plantations.

Coffea arabica is originally an Ethiopian plant, transported to the Middle East and from there to Southern and Central Europe. The dark beverage made from its toasted, ground beans was a well known albeit not popular stimulant in Europe in the late Middle Ages. It remained a gourmet beverage for a long time until it gained popularity among the working classes, urban and rural, in England and other European countries during the industrial revolution. The Dutch were the first to try colonial coffee plantations in Java. In France coffee became a favorite beverage

of the uneasy class of intellectuals. In 1720 more practical entrepreneurs and colonial officials introduced coffee in French colonies in America, namely Martinica and Guyana.

In 1729 a Portuguese military expedition was sent from the North of Brazil to the borders of the French Guyana. Checking border markers was the official mission. But the commander, Francisco de Melo Palheta, a Sargeant-Major of the Portuguese Army, was secretly but explicitly ordered to steal coffee seeds or seedlings. It seems that he had no trouble at all in executing the secret mission for he brought back five seedlings and a thousand seeds. They were distributed among councilmen and farmers from the Amazonian town of Belem, out of which the expedition originated.[24]

After a few years of small scale cultivation in the Belem area, one of the councilmen, Joao Alberto Castello Branco, migrated to Rio de Janeiro city in the early 1760's and took coffee seeds and seedlings with him. This episode is considered to be the origin of all large coffee plantations in Brazil. Coffea arabica immediately took a liking to the Rio de Janeiro city area. Rio was at the time a modest but thriving port city soon to be declared colonial capital. It had less than 40,000 inhabitants.

Several large coffee plantations were created in the 1770's and 1780's, some right next to Rio's incipient downtown, like on current Evaristo da Veiga street. Others were further away, on the foothills of Gavea mountain, today well within city limits. Some plots developed even further, in the present day neighborhoods of Jacarepagua and Campo Grande, 40 to 60 km away from downtown. Some

farms in Gavea had more than 30,000 coffee bushes.[25] Most of contemporary Rio downtown and outlying urban areas were originally cleared and colonized by coffee farms. A boom cash crop opened the way for urban growth.

In the 1790's Coffea arabica found its way up one of the isolated mountain ranges in the outskirts of Rio. It was called Serra da Tijuca. Portions of the lush tropical forests on its slopes had been selectively logged for brazil-wood and lumber. But Coffea arabica had there its first experience in substituting forests on mountain slopes specially cleared for its cultivation.[26] Coffee plants thrived with the combination of heat, humidity, rainfall, soils and altitude. Significantly, the core area of Tijuca National Park is composed of a replanted forest on the Serra da Tijuca. Other park areas include successional second growth forests on nearby slopes that also hosted pioneer rows of coffee bushes.

This was an ominous event. For the next 60 years this was to become the basic pattern for the expansion of coffee plantations in the whole Rio de Janeiro area. Total deforestation of mountain slopes was followed by the introduction of rows of dark green coffee shrubs. This pattern progressively deforested foothills and slopes on the Eastern face of the Serra do Mar, then on its high ridges and finally in the entire extension of the Paraiba do Sul Valley. The native forests on the ridge and in the valley had remained virtually undisturbed for 250 years of Portuguese colonization and thousands of years of Native American occupation.

But in the seven decades between 1790 and 1860 they were almost entirely obliterated. A frontier of approximately 30,000 km², two thirds of the Rio de Janeiro area, was cleared of its original or second growth flora in 70 years.[27]

This pattern of coffee expansion affected also portions of the current states of Minas Gerais and Sao Paulo. The rapacious green wave of coffee "stopped" only 160 years later, in the late 1920's, in the Southern state of Parana, 1,500 km away from Rio, where it started. In Parana coffee met ecological and economic limits. Frosts and persistent diseases killed shrubs while international depression killed prices. After more than a century growing on the basis of coffee plantations the Brazilian economy was forced to shift rather abruptly to industrialization in order to keep growing. As seen in Chapter 2, the shift was quite successful.

Planting and Harvesting Coffee in 19th Century Rio de Janeiro

Before tracing in more detail the destructive routes of Coffea arabica in the Rio de Janeiro area, the basic characteristics of the species and of its cultivation in local farms must be analyzed. This analysis will lead to the understanding of the wide range of environmental impacts of coffee farming.

Coffea arabica is a perennial, woody, evergreen shrub of the Rubiacea family. In its original Ethiopian range it grew in moist savannas under tree cover, but not under closed canopies. The main stem of a mature specimen, 10 to 15 cm in diameter, can be

considered a trunk. Lateral branches arise low above the ground, parallel to it or slightly tipped upward. Leaves are opposite, large (8 to 15 cm long), leathery, dark and glossy green on the top and dull green underneath. Mature commercial specimens are regularly pruned and kept at a height of 2.5 to 3.0 m. Wild adult specimens exposed to sunshine can reach 9 to 10 m. Branches reach a length of 1.5 to 2.0 m in commercial specimens and 3.0 m in wild ones.

Flowers and subsequent berries (sometimes called cherries) arise on all branches, along the extension of each, in bunches near leaf bases. Blooming occurs once a year, generally, but blossoms, green berries and ripe berries coexist for several weeks. Planted as seedlings, Coffea arabica shrubs start to produce on a commercial scale only three or four years later. Although wild populations thrive in partial shade, mature commercial specimens tolerate full sun exposure. However, they cannot resist long hot periods. Draught and frost are also lethal. After harvesting it is necessary to prune old and broken branches, besides new ones at the top of the shrub, in order to keep productivity stable. [28]

Brazilian Historian Maria Celina Whateley wrote a precious monograph about the development of coffee plantations in Resende, a Rio de Janeiro locality where incidentally Brazil's first national park (Itatiaia) was created in 1937. Her brief description of the procedures and techniques adopted in this pioneer coffee plantation area in the Paraiba do Sul Valley provided an outline for this author's account of Coffea arabica's

impact on the environment.[29]

Coffee plantations were an intensified, large-scale, European version of Native American "slash and burn" farming. They were highly complex commercial and agricultural operations, involving hundreds of men and women (farmers, slaves, overseers, free workers, craftsmen, etc), besides equipment and animals. They were typically latifundios, large or extremely large properties. The first step in the establishment of a coffee plantation was, of course, the clearing of the tropical forests which dominated Rio de Janeiro's landscape. This was a heavy and dangerous job in which expensive Black slaves were never used. Snake and insect bites, falling limbs, uncontrolled fires and numerous other types of accidents could hurt them. Instead, the job was always done by free workers somehow related to the landowner's patriarchal extended family. Often the job was done in exchange for the right to use temporarily the cleared areas for subsistence farming.

Following the rainy season, which ends in early April, underbrush was cut and left to dry for several weeks. Dry underbrush was lit in strategic locations and huge fires sometimes burned for weeks. A farm in need of lumber or close enough to a market for it would first log "noble" tree specimens. Established or isolated farms would not necessarily care for commercially valuable specimens, which were left to burn.

Portuguese colonists and Brazilian nationals alike obviously inherited this method from Native Americans' swidden farming. Indeed, burning released a load of nutrients into the forest humus,

making it extremely and immediately fertile. The crucial difference for the environment in plantations was technological. The iron hoe enabled Europeans, through the back-braking labor of the slaves, to control unwanted weeds and to continue cultivation on the same plot until forest humus was depleted. Natives had no instruments for the effective control of weeds. The longer lasting and more extensive plantations severely impaired spontaneous successional forest regrowth and frequently made it totally impossible.

After clearing snags, dead wood and debris, slaves dug individual planting holes for Coffea arabica seedlings. Plantations were invariably located on cool slopes, never on the warm riverbottoms or valley floors. A wasteful and altogether intriguing habit developed in Rio de Janeiro coffee plantations. Planting holes were drawn in straight lines along slopes, perpendicular to foothills. The neat rows of individually distinguishable shrubs growing on the recently "tamed" landscape offered a quite "disciplined" agricultural design. Landowners had visible proof of their dominion over the land. Horizontally contoured rows would have produced the same effect, but they were harder to design and obviously not compatible with the general wastefulness of pioneer colonial agriculture. Terracing was simply out of the question. Even a slanted vertical design would seem soothingly geometrical but nowhere did it prevail. The pastoral landscape here had this strictly vertical bias.

The crux of the matter here, though, is not so much aesthetics

or psychological security, but care for the land. For accelerating erosion on slopes, the vertical perpendicular design simply could not have been better conceived. Tropical rain run-off rushed vertically from one coffee shrub to the next a few meters below it, at maximum speed, peeling off soil around stems and roots. To make things worse, remaining tree trunks were purposefully left parallel to the rows, whereas a horizontal position could have helped retard or avoid widespread erosion.

After a few decades of coffee planting it was common knowledge among planters that shrubs on hill tops and steep slopes would soon stand on nutrient poor soil, or on sterile sub-soil. Erosion exposed roots to direct sunlight. If roots were not immediately recovered with soil, coffee shrubs were sure to die or would topple over first.

Farmers apparently considered that such losses were compensated for. Erosion added nutrients to soils on more level stretches, specially on foothills, at least for some time. However, sometimes shrubs on lower areas had to be rescued from excess soil and debris, adding to maintenance costs. Advantages and drawbacks probably cancelled each other out. In a few cases, some properties benefited from the process, for some time, because they had larger percentages of gentle slopes on which erosion developed slower.

Warren Dean suggests that at least in the rolling plains of Sao Paulo's plateau the straight rows were required by slave labor discipline. Fewer overseers could supervise the work of the same

number of slaves in plantations with straight rows. Being a densely leaved shrub, Coffea arabica blocks human vision. Slaves were known to hide behind shrubs to avoid working. In the case of Rio de Janeiro state's mountain slopes, the need to economize on workers supervision would also justify the rows, although rows did not necessarily have to be vertical and perpendicular to foothills.[30]

Whatever their short-term advantages for individual farms or their utility in controlling the work force, the perpendicular rows of coffee plants caused an enormous loss of fertile soil. It was an absurdly wasteful practice, an open invitation to depletion and disaster. Farmers usually abandoned coffee stands after 15 to 25 years, because they stood on depleted soils. On many slopes topsoil was entirely washed away. For many years after being abandoned, grasses and ferns were all that would grow between dead or ailing coffee shrubs. Rio de Janeiro's soils will most probably never recover a fraction of their lost fertility during humankind's life span. The bare, rounded mountains and hills and the silted rivers are the vivid consequences of eroded soils.

The municipio of Itaperuna, in Rio de Janeiro state's Northwest, was the most productive coffee area in the world in 1870's. Nutrient depletion, conversion to pastures and overgrazing led today to desertification. Neighboring municipios suffer similar problems. Reclamation of the area will demand extremely expensive investments in a very poor area. Even the most pragmatic engineers and agricultural economists admit that the history of

coffee plantations followed by overgrazing was a prime example of wastefulness.

Carefully aligned in their rows, coffee seedlings were planted and protected from sun rays in their first months by arapucas. These were scraggly man-made contraptions devised with twigs and leaves. No original trees were spared for providing shade. Spacing between shrubs was 2.6 m. 3.0 m separated rows. In the first two or three years subsistence crops, like corns or beans, could be planted between rows. This added to nutrient consumption but at least helped cover soils for part of the year. At elevations between 150 and 300 m, where temperatures were warmer, coffee plants were located preferably on shade protected slopes. Above 300 m maximum solar exposure could be sought because altitudes moderated temperatures.

Shrubs produced on a commercial scale after three or four years. Shrubs reached "maturity" in their sixth year, entering their "useful life", which lasted until the 25th year. Healthy and productive stands were harvested until the 30th year, after which they were almost invariably abandoned as "old". It should be emphasized that over the years no fertilizers of any kind were added to the original soil nutrients and the ones released by the burning of the forests. This obviously accelerated the "aging" of the shrubs. According to climatic, topographic and geologic variables, these time spans changed slightly from area to area. But depletion was always a generation away. As Sergio Buarque de Holanda puts it, "...rarely two [human] generations went by without

a farm moving away or changing owners".[31]

When an "old" stand was abandoned, new plantations had to be on line. They were planted on virgin soils invariably recruited from primitive forests. An individual farmer's new plantation might be on the same property or, if no more original forests existed there, on a new property, nearby or far away. Native Americans, with their subsistence farming, could wait a few decades and use old agricultural plots again. But European and Brazilian farmers, producing for a thriving international market, could not wait. If necessary, coffee farmers would migrate with family, extended family, qualified workers, slaves, overseers and others, sometimes taking with them more than 1,000 people, besides animals and equipment.

Old plantations had several fates. Many were simply abandoned to <u>capoeiras</u>, successional second growth. This was possible only (1) where there were significant remains of original forests to allow repopulation and (2) where enough fertile soil had survived. In general, abandoned coffee plantations were not immediately destroyed, mainly because it demanded quite an amount of labor. It was therefore common to see old coffee plots being reclaimed by grasses and ferns or even by successional <u>capoeiras</u>.

Occasionally old farms would serve as seedling suppliers, or for subsistence farming or urban development, in the hand of some lesser family member. Later in the 19th century many farms were overhauled and became pastures. Not uncommon was the cutting of remaining or second growth forests for lumber and timber. This was

done even by established farmers pressed for cash on account of declining revenues from "aging" coffee stands. Therefore, not even in its depleted wake did the large holdings leave a slim chance for the emergence of extensive second growth forests or, for that matter, a class of smallholders. Anyway, smallholders would have a hard time making the exhausted lands produce. As a rule, coffee plantation dynamics continually pulled human population away from declining areas, creating Rio de Janeiro's extremely uneven population distribution.

Mobile coffee plantations quickly gobbled up the Serra do Mar ridge and the Paraiba do Sul Valley frontier areas. In 1860 most new plantations were being established in the neighboring provinces of Minas Gerais and Sao Paulo. After three severe slumps in the 1850's, 1860's and 1870's, Rio de Janeiro state's coffee production peaked in 1882, only to plummet immediately after. Indebted or less mobile farmers were trapped with depleted lands, aging coffee stands and legions of Black slaves. New coffee plantations in Sao Paulo were being staffed with free workers, mostly European immigrants.

Slavery abolition became increasingly palpable by the 1870's, when the largest concentration of slaves was located in the declining farms of the Paraiba do Sul Valley. Slaves that had cost their owners so dearly were now virtually unmarketable. Abused lands were commercially worthless. Faulknerian dramas of pathetic decline of once powerful "coffee barons" became commonplace and were later captured by novelists like Lucio Cardoso and Monteiro

Lobato.

Maintenance and harvesting of coffee plantations also had aspects relevant to the environmental history of the Rio de Janeiro area. They added to Coffea arabica's numerous impacts. At least twice a year plantations were thoroughly weeded, once to disband competition, once to allow harvesting. Coffee berries were harvested in the drier season, between May and September. July was the peak of the harvest. Collecting coffee berries was and still is a very complex operation for which until today no acceptable mechanical device had been devised.

The very morphology of coffee shrubs complicates harvesting. It is a rather tall and bulky shrub for human proportions. Large leafs and long branches make it difficult to reach inside the shrub. Also, berries are spread along a considerable length of each branch. Green berries are mixed with ripe ones. Slope areas increase the difficulty of maneuvering around shrubs.

Harvesting coffee is until today done mostly in the same way as in the 19th century. So the present tense can be used to describe it. Actual harvesting has to be done by adults or older teenagers with long and strong arms. The basic harvesting operation is quite crude. One hand holds firmly an individual branch while the other "scrapes" the berries off using a hand "clamp" consisting of the thumb and four opposing fingers. Scraping is done from the inside to the outside of the shrub. This operation is popularly called derrica. Harvesters have to use a small ladder or a stool to reach higher branches. Lower branches

are harvested in a kneeling position. Scraping all branches on a single adult shrub may require 20 minutes of an experienced adult worker.

This rough and demanding work results in many injuries to hands, arms, faces and eyes, besides falls from ladders and stools. The toughest slaves were not selected for harvesting, though. On the contrary, sheer force is detrimental to the health of the plant. Scraping tears off leafs and twigs and not every worker has the correct gauging on his "hand clamp" to avoid excessive damage to shrubs. Field hand slaves, therefore, were usually reserved for heavy tasks such as weeding, digging and hauling.

Part of the scraped berries remain in the harvesters' hands. Unavoidably, though, many berries fall to the ground and are immediately collected by children or less vigorous adults. This is why the ground has to be carefully cleared of weeds before harvesting. The small berries (hardly 2.0 com in diameter) can be easily lost under weeds. In fact, pulled weeds are usually removed from the harvesting area, so the ground will be "clean". This of course increases exposure of bare soil to the elements, accelerating erosion. Very green berries are abandoned on the ground and sometimes generate seedlings not rarely used for substitutions or new plantations.

Some farms adopt an alternative system. Large raw cotton cloths are laid around shrubs being harvested so that fallen berries can be more easily gathered. But even then weeds cannot be allowed to grow high or else cloths will not spread properly.

Weeding and weed removal are still necessary. When cloths are used sometimes workers use slender poles to beat the shrubs and release berries, avoiding dreary scraping. When enough adults are not present, poles are used even in the absence of cloths. Again bushes can be hit just so hard and the heaviest hand is not necessarily the best. Children can do "first line" harvesting when poles are used. Sometimes they also scrape lower branches.

Whether scraped or knocked down with poles, both ripe and green berries are harvested. Mixing them is a basic cause for poor coffee ground quality. In 19th century conditions, better quality standards demanded the manual separation of ripe berries from green ones. This additional labor-intensive step was rarely adopted in Rio de Janeiro's plantations, jeopardizing the quality of the end-product.

Harvested berries are sifted on site in individual straw strainers to separate them from leaves, twigs, pebbles, sand and chunks of soil. Berries are then put in large containers and taken to a large, flat, sun-bathed court, cemented or otherwise isolated from soil humidity. They are subjected to a natural drying process which begins to separate the bean from its skin, pulp and peel. Depending on the amount of sunshine, ripe berries take 15 to 30 days to dry. They are spread on the court, shuffled around constantly and carefully piled up every afternoon to escape dew.

In the pioneer farms of the Paraiba do Sul Valley, coffee beans were separated from peel and pulp by manual or hydraulic pounding. Beans would then be roasted and, for local consumption,

hand ground. Raw beans could be stored for months in cool, dry places. Many farms preferred to roast them before shipping, an additional step which demanded timber.

Roasted or raw, coffee beans were transported to a port area through "donkey trains" following the old mining supply trails. Only 18 to 24 km were covered each day. Since each animal could carry only 90 to 120 kg of coffee, tens of thousands of donkeys, mules and horses were needed for transportation. The large animal population required grazing areas and/or subsistence crops along the numerous resting or camping areas. Blacksmiths still made a living along the trails.

Behind Guanabara bay, a string of small port towns thrived: Porto das Caixas, Mage, Porto da Estrela, Piedade, Surui, Itambi and Pilar. They were located next to the foothills of the Serra do Mar, near trail heads, on the banks of small rivers that flowed into the bay. There coffee bags were transferred to small boats and barges and shipped to nearby Rio de Janeiro city port. Water transportation was cheaper than "donkey trains".

Rio de Janeiro city, after 1854, started to connect itself with the producing areas through railroads. In fact, Brazil's first railroad connected Porto da Estrela to trail heads in the Serra do Mar foothills, behind Guanabara bay. Railroads wiped out the "donkey train" business in a few years. The stopover ports just mentioned also ran out of business. Not only did coffee flow directly to Rio via railroad, but also ports were blocked by the silting caused by local coffee plantations. Cutting of mangrove

vegetation in Guanabara bay also contributed to block access to these ports, most of which simply disappeared.

The first Brazilian railroad, just mentioned, was only 14 km long. Soon, though, tracks were connecting distant coffee producing areas directly to Rio. By 1869, 478 of Brazil's 736 km of tracks were located in Rio de Janeiro province and their design was entirely shaped by coffee plantations. They were popularly known as "coffee railroads". Brazilian railroads followed, as it were, coffee plantations, further stimulating their itinerant nature with easy transportation.

Some technical innovations were introduced in post-harvest phases of coffee production. They included imported machinery to select berries, to dry berries and separate beans from peel and pulp and to roast and grind beans. Most of Rio de Janeiro's farmers could not absorb these late 19th century innovations, because they could not afford them or were impervious to them. Therefore, they will not be analyzed here, even though they did affect energy consumption patterns where they were adopted, demanding timber or coal for fuel. Water consumption was also changed because some mechanical operations demanded the soaking of coffee berries.[32]

In summary, coffee plantations in the Rio de Janeiro area were vast commercial operations in which natural resources of the vast Rio de Janeiro area were used without a minimal dose of conservation. Native forests were obliterated. Slopes were entirely denuded. Forest humus was depleted and successional

processes impaired or totally blocked. Soil was exposed to the elements and erosion washed away topsoil. Rivers were silted. Pastures interrupted eventual successional second growth. Replanting trees was unheard of. Overgrazing produced further erosion and depletion.

Coffee planters and their dependents considered the landscape to be blessed with endless abundance. Only a few decades were enough to contradict their assumptions. The availability of free, unregulated, virgin lands was the mirage that made coffee planters avert their eyes from the immediate destruction and depletion surrounding them. There would always be another forest to be cleared for another farm, they thought. The whole Rio de Janeiro forest frontier was consumed under the delusion of the mirage.

The Green Wave of Coffee in Rio de Janeiro Province and State

As stated earlier, sugar-cane plantations in the Campos dos Goitacazes area were the major agricultural enterprise in the Rio de Janeiro area before the introduction of coffee plantations. A ranking social historian and essayist from Rio de Janeiro, Oliveira Viana, writes that all local large land owners in the 16th and 17th centuries were typical senhores de engenho, sugar mill masters. Sugar-cane plantations were attracted to the warm coastal plain. Their main environmental "enemy" were the wetlands that impressed Darwin so much. In a sense, sugar-cane plantations have been "drying up" the Paraiba do Sul delta for almost centuries, and the process continues.[33] Mountains and even hills were mostly spared

by sugar-cane plantations, although forests on them were cleared for fuel and grazing areas.

Viana and Bruno stress how population centers in the Rio de Janeiro area were all coastal, as late as 1800. This expressed the dominance of sugar-cane plantations. Rio, Campos, Atafona, Sao Joao da Barra, Macae, Sao Pedro da Aldeia, Cabo Frio, Araruama, Saquarema, Marica, Itaborai, Mage, Sao Goncalo, Inhomirim, Iguacu, Mangaratiba, Angra dos Reis and Parati were indeed all coastal settlements. The **Serra do Mar** Range and the Paraiba do Sul Valley had only pale signs of European occupation, namely the "donkey train" stopovers of Paraiba do Sul, Resende and Barra Mansa. Most of the valley was "void of any civilized elements...and culture". Indeed, only "uncivilized" **Goitaca** and **Sacuru** Natives roamed the central valley and the headwaters of some Atlantic flowing rivers. **Coroado** and **Puru** Natives lived on the Western bank of the Paraiba do Sul river.[34]

Coffee plantations, in Viana's words, "subdued and civilized" this entire frontier area in a few decades. Although sugar-cane plantations actually expanded in the meantime, political power and social prestige shifted away from the coast toward the Serra do Mar and the Paraiba do Sul Valley coffee farms and "coffee cities".

> Since then [1790], the coastal plain, prestigious during the sugar-cane cycle, lost its hegemony. The new gravitational center of economic and social activities in the Rio de Janeiro area shifted gradually towards the mountains.[35]

In fact, the Valley coffee plantation owners were the single most powerful social group in Brazil from Independence (1822) to the late 1870's. They controlled the largest share of Brazilian wealth, which showed out in Brazil's burgeoning coffee exports. From 1821 until 1882 (when Rio de Janeiro's production peaked) Brazil's coffee exports grew from 7,740 to 401,220 tons.[35]

But an important detail is that many Coastal Plain areas had remarkable coffee plantations of their own, before or at the same time as the "mountains" and the Valley. As shown, Coffea arabica actually had its first tests on the lowlands and isolated mountains in Rio de Janeiro city. In fact, while it lasted, Serra da Tijuca coffee was considered the best in the country. In the extensive plains around Guanabara and Sepetiba bays, only a few dozen kilometers away from Rio, coffee had several expansion poles, such as in Sao Goncalo. From there it followed a generally Northeastern course along the **Serra do Mar** foothills and adjoining plains, between 1800 and 1840.

Mage, Itaborai, Rio Bonito, Macacu, Araruama, Saquarema, Marica, Silva Jardim, Casimiro de Abreu, Sao Pedro da Aldeia, Cabo Frio, Macabu, Macae and even Campos were hit by the "green wave" of coffee plantations. Many sugar-cane farms in the area adopted coffee as a "complementary" culture. Forested hills and slopes not used for sugar-cane were cleared. This particular pathway of coffee plantations sent important offshoots to Nova Friburgo, Madalena and Cantagalo, on the top of the **Serra do Mar**, around 1840.

A crucial detail is necessary to understand the enormous expansion of coffee plantations in the Rio de Janeiro area. It was an export crop and international prices for coffee grew continuously during the whole 19th century, with only short slumps. This of course stimulated widespread planting. Brazil's coffee exports grew 50 times in volume and even more in value between 1822 and 1889. Viana stresses that by 1840-1850 coffee was being planted even in areas "climatically and economically" inadequate, all over Rio de Janeiro province. This included slender coastal plains and steep mountain slopes to the South, around Parati, Angra dos Reis, Mangaratiba and Itaguai, where coffee grew but did not thrive. Even mountain tops subject to lethal frost had coffee farms. These coastal coffee farms were anyway large enough to be mentioned as "modest starts" for coffee by Caio Prado Junior, a ranking Brazilian Historian.[37] Overall, though, sugar-cane continued to predominate on the Coastal Plain. Coffee would really thrive in the mountains.

In this movement around and sometimes up the Eastern slopes of the **Serra do Mar**, coffee plantations managed to miss a few areas later singled out for environmental preservation. The most notorious was the site of **Serra dos Orgaos** National Park, which for undetermined reasons exhibits considerable extension of original undisturbed forests. Another spared stretch was **Tingua**, in which a union protective forest was established in the 1950's and a new national park is scheduled for creation in 1988. It is also supposed to contain undisturbed remains of original forests, even

though an ancient "donkey train" trail is visible inside its borders. Why this area was spared is also a mystery.

These were exceptions, though. The rule was the total obliteration of original forest covers on all Eastern slopes of the Serra do Mar from Sepetiba and Guanabara bays to the North. In the 1950's and 1960's numerous union protective forests were created on these slopes by the federal government. The purpose was to control erosion and protect watersheds and second growth forests. But extensive deforested slopes further away from Rio de Janeiro city did not receive even this belated and mostly passive attention. The area of **Poco das Antas** National Biological Preserve, for example, in the **municipio** of Silva Jardim, was totally logged and covered with coffee plantations. Somehow it escaped being converted to pastures and second growth forests could establish themselves. Overall, before 1850 the entire extension of Eastern slopes of the **Serra do Mar** were occupied by declining coffee plantations or were a continuous wasteland later converted to pastures.

The Paraiba do Sul Valley had the same fate. Viana points Resende as a focal point for coffee plantations in the Valley. From there coffee plantation spread up and down the Valley and later into Sao Paulo's "purple soil" basaltic plateau. In Resende, as in **Tijuca** and **Serra dos Orgaos** park sites, again a future park area was in the path of coffee expansion. Itatiaia National Park, Brazil's first, was created close to Resende, in areas partially deforested for pioneer Valley coffee plantations.

These plantations probably derived from the ones located on the coastal areas around Parati and Angra dos Reis. Resende itself originated from a "donkey train" stopover between those two ports and the mining district. Exactly between Resende and the coast lies **Serra da Bocaina** National Park. Therefore, this fourth Rio de Janeiro national park was also affected by coffee plantations, although no extensive ones could be established on its steep and unstable slopes. Resende established its first coffee farm in the 1790's. By 1810 it was "exporting" seedlings and know-how throughout the Valley. In 1830 Resende plantations started reaching their prime. By this time, many plantations on the Coastal Plain were declining or had been abandoned.[38]

Affonso d'Escragnolle Taunay, a distinguished Brazilian Historian, produced the major study on coffee plantations in Brazil. He also mentions Resende as a major coffee area in the Province in the early 19th century, including adjoining areas such as Pirai and Barra Mansa. Interestingly he mentions the accounts of famous naturalists who explored the nearby Itatiaia region. Spix and Martius, two young German naturalists, crossed Resende in 1817 and mentioned no coffee farms near Itatiaia. Auguste de Saint-Hillaire, French, was impressed by enormous coffee farms in 1822, only five years later. Some farms had more than 100,000 shrubs each.

Taunay stresses the importance of another pioneer coffee areas in the Paraiba do Sul Valley: Vassouras, Valenca and Paraiba do Sul. 100 km downstream from Resende

Rio de Janeiro city and had its golden days as "capital of Brazilian coffee" in the 1810's and 1820's.[39] The coffee farms in these three areas declined sharply before 1840 and were later converted to pastures. No natural landscapes were spared for future preservation in the vicinities.

It is by now clear that Coffea arabica found what Viana calls its "biological optimum" in the mountains. Viana distinguishes coffee's "dispersion area" from its "productive area". Although cultivated almost everywhere in Rio de Janeiro province ("dispersion area"), coffee plants thrived best is specific sections of its mountains ("productive area"):

> This was the so-called "upward range area", comprising North-facing slopes of the Serra do Mar and West-facing slopes of the Serra da Mantiqueira...generally called the 'Paraiba Plateau'.[40]

More specifically, coffee plants bloomed faster, healthier and longer on slopes between 200 and 550 m of altitude in the Paraiba do Sul Valley. Probably the rain shadow caused by the Serra do Mar over its own Western slopes made the adjoining Mantiqueira slopes slightly more propitious. The "lowlands" of the Valley floor were too warm. Lands above 600 m were a bit too cool. Coffee survived in them but did not attain the same productivity. Prado Junior stresses how the common range of Valley altitudes, between 300 and 900 m, moderated the temperature of this tropical area and protected Coffea arabica from excessive heat. He also points out how the closely knit hills and mountains combined protection from strong winds with adequate exposure to sunshine. Dean mentions

that farmers avoided lethal frost in higher altitudes by not planting on South-facing slopes.[40]

Viana summarizes his findings about coffee's distribution as follows:

> Coffee plants got started on the [Coastal] Plain but quickly left it behind, climbing up the mountains. They marched on through Rio de Janeiro territory...searching for their biological optimum.[42]

Had coffee found its optimum right away it would already have been destructive enough of the local environment. After all, the whole Paraiba do Sul Valley and parts of the **Serra do Mar** held vast optimum sections. But the high profitability of coffee plantations led to their establishment in almost every nook of Rio de Janeiro territory, even if in a secondary status. The result was that there seems not to exist a single stretch of original forests on the Western slopes of the **Serra do Mar** nor in the Paraiba do Sul Valley proper. A small hill top area on the Northern edge of the **Serra do Mar** is the site of a Rio de Janeiro state park called **Desengano**. It is supposed to contain undisturbed remains of original forests. This is probably the only exception of overall depletion in the whole Northern section of Rio de Janeiro state.

The boom and bust cycle of coffee in the Rio de Janeiro area is shown by just a few figures. From 1813 until 1886 Rio de Janeiro was Brazil's leading coffee producer. Its production peaked twice at 2.3 million bags (of 60 kg) in 1855 and 1867, with a significant slump of only 1.2 million in 1864. 1882 was the all-time peak with 2.6 million bags. From their the province's

production plummeted. Plundered soils with aging stands produced continually decreasing yields. In 1886 Sao Paulo province's production assumed first place and quickly rushed to 5.0 million bags a year in 1900, while Rio de Janeiro's production dropped to 1.4 million, close to the 1864 slump level.

In 1860 Rio de Janeiro produced more than 80% of Brazil's coffee. In 1900 it was down to only 20% and falling sharply. Railroad track mileage also gives a measure of the decline of Rio de Janeiro plantations. In 1889 Sao Paulo had 1,200 km of tracks against Rio de Janeiro's 800, practically inverting the proportion of 1869.[43] For each coffee producing municipio in Rio de Janeiro province similar figures reveal even shorter boom and bust cycles. In a few decades massive coffee production figures were substituted by others showing human depopulation, expansion of fallow land and growth of cattle population.

Imminent disruption was clear in the minds of Rio de Janeiro coffee growers even during the all-time peak production of 1882. The end was looming and the fact was clear even for established local politicians. In 1880 Rio de Janeiro's province Legislature produced a report which stated that "...the [province's] soil fertility had been exhausted and lack of care had turned the [Paraiba do Sul] valley into deep bogs that generate health hazards". Slavery abolition in 1888 simply closed down scores of farms, many of them permanently. For a few years Rio de Janeiro's coffee production was virtually disrupted. Harvesting of extensive aging plantations still guaranteed a significant but declining

coffee production in the first two decades of the 20th century. In 1904 the state's Legislature discussed but typically did not approve a much belated bill that would forbid cutting trees on public lands and restrict it on private lands.[44]

Even if the political will had existed at all, time had long run out for Rio de Janeiro's forests. Little or nothing of a "natural" quality was left to be preserved. Not even drastic forest conservation policies would have made any immediate difference because there were no more forests to conserve. Only land reclamation could - and was not - be implemented. After a century of coffee plantations, the Rio de Janeiro area became a vast wasteland.

In conclusion, the local history of coffee plantations is the major consideration for the analysis of Rio de Janeiro's national parks as ecological units. **Serra dos Orgaos** NP was barely missed by coffee farms, which practically surrounded it in the early 1800's. **Tijuca** and **Itatiaia** NP's were ravaged by them. **Serra da Bocaina** NP is plotted in the most extensive area in the state left untouched by coffee, although even its foothills once had important stands. Almost every other public protected land in the state was to some degree affected by coffee plantations, as will be shown in Chapter 7.

If national parks are supposed to preserve areas in their "natural" condition, then Rio de Janeiro was certainly <u>one of the most unsuited locations for them anywhere in Brazil</u>. Decades before any extensive industrialization, the coffee plantation

system broke the area's ecological integrity and depleted flora, fauna, land and water resources in almost every corner of the state. As Sergio Buarque de Holanda says about Brazilian agriculture in general, Rio de Janeiro's lands were mined, not farmed. The following chapters will therefore try identify the main natural traits of Rio de Janeiro's national parks and other local public protected lands.

CHAPTER 7

Protected Lands in Contemporary Rio de Janeiro

The State of Rio de Janeiro Today

This chapter will first bring the social and environmental history account developed in Chapter 6 up to date. This will give an idea of the Rio de Janeiro state's contemporary situation and importance in the national scene. A second part of the chapter will present an account of all types of public protected lands existing in the state. This will give a context for the following four chapters, which examine in more detail the state's national parks.

The decline of Rio de Janeiro's coffee plantations undermined the hegemony of local "coffee barons" in the national political and economic scene. Even before the abolition of slavery in 1888 all but wiped them out, the "coffee barons" were loosing ground to new coffee farmers from Western Sao Paulo, who had new stands, better topography and soils, salaried workers and modern equipment. Rio de Janeiro's agriculture, already weakened by soil depletion, never recovered from the blow of slavery abolition and probably never

will.[1]

Despite this, Rio de Janeiro state managed to hold a leading position in national issues in the last century. Several reasons helped it overcome the disruption of its commercial agriculture caused by soil depletion and slavery abolition. One important factor was that the city of Rio de Janeiro remained the national capital until 1960, concentrating administrative agencies and educational and cultural institutions. Rio de Janeiro city, metropolitan area and state participated in the country's industrial boom that started in the 1940's. Rio's port was until 1905 responsible for exporting most of Brazil's still soaring coffee production, even though local crops had declined sharply. Even today Rio has the second port in the country. Related to these factors, Rio de Janeiro`s city and metropolitan areas had immense population growth. Until the early 1950's Rio was Brazil's largest city.

In demographics Rio de Janeiro state today runs third in Brazil, behind Sao Paulo and Minas Gerais states. In 1987 the state had 12.7 million inhabitants, 9.1% of the Brazilian population. 11 million live in Rio's metropolitan area and 6.5 in Rio de Janeiro city alone. Rio de Janeiro state is the most urbanized in Brazil, with 91% of city dwellers. It has only 44,268 km^2 (.52% of the Brazilian territory) and Brazil's highest population density. This means that the state has remained a leading one in the Brazilian scene. Its preserved areas, including national parks, therefore have a high public visibility.

The combination of a level high of urbanization and inefficient agriculture is the key point for understanding the current natural resource situation of the state of Rio de Janeiro. After coffee`s quick decline no other important agricultural pursuit replaced it in state territory. The high level of urbanization in no way corresponds to high agricultural production or productivity of local crops. Although Brazil's agriculture in general is efficient in export crops (coffee, sugar, soya, cocoa, citric juices) it does not supply the country with enough staples.

Brazil is a traditional importer of basic foodstuffs such as milk, meat, rice, beans, wheat, potatoes, corn and even onions and garlic. Rio de Janeiro's situation is particularly bad in this respect. Its population can only be supported by voluminous food imports from other states and abroad. Many states have their own considerable staple crops. But Rio de Janeiro imports, besides foodstuffs mentioned above, basic or perishable items such as salt, tomatoes, lettuce, cabbage, cauliflower, poultry, eggs, fish and dozens of others. Coffee's social and environmental legacy was not suited for a "green belt" and no such entity has developed yet in Rio de Janeiro state.

A brief overview of the state's current agricultural profile will give an idea of the poor agricultural lands left behind by coffee plantations. Sugar cane plantations around the Campos lowlands are still present. They were modernized but have chronic low productivity. They survive only with enormous public subsidies. Coffee plantations are making a slow comeback in parts

of the Paraiba do Sul Valley in lands once depleted by the original plantations. They are planted with modern conservation and agricultural techniques and their prospects and productivity are good. Rice has developed rather well in the lower Paraiba do Sul Valley wetlands. The larger part of old coffee lands in the North and Northeast mountains is still used as pastures for extensive dairy farming with ridiculously low productivity figures. Closer to Rio's metropolitan area an incipient "green belt" of smallholders cultivates gardens, orchards and fowl in the mountains of Teresopolis, Nova Friburgo and vicinities. The Southwestern Paraiba do Sul Valley is also dedicated to dairy farming but it has some "islands" of high productivity. A reasonable amount of commercial fishing is done along the state's coastline. The Southern coast produces a considerable amount of fruit.

A careful reading of the official statistics of agricultural production in Rio de Janeiro state yields dismal findings. 17 of the state's 34 products are cultivated in areas proportionally smaller than its territorial expanse in Brazil. None of the 34 products has yields proportionally larger than the state's percentage of Brazil's population. 15 of the 34 products have productivity figures below national averages, including bananas, potatoes, onions, oranges and corn. Of the 19 products with higher than average productivity, two are export crops (coffee and sugar) and seven are minute experimental cultures. Data on animal herds, animal products and forest products are even worse.[2] It is a commonplace to say that Rio de Janeiro state's agriculture is the

worse in the country. This is not true in an absolute sense but it certainly is true in the relative sense of its deficit in feeding the local population. All this illustrates the extensive resource depletion caused by 19th century coffee plantations.

Urban and industrial activities can be briefly summarized. Heavy and light industries and all kinds of services in Rio's metropolitan area; smaller industries in outlying medium sized cities; major metalworks in the Volta Redonda - Barra Mansa, where in the 1940's the federal government located Brazil's first large steel plant; tourism and leisure in the **Serra do Mar** range in the vicinity of Rio; mining and manufacture of cement in the Mid-North, in Cantagalo; burgeoning oil and natural gas production on the Northern continental shelf; alcohol production in the sugar cane plantation areas around Campos; ship building and tourism in the Southern coast. The city of Rio de Janeiro also has educational, cultural and leisure activities, besides the largest tourist trade in the country.

In conclusion, the state of Rio de Janeiro is certainly not as bad off as an isolated boom and bust cycle of coffee would have left it. It is not a backward, depressed area. Federal government presence and investment and the industrial and service center of the city of Rio de Janeiro have held the state in an overall second place in the Brazilian scene, behind Sao Paulo and still slightly in front of Minas Gerais, which gains ground quickly. Far from being a stagnant state, Rio de Janeiro's cities, industries and agriculture still demand natural resources in a grand scale. The

Paraiba do Sul Valley, though, is mostly a stagnant region. Many municipios suffered continual depopulation over the last decades. Indeed, most of the state's rural sector still reflects the disruption of coffee plantations. It pulls the state's economy back and nothing indicates that coffee's legacy will ever allow for anything but a mediocre agriculture.

Conservation and Preservation Units Extant in the State of Rio de Janeiro

The rest of this chapter will consider the entire set of preservation units existent in Rio de Janeiro state. The following chapters will analyze in more detail the state's four national parks. There are at least 62 preservation and conservation units in Rio de Janeiro state. Not much more than the names and general location are available for some. For others basic information is available but current situations proved impossible to assess. They will be analyzed by level of administration and by type. The objective is to evaluate their situation as public goods and examine the types of landscapes they protect.

a - National Parks and National Biological Preserves

Four national parks and one national biological preserve listed in Table 24 are managed by the Instituto. As argued in Chapter 6 the parks and the preserve are located in areas affected by coffee plantations. Two parks are located in areas which were major focal points for coffee: Tijuca and Itatiaia. Serra da

Table 24

Federal Conservation and Preservation Units in the State of Rio de Janeiro (I): National Parks and National Biological Preserves, Name and Location

Name	Municipios Affected in the State
Parks	
Itatiaia	Resende
Serra dos Orgaos	Teresopolis, Mage, Petropolis
Tijuca	Rio de Janeiro
Serra da Bocaina	Parati, Angra dos Reis
Preserve	
Poco das Antas	Silva Jardim

Source: Departamento de Parques Nacionais e Reservas Equivalentes, Instituto Brasileiro de Desenvolvimento Florestal

Bocaina was designed to protect the state's largest continuous area not covered by coffee plantations, although its lower areas in Parati and Angra dos Reis once did have stands remarkable enough to be mentioned in many economic history books. Serra dos Orgaos is the only Instituto unit to have escaped from coffee although a few of its foothill areas were most probably covered with stands. Poco das Antas biological preserve was cleared in the early 19th century, although maybe not in its entirety because substantial second growth developed.

All five units therefore protect mountain tops and slopes,

the preferred range of Coffea arabica. Tijuca encompasses successional second growth, some disturbed original forests and artificially reforested slopes. Serra dos Orgaos and Serra da Bocaina have mostly undisturbed forest stands. Itatiaia combines successional second growth, original forest remains and partly disturbed alpine meadows. Poco das Antas has well developed successional forests that have been able to support recently introduced populations of the endemic golden marmoset. The Instituto's units in Rio de Janeiro were, therefore, plotted in the wake of the "green wave" coffee plantations, combining undisturbed, successional and replanted forests. They are basically mountain top parks with forests.

b - Ecological Station and Environmental Protection Areas

Table 25 lists one ecological station and five environmental protection areas in Rio de Janeiro state. These six units are under the responsibility of the Secretaria. Rio de Janeiro has only one small ecological station, Pirai. It is located inside an extensive inundated area called Ribeirao das Lajes, a mountain river dammed for energy and water supply purposes. It lies about 60 km Northwest from the city of Rio de Janeiro, on the top of Serra do Mar Range. The dammed area is managed by a federal electric utility company. The station was negotiated by the Secretaria with the utility, on a temporary basis. Although densely vegetated the area was almost altered. Deforestation for coffee plantations, grazing, successional second growth and the

Table 25

Federal Conservation and Preservation Units in the State of Rio de Janeiro (II): Ecological Station and Environmental Protection Areas, Name, Location and Area

Name	Municipios Affected in the State	Approximate Area (km^2)
Ecological Station		
Pirai	Pirai	40
Env. Protection Areas		
Petropolis	Petropolis	440
Cairucu	Parati	338
Guapi-Mirim	Mage, Sao Goncalo, Itaborai	143
Mantiqueira	Resende	4,025
Tamoios	Angra dos Reis	-

Sources: Secretaria Especial de Meio Ambiente. Areas de Protecao Ambiental: Abordagem Historica e Tecnica. Brasilia, 1987; Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

large lake formed behind the dam completely changed the original landscape. Ecological stations' integrated objective of preservation and induced changes has to be tailored to the particular circumstances of massive human alteration of this landscape. It is unfortunate that the Secretaria did not elect other areas in the state for ecological stations. It could certainly find in Rio de Janeiro state less altered sites than Pirai.

The five environmental protection areas have considerably large areas but it should be recalled that they are not under public ownership and are not preservation or conservation units proper. They are submitted only to hopefully strict zoning regulations. Petropolis EPA was the first of its kind created by the Secretaria. It recently generated harsh controversy. It is a small and slightly altered Serra do Mar high altitude slope spared by coffee planters probably due to excessive cold. In 1985 the municipal government of Petropolis decided to build a water supply dam in the heart of the small unit. Although perfectly allowable, the reservoir could be built only after consultation with the Secretaria. Local environmentalists publicized the irregular decision and the Secretaria eventually managed to interrupt construction work already under way.[3]

It is evident that this environmental protection area was not created with adequate "community participation". But Secretaria published material claims that a task force with representatives of community and government organizations was put together to create the unit. Priorities agreed upon were protection of watersheds, steep slopes and densely forested areas and even of neighboring preservation units. Interestingly, Petropolis environmental protection area borders with three of them: Serra dos Orgaos NP, Araras UPF and Araras State Biological Preserve. A "technical governance" board with government and community representatives was instituted in 1982 but it did not avoid the serious conflict mentioned above.[4] Actually, Petropolis

government behaved as if the unit did not exist at all and as if it were not part of the governance body. Although very small, Petropolis EPA can help the neighboring preservation units to withstand encroachment pressures.

Cairucu was created on the extreme Southern coast of the state. This time the Secretaria put no less than 17 representatives of government and private institutions on the task force responsible for creating the unit. Its priorities are the preservation of original forest remains, protection of endangered species (some of them endemic), preservation of mangrove areas with climax vegetation and stability of caicara life style. Caicaras descend from native populations living in Portuguese controlled aldeias. They are small farmers and fishermen on the borderline between native and national cultures.

The unit has a "technical governance" board comprised by the municipal government of Parati, the Brazilian Navy, the Instituto, the federal land reform authority, the federal fisheries authority, the Fundacao Estadual de Engenharia de Meio Ambiente (the state's environmental quality authority) and other state and federal agencies. Once again this environmental protection area borders with a national park, Serra da Bocaina.[5] Cairucu area includes stretches once covered by coffee, sugar cane and subsistence farming on this relatively isolated part of Rio de Janeiro State's coastline. This unit is well located to preserve natural areas and assist in the establishment of a neighboring national park.

Guapi-Mirim lies inside Guanabara bay, in the geometrical

center of Rio de Janeiro's metropolitan region. It is a highly altered area. For centuries it has been used for shellfish collection. Mangrove vegetation cutting contributed to the silting of the Guanabara bay port towns in the mid-19th century, as mentioned in Chapter 6. The main purpose of this unit is to save remains of the once extensive Guanabara bay mangroves, crucial in local marine life cycles and food chains. Fourteen government and private institutions sat on the creating task force, including the Brazilian Society for the Advancement of Science and Rio's metropolitan development authority, FUNDREM. The area is regularly used for shellfish gathering, fishing, subsistence agriculture and logging. These salty lowlands were certainly never used for sugar cane or for coffee farms but urban and industrial development have effectively claimed the larger part of Guanabara bay's mangroves.[6] Guapi-Mirim EPA therefore has little or no importance for protecting natural or undisturbed areas. It is designed to conserve resources in an altered area.

Serra da Mantiqueira EPA is a large, ambitious, preservation-oriented environmental protection area. The creation task force proposed an even larger area for it but the Secretaria decided to include only summits, alpine meadows and important slopes of the Mantiqueira Range. This unit is more properly assessed as located in Sao Paulo or in Minas Gerais because respectively 16 and seven municipios of those states comprise it. Only one Rio de Janeiro municipio is affected: Resende. This is the third environmental protection area to border with a local national park, in this case

Itatiaia. Its priorities are the protection of flora and fauna, rational use of resources and "interconnection" of local protected areas.[7] Obviously a good deal of these areas were directly affected by coffee plantations in the 19th century. The areas that escaped were too steep or too high and cold. Serra da Mantiqueira EPA is an important unit for preservation purposes, although probably too large to be managed effectively under current Brazilian conditions.

No details were available about Tamoios. From knowledge of the area this author assumes that the unit was designed to control urban and tourism development in the marine island of Ilha Grande, which strongly appeals to inhabitants of both Rio de Janeiro and Sao Paulo metropolitan areas. Three other preservation or conservation units are plotted on this island, as will be shown below.

Therefore Rio de Janeiro state's environmental protection areas have been located in areas with some natural value and threatened by development and human occupation. These are exactly the kind of areas suited for their purposes. A striking feature is that four of the five units are neighbors of other protected areas, a detail that most certainly is not casual. With these five units the Secretaria will face a difficult test of its managerial capacity to control economic expansion through cooperative planning and zoning.

c - Union Protective Forests

As mentioned in Chapter 4, union protective forests were massively created in the Rio de Janeiro metropolitan area between 1944 and 1964. They were all located on Eastern slopes of the Serra do Mar mountains hit by coffee plantations early in the 19th century and close to Rio de Janeiro's metropolitan area. They include essentially slopes with successional second growth flora, some of it more than a century and a half old. Recurrent land-slides and mud-slides affecting vital roads and excessive silting of lowland rivers prompted the federal government to create these units.

Table 26 has a listing of 23 protective forests located in Rio de Janeiro. It is only tentative because available sources are inconsistent. Names change from one source to another and possibly two units have been listed twice under different names. They are managed by the Instituto. A few comments apply. Many of these second growth forests are associated with other preservation and conservation units. Araras protective forest adjoins with Petropolis EPA. Mantiqueira was created around part of Itatiaia NP boundaries. Petropolis contains Araras State Biological Preserve. Garrafao is "subordinated" to Serra dos Orgaos NP. Pedra Branca (in Rio de Janeiro municipio) adjoins with Pedra Branca State Park.

Tingua, the largest, is scheduled to become a national park before 1988 is over. It should be recalled that Tijuca NP was created with nine other protective forests. In 1985 Luiz Toledo Filho, the Instituto's regional director, intended to transform

Table 26

Federal Conservation and Preservation Units in the State of Rio de Janeiro (III): Union Protective Forests, Name and Area (in alphabetical order)

Name	Approximate Area (km^2)
Araras	20.6
Batalha	12.0
Caboclos	15.0
Camorim	26.0
Colonia	8.0
Covanca	3.0
Curicica	2.0
Egalen	10.0
Engenho Novo de Guaratiba	9.0
Garrafao	-
Guaratiba	10.0
Jacarepagua	-
Mantiqueira	50.0
Mendanha	14.0
Pedra Branca (Rio de Janeiro)	-
Pedra Branca (Nova Friburgo)	2.8
Petropolis	85.0
Quininha	10.0
Rio do Ouro	120.0
Rio Grande	18.0
Sao Pedro	50.0
Tingua	500.0
Xerem	85.0

Sources: Instituto Brasileiro de Desenvolvimento Florestal. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, 1975, "Anexo IV"; Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

"19" protective forests into national parks or national biological preserves. This has not happened yet.[8]

Overall it seems that union protective forests have effectively precluded development and allowed substantial extensions of second growth. At least 1,050 km² of Rio de Janeiro state, a respectable 2.4% of its territory, has protective forest status. Some of them have even helped protect or create preservation units proper. But these protective forests are covered mainly with second growth vegetation and were designed to control erosion and protect watersheds. They do not preserve significant "natural" landscapes nor do they provide leisure, education, research or fauna and flora management.

d - National Forests

A national forest exists in Rio de Janeiro state, with the name Mario Xavier. Its exact location remained uncertain. It probably was created very recently encompassing one or more adjoining protective forests mentioned above. Therefore, it most certainly contains second growth forests. It is under Instituto responsibility.[9] It seems strange, though that the Instituto should plan to cut second growth on unstable slopes acquired by government to control erosion and preserve watersheds.

e - Areas of Relevant Ecological Concern

One of these Secretaria units was created in the municipio of Volta Redonda. This is one of the most ravaged sections of the Paraiba do Sul Valley and for the last 40 years home of Brazil's most important steel plant. What reportedly motivated the creation

of this unit was the discovery of a species of fresh-water turtle believed to be extinct for decades.[10] There is hardly an acre of "natural" area to be preserved anywhere in Volta Redonda. The protection of the hardy turtle species that survived the destruction of its habitat was the sole motivation for this unit.

f - State Parks

Rio de Janeiro state has three state parks, listed in Table 27. State parks are under the authority of a new State Forest Institute, from the state Department of Agriculture. **Desengano** is a rare extensive remain of original forests. It is located in the state`s otherwise ravaged Mid-North **Serra do Mar** range. It was created in 1970. In 1982 it had a director, a central office and lodging for researchers and rangers. Even though, it was described as "invaded" by hunters and loggers. Recent press accounts stress continuing invasions and also the acquisition of private lands inside the park by the state government.[11] The natural value of this unit is enormous because it is the only extensive remain of original forests anywhere in the North of the state. Its political situation is extremely insecure, though.

Ilha Grande was created in 1971 and seems to have been reduced by a state decree in 1978. Information about it is conflicting. One source states that the park occupies 25% of Ilha Grande and that it has only 80 km² (as opposed to 150 km²) of original forest cover. Strangely, the same source states that "permanent preservation" status is restricted to areas above the altitude

Table 27

State Conservation and Preservation Units in the State of Rio de Janeiro (I): State Parks, Name, Location and Area (in order of creation)

Name	Municipios affected	Approximate Areas (km^2)
Desengano	Santa Maria Madalena, Sao Fidelis, Campos	220
Ilha Grande	Angra dos Reis	150
Pedra Branca	Rio de Janeiro	125

Sources: Harold Edgard Strang et al. Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas Mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982; Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

of 200 m. This puzzling proviso utterly disqualifies it as a 1965 Forest Code State Park which requires permanent preservation status for the entire areas of parks.[12] This park is a neighbor of Tamoios environmental protection area and Praia do Sul state biological preserve, located on the same island. Once again, the ecological importance of Ilha Grande State Park is threatened by its unclear political definition.

Pedra Branca state park was created in 1974 inside the municipio of Rio de Janeiro. 30% of its area came from the protective forest with the same name. It is located in a rare sparsely populated nook of the bristling Rio de Janeiro

metropolitan area. Its altitudes are above 100 m. It is plotted along a ridge that overlooks the populous lowland neighborhoods of Jacarepagua, Bangu, Campo Grande and Barra de Guaratiba. It has some original forests and rare local fauna, but most forests are second growth. Coffee farms were recorded there and "natural" water reservoirs are tapped for supplying those outlying Rio de Janeiro neighborhoods. Private properties remain to be acquired by the state. Recently new power transmission lines were built across the park, requiring the cutting of tall original or second growth trees.[13] This unit protects important natural areas not far away from city limits but also lacks adequate public control.

There is an isolated reference to a fourth state park called Nascentes do Rio Sao Joao, "headwaters of the Sao Joao river", affecting the municipios of Cachoeiras de Macacu, Nova Friburgo, Silva Jardim and Casimiro de Abreu. It does not show up in any of the more recent materials. It probably never really got off the paper of the State Decree Law 131, October 24, 1969, which created it. The Sao Joao river has been recently defended by environmentalists, hikers and white-water rafters as worthy of government protection. But this proposed park is not mentioned by them nor in the comprehensive search on state units made by Strang et al. It seems a "forgotten" unit, both by government and citizens.

g - State Biological Preserves

Three state biological preserves exist in Rio de Janeiro. They

are listed in Table 28. The Fundacao Estadual de Engenharia de Meio Ambiente, the state environmental quality company, manages these units. Araras was created in 1977 and is a neighbor of Serra da Orgaos NP, Petropolis EPA and Araras UPF, from which it was "detached". Available sources do not clarify to what degree these four units overlap or border with each other. Araras State Park contains undisturbed mountain forests on an Eastern Serra do Mar slope. Flora and fauna are rich and diversified. It has a central office, a director, lodging for researchers and in 1982 a management plan was being drafted. Praia do Sul is a fourth protected area located on Ilha Grande. It was created in 1981 with a precious combination of undisturbed seashore landscape and sites of archeological value. It contains what probably is the only undisturbed restinga formation in the state and has a stretch of mountains with original forests.[14] Jacaranda state park was mentioned only in superficial press accounts. It was created in 1983 and is still another neighbor of Serra dos Orgaos NP and other nearby units. All three state biological preserves therefore seem to have high ecological value. Their political stability is at least unclear.

The same 1969 state Decree Law which created the cryptic Nascentes do Rio Sao Joao State Park established an equally mysterious Pau Brasil State Biological Preserve, affecting areas of the municipios of Casimiro de Abreu, Araruama, Cabo Frio and Sao Pedro da Aldeia. This preserve includes the most productive original range of pau-brasil. Again the only reference to this

Table 28

State Conservation and Preservation Units in the State of Rio de Janeiro (II): State Biological Preserves, Name, Location and Area (in order of creation)

Name	Municipios affected	Approximate Areas (km²)
Araras	Petropolis, Miguel Pereira	20.7
Praia do Sul	Angra dos Reis	36.0
Jacaranda	Teresopolis	-

Source: Harold Edgard Strang et al. Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas Mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982.

unit was the decree creating it. Its design is ecologically sound, combining Serra do Mar slopes, Coastal Plain stretches, coastal lagoons and beach areas. The area has been deeply disturbed by human occupation, though. This state units is probably fictional.

h - State Biological and Archeological Preserve

Located in a remote corner of the municipio of Rio de Janeiro is a unique Guaratiba State Biological and Archeological Preserve, created by a state decree in 1974. Its legal status remained unclear. It is managed by the State Forest Institute. Available information describes it as a 25 km² stretch of seashore in Sepetiba bay behind the elongated Marambaia sandbar, containing

and restinga and mangrove vegetation. It contains sambaquis, concentrations of shells and stone instruments, valuable archeological sites that reveal the life style of ancient human populations. The area is "occupied" by the Army.[15] The area is probably disturbed by human occupation to some degree. Incidentally, the neighboring and scenic Marambaia sandbar is Navy territory, used for maneuvers and drills. The degree of preservation of these two military controlled areas is unclear, but they are crucial if the state is to have significant preserved seashore stretches. Rio de Janeiro's coastline landscapes are scantly protected by federal or state preservation units.

A similar unit was proposed but not created. A field archeologist from the Museu Nacional do Rio de Janeiro, Lina Maria Kneip, drafted a proposal for a biological and archeological preserve in Barra Nova, in the municipality of Saquarema. The area combines a fairly undisturbed sample of restinga-coastal lagoon landscape and sambaquis already under archeological investigation. This proposal was probably directed to the state government, but never enacted.[16]

i - State Forest Preserves

Three State Forest Preserves were recorded in available sources. They are listed in Table 29. The State Forest Institute manages them. Their legal status is unclear but they are probably based on the 1965 Forest Code. The only relevant detail about these units is that tiny Grajau, inside Rio de Janeiro city, is a

"replanted" forest. Considering its proximity with the replanted section of Tijuca NP it would be interesting to explore this information and try to establish some sort of relationship between these two reforestation efforts.

Table 29

State Conservation and Preservation Units in the State Rio de Janeiro (III): State Forest Preserves, Name, Location and Area (in order of creation)

Name	Municipios affected	Approximate Areas (km^2)
Parati	Parati	-
Grajau	Rio de Janeiro	.5
Crubixas	Macae	7.1

Sources: Harold Edgard Strang et al: Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas Mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982; IBASE News Files.

j - State Environmental Protection Areas

As explained in Chapter 4, environmental protection areas can be created by state and municipal governments. Rio de Janeiro state has at least three of these units. They are listed in Table 30. They are created and managed by the Fundacao Estadual de Engenharia de Meio Ambiente, FEEMA.

Relevant information is scarce but a striking detail is that both Jacaranda and Desengano were plotted inside existing preservation units, respectively a biological preserve and a park. Jacaranda EPA was aimed to control human encroachment in the

Table 30

State Conservation and Preservation Units in the State of Rio de Janeiro (IV): State Environmental Protection Areas, Name and Location

Name	Municipios affected
Jacaranda	Teresopolis
Marica	Marica
Desengano	Santa Maria Madalena, Sao Fidelis, Campos

Source: IBASE News Files.

respective preserve. Desengano was created explicitly as an instrument to "interrupt predatory activities" occurring in the respective state park. Establishing environmental protection areas to save protected areas indicates more the inefficiency of state preservation units proper than anything else of a positive tone. If environmental protection areas can help "preserve preserves", it is all the better. But the sheer necessity of further protection of designated preserves is clearly a bad sign.

A few comments on proposed environmental protection areas are appropriate. In 1984 the Fundacao Estadual de Engenharia de Meio Ambiente asked for and received community suggestions for new environmental protection areas. Besides several non-protected areas the agency was asked to create units around Itatiaia and Tijuca NP's and Pedra Branca State Park. Again this is a clear indication of the inefficiency of the existing units, at least in the eyes of concerned citizens. The agency's own priority, on the

other hand, reflects its original water quality responsibilities. It values the "protection of watersheds" along the Eastern slopes of Serra do Mar range, the ones with rivers flowing to the densely populated Coastal Plain. As if recognizing the general inefficiency of environmental protection units in the state, agency officials declared that it intended to "overlap" environmental protection areas and other preservation units.[17] This is at least awkward, even though it was not announced or reported as such.

State Law 690/1984 mandated the Fundacao Estadual de Engenharia do Meio Ambiente to define "permanent preservation areas" in the state. By August 1984 it had missed the deadline by more than 60 days. The delay was justified as a chance to allow for community inputs. These proposed units are provisional. They will be subject to "control" until each is later defined as a park, a preserve, an environmental protection area or an ecological station (or maybe none). In 1986 the agency was still in the process of selecting areas for "50 new preservation units", a very ambitious goal for a state where existing units are in a generally poor situation.

The agency's official position is that "at least 40%" of Rio de Janeiro State should have some form of permanent vegetation cover, original or not, for erosion control and water supply purposes. Its own estimate of the state's permanent floral cover is 14%, of which less than one third is original. By 1986 the Fundacao Estadual de Engenharia de Meio Ambiente proposed as "worthy of protection" all ocean islands, many <u>restinga</u> and coastal

lagoon areas from Saquarema to Sao Joao da Barra, mangroves, remaining Coastal Plain forests, slope forests and areas behind dams. The agency is now bidding to take over all non-federal conservation and preservation units in Rio de Janeiro state, including municipal ones.[18] The agency's listing of areas worthy of protection is indeed impressive but entirely redundant with (1) existing preservation units or (2) environmental groups' demands, not to mention common sense.

k - Other State Units

Flumitur, the Rio de Janeiro state tourism company, runs a "state leisure area" called Parati-Mirim, located in the municipio of Parati, on the extreme South coast. It was created in 1976 with only 11.5 km² in an area originally set aside in 1972 for a state park. Preservation objectives were certainly erased or lowered by the unclear status of "leisure area". Flumitur also manages a Furnas do Catete park. It was donated by the municipal government of Nova Friburgo, which created it but never defined its limits. It is an extremely small mountainous area (.7 km²) with some remarkable rock formations.[19] Flumitur, of course, has no mandated environmental protection authority.

The state's artistic and cultural heritage agency has two ill-defined "natural areas". Both lie in outstanding spots of the state's coastline: their names are Grumari and Dunas de Cabo Frio. The legal status and the preservation capability of this type of unit remained a mystery. Grumari is a beach area near Rio. Cabo

Frio dune areas are under siege by urban development and construction companies.[20] The creating agency also lacks authority for environmental protection.

The Centro de Primatologia (Primatology Center) is not exactly a preservation unit. It is a unique research institution. 50 of the 200 known species of primates occur exclusively in Brazilian territory and a majority of these 50 species are endemic to several stretches of the Atlantic coastal rain forests. The Centro de Primatologia has been studying many species of primates and using them for laboratory research. As the original habitat of these species has been dwindling, the Centro de Primatologia is now also dedicated to the non-anticipated role of reproducing them in captivity and even helping their reintroduction in the wild. The Centro de Primatologia has been active in the golden and golden-faced marmoset management projects in Poco das Antas and Una national biological preserves. Its own modest facilities, though, look more like a small zoo than a preservation unit of any kind.[21]

Finally there are at least 10 other areas considered part of the state's "cultural heritage". They were set aside by a series of specific ordinances issued jointly by the federal and the state historic and artistic heritage agencies between 1965 and 1980. These ordinances restrict development and encroachment, but neither agency has executive, supervisory or police powers. Developers have openly stated that they do not recognize the legitimacy of these ordinances. All areas are small hilltops inside Rio de Janeiro city, with the exception of the municipal Jacarepagua

Biological Preserve (to be studied below).[22] The long term preservation effects of these ordinances is most doubtful.

1 - Municipal Conservation and Preservation Units

This sub-section I will deal exclusively with municipal units in the area of Rio de janeiro city. Environmental protection areas have been created in the last two years by Rio's municipal government. They are being used to redefine city zoning and building codes or to enforce existing codes in an effective manner. Preservation of natural landscapes is a tertiary priority, if present at all. At least eight units were created, some of them in the heart of the city. Other municipal governments in Rio's metropolitan area announced their intention of using environmental protection areas as an urban planning instrument.[23]

Jacarepagua Municipal Biological Preserve is a sad example of how urban sprawl can delete protected natural areas with government cooperation. Incidentally, it is the only municipal biological preserve that appeared in available sources. Jacarepagua is located in the coastal lowlands South of Rio, about 50 km away from downtown. Restinga vegetation and coastal lagoons merge with forested slopes of the Tijuca ridge, on top of which is the Tijuca National Park. In 1947 a famous Brazilian architect, Lucio Costa, developed a master plan for Jacarepagua's incorporation into city limits. Until then it was a sparsely inhabited farm area, mainly because of the abrupt mountain ridges that isolated it from the city. Costa' plan included preservation areas and established

zoning patterns adequate for them.

In 1953 one of the land development companies active in the area generously "donated" the preserve area to the city government. At that time Rio was still Brazil's capital and was governed by federally appointed administrators. The federal administration and, after 1960, the state government never really established or otherwise secured the preserve area although better roads and even tunnels were making Jacarepagua into a regular outlying neighborhood. In 1965 Carlos Manes Bandeira, an energetic Archeologist, was dismayed when he set out to explore the area of the biological preserve. Several valuable sites had been destroyed by the removal of sand for construction purposes. He could still find broken pieces of bones, instruments and shells carelessly dug out of local sambaquis. Bandeira emphatically says that he was "20 years late" in his frustrated research attempt. Lack of a "conservation" mentality had left a designated preservation area vulnerable to the vagaries of urban expansion.

In 1980 the city government established new zoning ordinances for the already damaged preservation area. Restaurants, social clubs and sport activities were permitted to locate there. Harold Edgard Strang, an experienced preservation professional and activist, predicted that this new zoning would "destroy the integrity" of the lagoon ecosystem and "frustrate" the preserve. Today the ill-defined area of Jacarepagua Biological Preserve is cut by a major federal road, has a small airfield, a major automobile racing track, an enormous municipal fair complex and is

surrounded by social clubs, supermarkets and shopping malls. The preserve's beach area was open to the public.

The Fundacao Brasileira de Conservacao da Natureza, a Rio based environmental group, tried to save the trashed preserve. In 1978 it proposed that a "Brazilian Oceanographic Institute" be created on the preserve to manage it for scientific research, preservation, public education, wildlife management and public recreation. The proposal was never enacted. In 1979 the city government redefined the preserve as a "Zoo-Botanical Park" where animals could live in their natural habitat and leisure could be offered to the population. Environmentalists and scientists spoke out against this transformation. The city government replied that no other choice was left due to "urban encroachment" around the area, a direct consequence of both government inaction and action. The park project included several buildings, a marina, observations decks, picnic areas, trails and a play ground.[24]

The Zoo-Botanical Park was not established, though. The municipal government still refers to the area as a biological preserve. The Jacarepagua area was only gradually occupied by city expansion and the preservation unit was plotted ever since its master plan. Considering these two facts, Jacarepagua biological preserve provides a discouraging example of what can happen to a highly visible preservation unit located in the nation's self-proclaimed "cultural capital", thanks to the combined indifference of federal, state and city governments. It rises somber thoughts about the security of all preservation units located in less

visible or highly remote areas.

An Assessment of Conservation and Preservation Units in Rio de Janeiro State

A definite conclusion about conservation and preservation in Rio de Janeiro state requires further research. Some main points can be stated, though. First, there is a wide variety of units, some of them ill-defined in purpose and in geographical limits. Second, there is the intriguing fact that quite a number of units overlap or juxtapose. This leads this author to suspect about the efficiency of each unit and of the combination of several. Third, there is a great difficulty in obtaining the simplest information about these units. Fourth, a considerable number of units are "passive", like union protective forests, in which no recreation, research, education or wildlife management occurs. Fifth, the political situation of most units is unstable and many times in visible deterioration. Sixth, landscapes like shorelines, estuaries, coastal lagoons and fresh water marshes remain mostly unaffected by preservation and conservation units. Last, but certainly not least, a good number of all types of units preserve altered areas with second growth flora depleted of original fauna, something all but unavoidable in a state ravaged by coffee plantations. A more detailed assessment of the efficiency of some of Rio de Janeiro state's preservation units will follow in the next four chapters. Each chapter is dedicated to the analysis of one of the state's national parks.

CHAPTER 8

Itatiaia National Park - Beyond Brazilian Geology

Natural Characteristics

Itatiaia National Park is located in Rio de Janeiro's extreme Southwest, with a section in the South of the state of Minas Gerais. It comprises territories of the municipios of Resende (Rio de Janeiro) and Aiuruoca, Liberdade and Itamonte (Minas Gerais). Its "geographical center" is roughly on the intersection of latitude 22° and longitude 45°. Itatiaia National Park (hereafter Itatiaia NP) lies on the most convoluted geomorphology in the whole Brazilian territory, in a section of the Mantiqueira mountain range. In Aziz Ab'Saber's division of the Brazilian territory Itatiaia NP is located in the Tropical Atlantic Region.

Itatiaia NP is in an area where the coastal Serra do Mar Range (locally called Bocaina) comes closest to the inland Mantiqueira Range. The Paraiba do Sul river cuts between both. Itatiaia is the local name of the Mantiqueira range. From the highest peaks to the floor of the Paraiba do Sul valley sometimes the difference in altitude runs over 2,000 m. Altitudes in the park vary from 831

m to 2787 m (Itatiaiacu peak, the state's summit), in succeeding "steps" of at least 200 m. At least five peaks with more than 2,400 m lie inside Itatiaia NP.

Each "step" or plateau has its own set of massive rock outcrops and boulders, interspersed with steep slopes covered with original or second growth vegetation and with meadow areas. The last plateau has grand rock boulders that divide the waters rushing to two major rivers. The Grande, in Minas Gerais, more to the West, forms the Parana. The Negro runs Eastward into the Paraiba do Sul basin. The headwaters of both rivers have many waterfalls and rapids. Their flows are very irregular.

The yearly average temperature on the highest Itatiaia plateaus is a chilly 11°C. They are subject to frosts and hail (common), and even slight snowfalls (rare). The "moderate mesothermal" climate of the high plateaus has a mild summer and a dry winter. Below these higj plateaus and above 1,600 m the climate is "medium mesothermal". Yearly average temperature are slightly below 14°C. Summers are mild but winters are rainy. The yearly average temperature on the high plateaus of the Minas Gerais side are slightly higher, around 18°C. The yearly average rainfall in medium range altitudes is 2.22 m, slightly lower than in higher altitudes. The park area has 191 days of rain a year. January is the wettest month with 27 days of rain; August is the driest with only 5. Average relative humidity is 75%.

The gigantic boulders laying on the upper plateau have eruptive origins, although they are not volcanic. The entire

geologic formation has an area of 1,450 km² and is composed of nefelehn cienitro or foyatic rock from the Jurassic. It is the largest alkaline rock formation in the world with the exception of the Kola formation in the Scandinavian peninsula. There is evidence of local glaciation. Ragged rocky peaks and "square", flat-sided boulders combine to form a geomorphology extremely unfamiliar to Brazilians. Local soils are classified as latosoils, podzolic and litosoils. The latter predominate in the park. Litosoils are "incomplete" and "shallow", without distinguishable horizons, composed of incompletely weathered rock fragments.

Although bare rocky soils, ragged rocky outcrops and naked boulders command the attention in the landscape, Itatiaia NP flora has a grand combination of original forests, successional second growth communities and high altitude meadow communities with many wild flowers. Up to 1,200 m altitude tropical rain forests are predominant, original and second growth. Between 1,200 m and 1,600 m the predominant vegetation is alpine rain forests. Above 1,600 m there are meadows and sub-tropical mixed conifer and tropical forests of altitude.

Plentiful rainfall helps preserve dense original forests of "noble" woods and palms in medium range slopes. The more scraggly and stunted alpine trees and respective communities on higher parts and the high meadows are subject to winter fires. Considering the entire range of altitudes, cacti, orchids, lianas, likens, mosses, bromelias, begonias and ferns and many others can be found associated among themselves and with representative species of

tropical forest trees such as cedro, cangerana, imbirucu, paineiras, indaguassu, jequitiba, bicuiba, sapucaia, canela, guatambu, copaibeira, macaranduba, grumixas, cabreuva and pau-ferro. Present at higher altitudes are Brazil's only two native conifers, pinheiro-do-parana (Araucaria augustifolia) and pinheirinho (Podocarpus lambertii), characteristic of sub-tropical and temperate forests. Intensely studied by foreign and Brazilian naturalists in the last 160 years, the local flora has more than a hundred recorded endemic species (specially land orchids and flowers verbenacae, oenoteracae, labiadae and amarilidacae), particularly in the higher plateau areas.

More than 100,000 (estimated) species of insects and 300 species of birds live regularly in the park area, including hummingbirds, hawks and toucans. Several rare or endangered species of felines, rodents, wild dogs, deer, sloths, peccary and primates inhabit Itatiaia NP, besides tapirs, snakes, lizards and amphibians. No large fish have been recorded in the park's streams. Field scientists working for the Park Service recently qualified Itatiaia NP as the single "most important [Brazilian] ecological preserve in the form of a national park". What they probably meant is that among the older parks Itatiaia NP is the most studied in its rich geology, fauna, flora, climate and natural history. They justify their claim with the following arguments: the landscape has different geological origins and is tipped towards different directions, the climate is unique and human occupation was conducted in a manner that allowed for survival of

original flora and fauna or its natural reconstitution.[1] For all this, Itatiaia NP definitely qualifies as a unique natural area in Brazil.

Human Occupation

Puri natives, from the Tupinamba federation, seem to have been the original human dwellers of the region around Itatiaia NP. They probably kept to lower altitudes, closer to the Paraiba do Sul Valley floor. Itatiaia is a name originated from the Puri language meaning "mountain ridge full of peaks" or "ragged crest". This is a very adequate description of what they could see distinctly from the valley floor, even if they never ventured up the hills. The Itatiaia region lies between the Portuguese port areas of Angra dos Reis and Parati and mining regions of Minas Gerais. In 1715 part of the region was included in a huge tract leased by the Portuguese crown to Garcia Rodrigues Paes Leme. But presence of Europeans was constant only after 1744, when an expedition was sent from inland Aiuruoca to search for new gold mining areas in the high sections of Mantiqueira Range. No gold was found but the expedition originated a "donkey train" trail and a stopover area near the present day city of Resende. Puri natives were soon driven out of the Resende area.[2]

Resende was one of those "donkey train" stopovers mentioned in Chapter 6 that eventually turned into a permanent settlement. In 1747 it earned that invariable sign with which the Portuguese signaled their permanent settlements: a chapel. Commerce

flourished and in 1757 the area was designated as a freguesia (a mixed administrative and religious jurisdiction). With the exhaustion of most Minas Gerais mines around 1780, Resende became a convenient option for ex-mining operators looking into the business of farming. Coffee seeds and seedlings were introduced in the area around 1780 and by 1802 coffee stands were already important enough to be mentioned as assets in contracts, leases and sales recorded in Public Notaries.

Resende was raised to the rank of village in 1801, when the name Resende became official. It quickly became the pioneer area for coffee plantations and related black slavery in the Paraiba do Sul Valley. In 1822 the French naturalist Auguste de Saint-Hillaire was impressed by large coffee farms around Resende, some with 100,000 plants each. The great production of coffee was responsible for moving Resende up the administrative hierarchy again: in 1848 the Imperial government elevated Resende to the status of city. Population figures for 1852, when Resende's coffee production was almost peaking, illustrate the importance of Black slavery. Of 34,500 inhabitants, 10,300 were slaves.[3]

The boom and bust cycle in the Resende area shows out clearly in the following figures and dates. In 1842 200,000 arrobas (a traditional Portuguese weight measure roughly equivalent to 15 kilograms) of coffee were produced by some 400 farms. In 1852 production peaked with 413 farms producing 800,000 arrobas. In 1860 the same number of farms produced only 200,000 arrobas, the 1842 level. From there it went downhill all the way to coffee

plant "eradication" and adoption of dairy farming in many properties late in the 19th century. Campo Belo, a Resende subdivision located in higher Mantiqueira range slopes, had 40 coffee farms in 1850, about 10% of the total. Sections of these 40 farms are today the lower sections of Itatiaia NP. Besides coffee Resende farms produced important staple crops such as mandioc, rice, beans and corn.[4]

Maria Celina Whateley notes that average farm sizes in Resende were somewhat smaller than in the contemporary important Valenca-Vassouras coffee plantation area downstream, studied by the American scholar Stanley J. Stein. Resende farmers were less prosperous. This lead to a relative disadvantage of the Resende area when slave prices started to soar in the early 1850's, as a result of the Brazilian government finally cracking down on the forbidden slave trade. This crackdown happened exactly when Resende's coffee production were starting to decline. Prices for slaves soared 150% between 1850 and 1875 and even more after that. Resende's coffee farmers had to tend their stands or open new plantations employing rented slaves and free Blacks.

Probably due to ecological changes, a "white moth" disease plagued Resende's coffee stands in the mid-1850's, exactly when labor became scarce and local plantations were "aging". The adult insect deposited eggs on the bushes' leaves and the growing larvae ate their stems. Although bushes survived, they produced no berries until the next year. By 1856 the disease made Resende's coffee production hit almost a rock-bottom. It fell more than 90%

as compared with the 1852 peak.[5] All this only accelerated regional downfall. After a slight comeback in the late 1860's coffee declined continuously in Resende, apparently without any further diseases.

Coffee beans were at first transported out of Resende in exactly the same manner and through the same trails as gold and precious stones had come across from Minas Gerais. The old "donkey train" trails took coffee to Parati and Angra dos Reis port areas. The difficult trip over the Bocaina range and down to the coast took several days. From there coffee was shipped to Rio. This mode was predominant until 1864.

From 1864 to 1872 sail boats and row boats took the declining Resende production downstream to Barra do Pirai. This trip lasted less than a day. In Barra do Pirai coffee bags were transferred to railroad cars bound to Rio de Janeiro. Proposals to tame some river rapids with expensive channels came up in this period. Although these proposals were not put into practice they reveal how coffee plantations pressed for even further changes in the environment. Railroad tracks were soon extended to Resende. In 1872 the first regular cargo and passenger train entered the city. Local production was now taken by rail directly to Rio de Janeiro in just a few hours.[6]

The arrival of the railroad came too late to rescue Resende from decline. In 1879 a few farmers developed a system for centralized handling of harvested berries for drying, removing pulp and peel, roasting and packaging. Smaller farms could dedicate

themselves exclusively to planting and harvesting. Possible scale benefits from this division of labor were erased by declining production and productivity.

In 1874 a great part of Resende's coffee plants were not harvested for lack of workers. In 1886 Resende's coffee still retained enough quality to win prizes in international fairs, but quantity never stopped plummeting. More mobile farmers were buying lands in Sao Paulo's Western plateau areas, in search of virgin forest stands to be cut for new coffee plantations. When Resende farmers moved out they took workers, slaves, masons, carpenters, merchants, craftsmen and others with them. Part of Whateley's own family moved from Resende to the frontier Ribeirao Preto area, in Sao Paulo. After slavery abolition in 1888 even ex-slaves moved towards Sao Paulo in search of jobs and a new start.[7] The itinerancy of coffee plantations was working to leave Resende a depleted area, socially stagnant and ecologically impoverished.

The fall was dramatic. In the 1860's Resende was still "the most important city" in the Paraiba do Sul Valley. It was probably the third most important city in Rio de Janeiro province, after Rio and Campos. It had several daily or weekly newspapers, religious events, a theater, a Free Mason Lodge, good schools, commerce, a horse race track and easy access to the coast. Later it had one of the first movie houses in Brazil's interior. But the decline of coffee changed Resende very fast. Socially ranking families moved away with their extended families and assets. Merchants and professionals followed them. Impoverished farmers no longer cared

for their plantations.

By 1874 Resende had only 329 km² under cultivation, against more than 920 km² under capoeira (successional second growth) or fallow. Only 65 km² were considered "virgin", all of them in the high Mantiqueira range area. In 1899 an outside expert hired by the Resende Farmers' Association to assess local agricultural prospects, bluntly wrote that Resende was "ruined" for coffee production. In 1906 Resende already produced 33% of the state's milk, using its depleted slopes as pastures after eradication of coffee shrubs.[8] Itatiaia NP would later be plotted on a combination of capoeira and virgin areas in the higher sections of Resende and neighboring lands of other three coffee producing municipios in Minas Gerais.

A belated federal government sponsored colonization project affected the future site of Itatiaia NP, adding to coffee's already extensive destruction. Between 1908 and 1918 "Itatiaia" and "Visconde de Maua" Colonial Settlements attracted a few hundred foreign immigrants (Italian and Scandinavian) to develop "small scale cultures" exactly in the steep slopes of the Campo Belo region. These colonies deforested steep slopes between the altitudes of 700 m and 1,200 m, where many original forests had been spared by coffee plantations. Fear of frost had probably dictated the absence of coffee plantations on these slopes.[9] This rare government initiative to establish smallholders in a plantation-dominated state therefore gave a further blow to the original ecological balance of the higher areas of Resende, leading

to their deforestation. It is true, though, that at least on the Minas Gerais Mantiqueira Range coffee had been planted at even higher altitudes, including areas today within Itatiaia NP boundaries.

Many naturalists travelled and collected specimens in the mountains slopes and meadows around Resende and specifically in the area of Itatiaia NP. From 1908 to 1928, at least, the Rio de Janeiro Botanical Garden (subordinated to the Department of Agriculture), managed a "Biological Station of Itatiaia". Regular expeditions were made by technicians and scientists linked to the Botanical Garden staff.[10] Agriculture Department personnel gained first-hand knowledge of the area. This was certainly a basic reason for the selection of the area as Brazil's first national park in 1937. Additionally, the station must have contributed to control human encroachment at least on the biologically rich high meadows.

In the early 1940's another type of human land use started to affect the higher Itatiaia area. The Army built and operated its new officers' academy in the outskirts of Resende. Officer training included extensive hiking and wilderness survival drills and even occasional simulated war maneuvers in the Mantiqueira mountain areas.[11]

In 1985 the municipio of Resende had 102,000 inhabitants. It was the 17th most populous municipio of Rio de Janeiro's 64. In the state's geography Resende is a medium-sized city-municipio, but rather remote due to its extreme Western position. Ironically,

most Rio de Janeiro inhabitants know Resende in its original capacity: as a stopover for buses and cars travelling between Rio and Sao Paulo cities. Its present day activities are dairy farming, poultry raising and small food industries, besides a dependable flow of tourists attracted to the nearby mountains of Bocaina and Mantiqueira, and to Itatiaia NP itself. Leisure homes and small hotels survive in plots marked out for the federal colonial settlements and some of them lie inside park boundaries.[12]

Creation of Itatiaia National Park

The creation of Itatiaia NP coincides with the beginnings of park history in Brazil. An Instituto publication credits the Botanist Alberto Loefgren as the main champion of the park and mentions Swiss naturalist Joseph Hubmeyer as its original proponent. In a 1913 text Hubmeyer emphasized the area's "inexhaustible potential" for scientific research and its adequate location (near Rio, Sao Paulo and Belo Horizonte) for leisure and hiking. With the 1934 Forest Code still very recent, the 1937 creation decree mentioned the Botanical Station as a reason for creating the Itatiaia NP. One park expert has stated that "scientific" purposes were more emphasized in the creation decree than "recreational" ones. Anyway, Itatiaia NP's location, almost equidistant from Brazil's three major population centers is a major factor of its recreational potential.

The creation decree also mentions the existence of primitive forests "entirely different from other mountain forests in Brazil",

the need to attract "foreign and national tourists" and the recommendation of the area made by the Federal Forest Council. The decree text referred to private colonization plots existing in the proposed park area and ordered their acquisition by government. Some tracts of public land should be "reserved" for hotels.

The first Brazilian national park was initially managed by a specific "Itatiaia National Park Commission", created inside the Agriculture Department by Decree Law 337, March 16, 1938. This statute again mentions the private plots of "Itatiaia" and "Visconde de Maua" Colonial Settlements. The wording now pointed towards a compromise with their owners. Plots now could be leased for lodging park visitors or traded for areas outside park boundaries.[13] The problem of these private holdings inside Itatiaia NP was not solved and became chronic.

The "Itatiaia National Park Commission" was extinguished by Decree Law 4084, February 4, 1942. Even before that Decree Law 982 had reorganized the Servico Florestal Federal, which gained a "National Park Section". This small third-echelon office in the Department of Agriculture was responsible for Brazilian national parks until 1967, when the Instituto Brasileiro de Desenvolvimento Florestal was created. In 1946 a union protective forest, named Mantiqueira, was created as a buffer zone around some of Itatiaia NP's boundaries.[14]

Administration of Itatiaia National Park

Until 1959 there were only four national parks in Brazil.

Itatiaia NP thus had an important role in forging Brazilian park administration standards. Scientific research was an Itatiaia NP activity that unfortunately did not flourish in other parks. In the late 1940's and early 1950's, the park's energetic and long time director, Wanderbilt Duarte de Barros, did his best to establish the unit as a natural history research center. At least two of his initiatives left published records that must be mentioned here. Between 1949 and 1951 Oliverio Pinto, from the Zoology Service of Sao Paulo State's Department of Agriculture, with the help of park personnel, did extensive and detailed field study of local bird fauna. This was done out of an invitation by Barros. Besides establishing a check list of 240 positively identified species, Pinto described them, speculated about their preferred ranges inside park boundaries and later helped organize a museum of stuffed specimens, still extant in 1988.

In his most interesting report Pinto puts his own research in the context of prior efforts which had helped to enhance the fame of the Itatiaia area. He mentions the expedition by the botanist Ernesto Ule, from the Museu Nacional do Rio de Janeiro (1894). In 1901 and 1921 new expeditions sponsored by the same institution studied fauna and flora. The Museu Paulista, from Sao Paulo, sent an expedition in 1906. The American Museum of Natural History, by initiative of Frank Murphy Chapman, sent a research team to Itatiaia, directed by E.G. Holt. The precise date of this expedition is not clear. Pinto's work added 53 species to the 187 identified by the Holt group.[15]

Almost at the same time Barros invited botanist Alexandre Curt Brade to do an "inventory" of the park's flora. Brade was familiar with the area since 1913. Besides presenting a very well organized text and check list, Brade too put his research in historical context mentioning scores of naturalists and expeditions that explored Itatiaia since 1822: Auguste Saint-Hillaire (1822), Frederick Sellow (1830), Auguste F. M. Glaziou (1872), Ritter von Fernsee (1879), Per Dusen (1902-1903), Alberto J. de Sampaio (1927), P. Porto (1914-1938) and Firmino Tamandare de Toledo Junior (1913).[16] After his expedition, incidentally, Glaziou was active in the landscaping of a future section of Tijuca NP.

Through Barros' long tenure Itatiaia NP was managed in a highly professional manner. Besides scientific research many other activities and plans reveal concern about preservation, visitation and public education. Buildings and facilities were expanded; cabins were built; four collective lodges were placed on trails to shelter hikers. Campgrounds were established and managed by a Boy Scouts chapter. Many trails were built along the park's different landscapes. The park was adequately staffed. A small library exists in the Fauna Museum. Barros believed that public visitation and education was an important part of the park's role and was specially optimistic about the park's future because of its location and easy access.[17]

Starting in the mid-1960's, though, Itatiaia NP suffered from the general abandonment of national parks and from the aging of its infra-structure. Trails, cabins, collective lodges, museum, staff

housing and even the visitors center were in need of repairs or restoration. Private plots with hotels and resort houses became a permanent problem. Staff dwindled, as retirements and dismissals were not met with enough substitutions.

In 1977 Marc Dourojeanni, a foreign park expert, presented the Instituto with a report on the state of selected Brazilian parks. He was positively impressed with Itatiaia NP. He considered it to have "unquestionable scientific and aesthetic interest", although it was excessively "small". Dourojeanni was extremely worried about private houses and hotels and not only because they occupy at least 10% of the park. In his opinion the worse was that they "loosen control [over the park] and produce a great deal confusion in the minds of visitors". Indeed visitors could witness blatant violations of park rules right in its core area (landscaping, domestic animals, introduction of exotic plants, etc). "Elementary principles of conservation" were violated by hotel and house owners, stimulating destructive behavior among visitors.

Dourojeanni suggested cutting off all private plots from the park and, in the meantime, curbing development and further introduction of domestic animals and alien plants. He proposed the expansion of park boundaries to some lower slopes and plateaus, to guarantee adequate habitat for certain animal species. In his opinion park management should try to restrict, and not stimulate, hiking on the higher plateau areas. Trail erosion and trampling was damaging important wild flower areas.[18]

In 1982, acting as a private citizen, Mario N. Borgonovi visited Itatiaia NP and presented a report about it to the direction of the Fundacao Brasileira de Conservacao da Natureza, the private Rio de Janeiro environmental group so many times mentioned in this text. The problem of private lands, houses and hotels inside the park lingered on. Private owners even formed an association to protect their interests, although private hotels and houses inside park boundaries are obviously against better park management standards and, indeed, against the letter of the law. Borgonovi collected a suggestion to divide the park in two: a national park proper and a "natural park". Private holdings would all be comprised by this second area. He favored the suggestion as an "adaptation" to the reality of resort houses and hotels, intensively used by owners, leasers and guests. It should be reminded that "natural parks" are still non-existent in Brazilian legislation. Anyway, the owners association opposed the idea, for unclear reasons. The stalemate continues until this day.

Park personnel in 1982 was reduced to 44, down from more than 120 in the late 1950's. There were 22 rangers, four office workers, four clerks, four gardeners, five craftsmen and one helper, two watchmen, one biologist and one forester. Park buildings and facilities included nine staff houses, nine visitor cabins, three collective lodgings, a garage for repairs, one wood shop, seven observation posts, eight outposts, a school, a central office and visitor center, a deposit, a dressing room, a greenhouse and two camping grounds, besides the wildlife museum, a library,

a herbarium and a weather station.[19]

Borgonovi pointed out other problems such as telecommunication towers and TV transmission antennas located on conspicuous ridges inside park boundaries. Domestic animals were still present. He concluded with suggestions: fences around critical boundaries, qualified rangers, visitation restrictions, extinction of park cabins and collective lodges, concentration of personnel in ecologically critical areas, research projects, hiring of guides and environmental education hikes for children.[20] It is clear from Borgonovi's report that **Itatiaia** is Brazil's best equipped national park. However its installations and facilities lack proper maintenance. Borgonovi's suggestion to restrict visitation or, at least, visitor impact in ecologically sensitive areas is understandable given the destruction caused by visitors.

In 1982 the park's Management Plan was published. It blended together the Instituto's official opinions and proposals with those of scientists and environmentalists engaged through the Fundacao Brasileira de Conservacao da Natureza. **Itatiaia** NP was again hailed as a "unique sample" of coastal tropical rain forests in a singular geological and geomorphological landscape. The "excellent potential" for public visitation and the protection of the headwaters of mountain streams and rivers are also cited as important features.

An important detail about private holdings is added. Most of the park's own buildings and facilities are built very close to privately owned plots. If the unit is in fact divided into a

national park and a natural park, as suggested by the plan, current administration buildings and facilities will be located in the "natural park" section, obviously not the ideal location. Besides this, private areas were sub-divided and intensively developed, adding to their negative effects on park ecology and visitors.

The plan suggests that new areas be added to the park to compensate for the natural park area loss and to guarantee adequate habitat for animals. Lack of "educational effort" is deemed responsible for recent mountain-climbing accidents, lost hikers and destruction of natural features. This is all the more serious because visitation grew in the late 1970's and early 1980's. The plan considers that the park offers visitors many good trails through varying scenic and natural landscapes. A detailed zoning is proposed. Five extensive areas were classified as "closed". They should be left to entirely natural processes, including the "repopulation of fauna and flora". The only human activities allowed in them are supervision and scientific observation. Sensitive and biologically rich plateau areas were included in the "closed" zone. Other zones, according to the 1979 National Park Regulation law, are meticulously described, including a "conflictive use" one, where microwave and TV antennas are located. The plan suggests their immediate dismantlement. The document concludes with detailed "environmental", "public use" and "operational" programs.[21]

Current Situation

Itatiaia NP is undoubtedly the best equipped national park in Brazil. With the exception of Iguacu NP, more famous for its waterfalls then for its limited park recreation facilities, it is the best known park in Brazil. Being the oldest park, this would be expected. Ideally it should be a model for park management. However, land ownership problems have plagued park managers for half a century with serious implications for park integrity, visitation standards and environmental preservation. The ecological quality of this intensively studied region seems to be holding despite growing pressures from neighboring farms and increasing visitation. E. Gouveia, a field Biologist, still found at least 163 endemic floral species in 1985 and confirmed the continual occurrence of numerous amphibians, reptiles, birds and mammals.[22]

Itatiaia NP's location is ideal for the environmental education of visitors from the country's three largest cities and metropolitan areas. It has helped establish a solid tourism and resort industry in an otherwise stagnant local economy. Its access is easy. It can be a source of seeds and seedlings of rare plant species. But the park service has to put in much more effort for all this potential to be reached. The park has performed better in the past than now. As of 1987 the park was almost abandoned: only 12 rangers and a handful of administrative and crafts personnel were on duty. A "Pro-Itatiaia National Park Association", based in Resende, was in June of 1987 actually defending its <u>closure</u> to

visitors so that its "infra-structure could be reorganized" and its natural features evaluated.[23]

Therefore, the oldest and best equipped Brazilian national park is today so vulnerable that its shutdown to visitation is being requested by environmentally concerned citizens. This is a discouraging comment on the situation of national parks in the country. Even a 50-year old, highly visible, nationally and internationally famous, thoroughly studied and relatively popular park is muddling through basic problems that political will could have solved long ago.

CHAPTER 9

Serra dos Orgaos National Park - The Pipe Organ Peaks

Natural Characteristics

Serra dos Orgaos National Park is located in the Central-Eastern portion of Rio de Janeiro's Serra do Mar mountain range. The park's name derives from the local denomination of the Serra do Mar in the municipios of Teresopolis and Petropolis. It lies roughly on the intersection of Latitude 22° with Longitude 42°. Climatically it lies inside the Tropical Atlantic Region defined by Azis Ab'Saber. In phytogeographic terms it is located in the Southeastern Atlantic Region. Serra dos Orgaos National Park (hereafter Serra dos Orgaos NP) is basically a steep East-facing slope of the Serra do Mar. Its boundaries affect the municipios of Teresopolis, Petropolis and Mage.

Serra dos Orgaos NP slopes rise abruptly from the Coastal Plain only 20 km away from Guanabara bay's innermost edge. The terrain is steep and convoluted. Its short rivers run directly to the plain and into Guanabara bay. They have extremely high gradients for Brazilian standards. No large river flows through the park nor is supplied by its tumbling waters.

The area's geology is dominated by gneiss and granite peaks and outcrops from the Pterozoic, estimated to belong to the Late Superior Pre-Cambrian era. Laurentian granite outcrops are also present. These Eastern-facing rocks are the most impressive result of the geologic faulting that occurred 60 million years ago as a consequence of seismic activity generated by the formation of the Andes. At that time a long and massive section of the **Serra do Mar** broke off and sunk into the Atlantic Ocean.

Ten peaks inside the park stand above 2,000 m and six others above 1,500 m. Pedra do Sino, with 2,263 m, is the park's summit. The catchy Dedo de Deus ("God's Finger") peak, with 1,692 m, also lies within the park. The park's lowest altitude is 145 m, in a foothill area inside the mostly flat municipio of Mage. Level areas inside the park are very rare.

Climate varies sharply with altitudes in **Serra dos Orgaos** National Park. From lower to higher sections, the climate changes from hot, sub-hot, moderate mesothermal to medium mesothermal. The upper ridges of the park are the coldest areas in the state of Rio de Janeiro together with the summits of **Itatiaia** National Park. Along the whole slope gradient temperatures are on the average 5 to 6° below the ones recorded on the warm Coastal Plain. Frost and hail are common at higher altitudes.

The average yearly temperature at 1,000 m is a cool 17.8°. The average yearly rainfall is between 2.0 and 2.5 m, growing sharply with altitude to a maximum of 3.6 m. Hydraulic balances are positive. Average relative humidity is steadily between 80 and

90%, commonly reaching 99% at higher altitudes.

Yellow, red-yellow and red latosoils are predominant throughout the park. Flora has four main types according to altitude. Below 1,400 m there are tropical coastal rain forests. Tropical mountain rain forests predominate between 1,400 and 1,800 m. A formation called tropical rain forests of altitude thrives between 1,800 and 2,000 m. Above 2,000 m there are open meadows with bushes and grasses; likens cover boulders and shaded outcrops. Floral species and communities are much like Itatiaia's, except for Itatiaia's much richer wild flower display.

Much of the flora at medium and higher altitudes remained undisturbed by human activities. The park's fauna is a rich sampling of Brazil's Atlantic coastal forest animals, including primates, felines, reptiles, amphibians, insects and birds. According to the biogeographic theory of "pleistocene refuges" proposed by K.S. Brown, Serra dos Orgaos NP lies inside a major Atlantic Coastal refuge. This means that the area has a great number of endemic species of fauna and flora that survived harsh conditions and repopulated neighboring areas.

Even the capoeiras (successional second growth) found inside park boundaries seem to proceed rapidly towards the climax formation of the park's best preserved original forests, located in the Soberbo valley. Altitude, climate, intense rainfall and the closed canopy have represented barriers to exotic or invader species. Natural fires are rare due to humidity but in 1955 a major man-made fire blazed for three months along one of the parks

edges. Two experts consider that the "lush Atlantic tropical forests of altitude" in **Serra dos Orgaos** NP probably contain "non-described species" of flora. They also recorded 13 of Brazil's officially endangered species as occurring in the park.[1]

Human Occupation

Serra dos Orgaos means literally "pipe organ mountain range". The most probable origin of this denomination is the Portuguese colonists' religious imagination. They saw in the area's slender peaks a semblance with the long organ pipes of some European cathedrals. Steep slopes, dense forests and cold probably kept Native Americans away from the park area, except for occasional hunting and gathering expeditions. No archeological evidence has been found indicating even temporary settlements of Native Americans inside current park boundaries. On the adjoining Mage lowlands, **Timbira Natives** met the first European arrivals and were quickly pushed out of the area by them.

Early Portuguese and French settlers in nearby Guanabara bay may have explored the nearby plains and mountains. In 1531, for example, four Portuguese explorers roamed for several weeks through the mountains behind Guanabara bay, following orders of a ranking Portuguese colonist, Martim Afonso de Souza. These men most probably crossed park areas.

The earliest Portuguese settlement anywhere near **Serra dos Orgaos** NP was a Coastal Plain <u>sesmaria</u> called Mage, located on the innermost edge of Guanabara bay. It was leased in 1567 to a

colonist called Simao da Mota. This was immediately after the French Huguenots had been pushed out of Guanabara bay. In 1632 another large sesmaria was leased, comprising the area of the current city of Petropolis. It was not occupied, though.

In 1696 coastal Mage was raised to the rank of freguesia. In 1703 a royal ordinance proposed to stimulate cattle raising along the "donkey train" trails between Rio and Minas Gerais mines by leasing new sesmarias specifically for that purpose. The ordinance mentioned the trail crossing **Serra dos Orgaos**. This illustrates how the **Serra do Mar** range remained a local frontier for Rio until at least 1700, as emphasized in Chapter 6.

By 1788 there were maps on which the small settlement of Teresopolis was plotted. By then the **Serra do Mar** range had been crossed regularly for almost a century by "donkey trains". The major trail between Rio and Vila Rica, the most important city in the mining district, passed very close to current park boundaries. The same trails were later used for transporting coffee from the Paraiba do Sul Valley to Maua port, near Mage. Mage became a village in 1789, when it had become a busy stopover port between Rio and the mining district. A few years later it would serve the coffee trade in the same capacity. Mage also had considerable sugar-cane and cattle farms of its own.

In 1857 Mage was elevated to the rank of city due to its busy port and coffee plantations. It benefited also from Brazil's first railroad, which in 1854 connected the nearby port of Maua to the **Serra do Mar** foothills behind Guanabara bay. The decline of its

own coffee farms and Rio's direct railroad connections to coffee producing regions wiped out Mage's economic dynamism and literally erased its port in the 1860's. Extensive silting of the modest rivers flowing into Guanabara bay also helped eliminate Mage's port. Health standards dropped sharply as stagnant waters became breeding areas for disease-carrying mosquitoes. Mage is a mostly flat, Coastal Plain **municipio**, but its territory extends up the **Serra dos Orgaos** range and actually includes the Dedo de Deus peak.

Rio de Janeiro city residents started using, early in the 19th century, areas close to the park as refuges from Rio's strife, heat and diseases. In 1818 an English citizen called George March established a farm in the slopes of the Teresopolis area. This farm was better known as a haven for English families escaping Rio's summers than for its agricultural production. Just a decade later the Brazilian Imperial family followed suit. It started to establish nearby Petropolis as the summer city for the court and the Imperial government. Around 1850 marshy Rio's health standards were appallingly low. Yellow fever and cholera were epidemic. Nobles, politicians, foreign diplomats, merchants and their families began to live part of the year or year around in the nearby mountain areas, near Teresopolis and Petropolis.

Coffee plantations were rampant in extensive parts of the territories of Petropolis, Teresopolis and Mage but they somehow spared Serra dos Orgaos NP slopes. No articulated explanation for this appears in available sources. Two educated guesses can be presented. First, resort houses for Rio's elite certainly

precluded large-scale coffee farms and preserved natural vegetation. Second, two German explorers, Spix and Martius, did extensive species collecting in the **Serra dos Orgaos** in 1817. They most probably called the attention of influential politicians and administrators to preserve the area. By the late 19th century maps drawn with the help of unspecified "military personnel from Belgium" already pointed to the need of protecting the area. Other foreign travellers and explorers reportedly studied and wrote about the area.

Teresopolis, a mountain top **municipio**, had its territory carved out of the **municipios** of Mage and Nova Friburgo. It was crossed by a latter day "donkey train" trail that went through a farm called Serra dos Orgaos. This trail was designed to be shorter and easier than the others. Probably because of its location in a very convoluted area, stopovers on this trail did not originate a permanent settlement as happened in some other places. In this case it was the progress of the Serra dos Orgaos farm which colonized the area. This big coffee farm populated the area and was later broken down into urban lots, a very common pattern in the origin of Brazilian inland cities.

When Teresopolis was considered a freguesia in 1855 there already was a solid church house. The settlement's name was Santo Antonio do Paquequer. The current city of Teresopolis developed in the lots around the farm and the church. Teresopolis was a name derived from the Brazilian Empress' name (Teresa Cristina). Indeed, the Imperial family enjoyed touring the area.

Local coffee farms were all but disrupted with the abolition of slavery in 1888. A civilian-military coup instituted republicanism in 1889 and sent the Imperial family to an European exile. Teresopolis managed to survive the collapse of its coffee farms and the absence of its most illustrious guests. For a fleeting year, in 1893, it was the capital of the state of Rio de Janeiro during a dire emergency. A Navy rebellion that lasted almost a half a year made coastal Rio and Niteroi (the state's capital) dangerous places for government officials. The President of Brazil himself at the same time governed the country out of nearby Petropolis.

As with Teresopolis, Petropolis' mountain top location retarded permanent European occupation. Only in 1686 were sesmarias leased and effectively occupied by Portuguese colonists in the area. Bernardo Soares Proenca, a Portuguese Army Sergeant-Major, was in 1721 granted a sesmaria in the exact location of the city of Petropolis. He is credited with the construction of an important shortcut for a "donkey train" trail through his property. Several other farms were established around Proenca's and heirs leased parts of them to other farmers.

In the 1820's even the Emperor Pedro I bought a property in the area, later explored by his son Pedro II. In 1828 Major Julio F. Koeler, a German army officer incorporated into the Brazilian Army, was ordered to make a road out of the "donkey train" trail between Rio and Petropolis. This was the first step to make Petropolis the Emperor's summer city and, indeed, Brazil's summer

capital.

At the public's expense, the Imperial government hired in 1840 a French immigration company to select at least 600 couples of immigrants (Swiss, French and German) to settle in the Petropolis area. They would establish farms and work in the construction of a royal palace and associated buildings and facilities. In the slave-ridden social scene of Rio de Janeiro province this was an uncommon example of massive immigration of non-Portuguese Europeans.

By 1843 two heavy wooden crosses were posted in the area of the projected Imperial summer city. Major Koeler was active both in road and city building. The first German colonists arrived in Petropolis in 1845. In 1846 Petropolis was considered a freguesia and in 1857 was elevated to the rank of city. It became government's summer city and permanent or part time residence for many of Rio's social and political elite, much like the less urbanized Teresopolis area, 50 km away.

As with Teresopolis, the end of slavery and of monarchy affected Petropolis in negative ways. Political vagaries - the naval revolt mentioned above - brought the federal government to Petropolis in 1893. Petropolis in fact remained as capital of Rio de Janeiro state from 1893 to 1902, a condition that somewhat soothed the impact of loosing the status of "Imperial city".[2]

The current situation of the **municipios** of Mage, Teresopolis and Petropolis is much different from Resende's. All three are in Rio de Janeiro's metropolitan area. Mage is today mostly a Rio

suburb, on the way to become a "dormitory" area for low-income commuters. Its rural areas are a depressed combination of small subsistence plots and a few dairy farms. Mage sections close to the foothills are sparsely populated and the Serra dos Orgaos slopes are hardly inhabited at all.

Teresopolis and Petropolis cities have retained their original quality of mountain resort areas. Hotel, lodges, camping grounds and social clubs attract rich and middle-class Rio inhabitants, if they do not have their own resort houses. A growing population of middle-class commuters is noticeable. Populations of both cities peak in the summer, when Rio's inhabitants still drive up the mountains for cooler days and nights. Cool and often frosty winters also attract a number of Rio dwellers less idiosyncratic about cold.[3]

Table 31

Population Growth in the Municipios of Mage, Petropolis and Teresopolis between 1960 and 1980

Municipio	Population		
	1960	1970	1980
Mage	59,076	113,023	180,600
Petropolis	150,000	189,140	245,700
Teresopolis	52,318	73,128	97,000

Source: Brazilian Census results cited by IBDF-FBCN. Plano de Manejo - Parque Nacional da Serra dos Orgaos. Brasilia, 1980. p.34.

Table 31 shows how the three **municipios** had rapid population growth in the last three decades. Mage, Petropolis and Teresopolis respectively rank 10th, 7th and 15th in population among Rio de Janeiro's 64 **municipios**. **Serra dos Orgaos** is therefore subject to much visitation pressures from nearby cities and Rio de Janeiro city itself, which lies less than 80 km away.

Creation of Serra dos Orgaos National Park

Serra dos Orgaos NP was Brazil's third national park. It was created in 1939. A newspaper article in the Jornal do Commercio, dated September 25, 1938, credits Edgard Chagas Doria with the original proposal of a national park in the area with the purpose of protecting watersheds. Warren Dean suggests that an important textile factory pressed for the park in order to guarantee its own water supply. The park was plotted around two areas donated by the municipal government of Teresopolis and by an unidentified private land owner. Donated areas totalled only 10 km^2 but the decreed area of the park was 100 km^2.

The creation decree stated as objectives the protection of Teresopolis watersheds, the preservation of original and undisturbed forested slopes for scientific research, soil conservation and tourism. The purpose of conserving soil anticipated the role of the numerous union protective forests later created on nearby slopes. As for tourism, the park is indeed located near Rio, along a major federal road. Only 80 km from downtown Rio, the park is easily accessible to a large urban

population. An Instituto document stresses the park's accessibility and considers it to be another "urban national park", similar to **Tijuca.**[4]

Many reasons, therefore, explain the creation of the park. Rio's elite resort houses helped spare the area from coffee farms. Spix and Martius' botanical findings gave the area a certain scientific fame. Resort tradition became a major economic activity. Easy access guarantees a large flow of visitors from nearby cities.

Administration of Serra dos Orgaos National Park

As with **Itatiaia**, the golden days of **Serra dos Orgaos** NP are long past. Elyowald Chagas Oliveira, its long time director, states that between 1942 and 1950 he had enough financial support to open trails, build bridges and lodges and establish facilities. He used mainly "hired workers". In 1951, in contrast, most park personnel were federal government workers, ill-paid and much less productive. Oliveira considers that the park "decayed" after 1951.

In 1959 the nearby federal road was modernized. Visitation tripled exactly when personnel was lacking. Road building reportedly originated a major fire which affected some sections of the park. Despite growing visitation pressures, **Serra dos Orgaos** NP never again had personnel and support comparable to the 1940's.[5]

Oliveira personally reported that in 1967 more than 500,000 visitors had flooded the park in more than 30,000 vehicles, most of them touring buses. The original infra-structure still resisted

and was actually the third best among Brazilian national parks, behind **Itatiaia** and **Iguacu**. The core area has paved roads, lawns, flower beds, four parking lots and a dirt road leading to an artificial river swimming pool. Around the pool are locker-rooms and bathrooms, a snack bar, a restaurant for 300 people and a picnic area for another 250. Administration facilities included six offices, a garage, storage buildings, a nursery and herbarium, metal and wood shops, a laundry area, a medical center, a restaurant, seven staff houses and two apartments "reserved for the Secretary of Agriculture and the President of the Instituto Brasileiro de Desenvolvimento Florestal".

Visitors also had camping grounds and cabins, served by a third restaurant. Four collective lodgings were placed on hiking and mountain climbing trails. A second core area lies at a lower altitude, in Mage. It has natural river pools, a farm house, a natural history museum named Martius (for the German explorer), a chapel, camping grounds and a soccer field.[6] For Brazilian standards, therefore, **Serra dos Orgaos** is indeed a well equipped park. Although its peaks can be seen from downtown Rio on a clear day, the park provides demanding hikes and mountain climbs as well as day trips. It therefore appeals to a wide variety of visitors.

The park's Management Plan was published in 1980. An interesting revelation not mentioned in other sources is that the park's main core area is located inside the city limits of Teresopolis. Urban sprawl therefore is a major threat to the park's integrity. The plan states the park's "intended" area as

93.7 km², not very far from the original 100 km². But it suggested a drastic reduction to 40 km². The document mentions specific park areas occupied by small farms and even a small water supply dam inside park limits.

Plan drafters proposed a very strict zoning: 80& of "closed areas", 15% of "primitive" areas and the remaining 5% divided between "intensive", "extensive", "historical-cultural" and "special" (administrative) uses. The ideal staff should add up to 66: 11 administrative, 19 rangers, 34 maintenance workers and two researchers. The document considered the unit of "great importance" in accordance with its original objectives. But another Instituto document states that **Serra dos Orgaos** NP would have to be at least "three or four times more extensive" in order to properly perpetuate its fauna.[7]

Again acting as a private citizen, Mario N. Borgonovi visited the **Serra dos Orgaos** NP in 1982 and filed a report to the Fundacao Brasileira de Conservacao da Natureza. His findings were discouraging. 42 years after its creation the park still lacked a defined perimeter. Of the proposed 100 km² the Instituto controlled only a controversial 23.5. The Management Plan had proposed a 60% reduction in park area, but Teresopolis developers, Borgonovi noted, were still pressing to build on unstable slopes right on the edge of the park. The substantial concession to alternative land use interests had backfired into further pressures on the park. Basic equipment and facilities were still operational although much of it was in need of repair and maintenance.

Borgonovi noticed faulty waste management, an almost complete lack of public information and farms inside park boundaries. The Management Plan was being applied only in part.

As in Itatiaia, Borgonovi felt that personnel and infra-structure were excessively directed towards visitation. Expensive parking lots, locker rooms and picnic areas attracted weekend crowds "not interested" in the park's preservation. In 1977 personnel numbered 70, consistent with the Management Plan's ideal of 66. But in 1982 the number was down to 36, mainly because of retirees not being substituted. Borgonovi gave a breakdown of the staff: 12 rangers, nine gardeners, three stone masons, two painters, two watchmen, seven office workers and a director (the only one with a university degree). The park had six vehicles, all of them more than five years old.

Borgonovi presented suggestions. Visitation should be "minimized". Facilities and staff should concentrate on preservation, education and research. Park borders should be fenced off. Rangers should have proper training. Cabins should be closed and overnight camping along trails prohibited. Visitation areas should be restricted. Research should be "reactivated" and trained guides should offer environmental education tours for school children. These suggestion were quite similar to the ones Borgonovi offered for Itatiaia NP, mentioned in Chapter 8. The main point of his suggestions was to restrict visitation. The Instituto itself recognizes that Serra dos Orgaos NP is located inside a "chain of cities" which generates an

"aggressive" level of visitation.

Borgonovi presented additional material on the land ownership situation. In 1941 a private construction firm called "Brasil Construtora" plotted the park's limits. Based on this work the park director stated in 1949 that the "identified area" of the unit was 105 km². A 1979 report by another director, however, showed how much the situation had deteriorated. His administration was "searching" Public Notaries for documents "proving" Instituto ownership of a mere 8.4 km². This was less even than the original 10 km² donated in 1939. The Martius Museum building was in danger of being repossessed by the family of its original owner. The same director offered a contradictory figure of 23.5 km² under Instituto control.[7] The park's political situation is clearly unstable.

Current Situation

Serra dos Orgaos NP's current situation is much like Itatiaia's. It is one of the oldest parks; it had golden days of good management and proper financial support in the 1940's; it started declining when visitation pressures mounted; its good infra-structure is deteriorating; its land ownership situation is unresolved, to say the least; personnel is dwindling. It also has the peculiar problems of urban encroachment and insufficient size.

The lack of natural areas for leisure in Rio de Janeiro's metropolitan area will continue to push large numbers of visitors towards Serra dos Orgaos NP. Its managers must decide, therefore, whether the park is going to continue as a haven for weekend and

holiday visitors. If so, they must manage this type of visitation, something that seems perfectly feasible. The smaller but faithful public of hikers, backpackers and mountain climbers can still have access to primitive areas. Besides this, the environmental education potential of the park is enormous and must be used in order to legitimize it.

The most serious problem is clearly the park's insufficient size. Most probably it will never consolidate its intended 100 km^2. Even if it does, the area is not large enough to perpetuate its fauna. Any further expansion will inevitably include second growth areas, with lower fauna supporting capability. As Itatiaia NP, Serra dos Orgaos NP is plagued by numerous problems that political determination could have easily solved decades ago.

Chapter 10

Tijuca National Park - The Garden in the Machine[1]

Natural Characteristics

Tijuca National Park is located inside the city limits of Rio de Janeiro. It lies roughly on the intersection of latitude 23° and longitude 43°. Tijuca National Park (hereafter Tijuca NP) measures officially 33 km². It is ten times larger than Central Park, in New York City, a comparable urban park. The park is crossed by several paved public roads which connect densely and moderately populated areas and divide it into three sections. All of the seven official gates into Tijuca NP lie between 15 to 20 minutes by car from downtown Rio de Janeiro and from one or another of its older neighborhoods. The park is inside the same phytogeographic and climatic areas as Itatiaia and Serra dos Orgaos.

Tijuca NP consists primarily of hilly to mountainous areas, with altitudes ranging mostly from 400 m to 1,021 m above sea level. The park's lowest altitude is 80 m. There are many outcrops of steep slopes, vertical walls and peaks all over the

Park. The park lies on an isolated Eastern offshoot of the Serra do Mar range surrounded by sections of the Coastal Plain and by the sea. Serra do Mar's main ridge lies about 40 km West. The geology of this offshoot is constituted of crystal rock with gneiss structure and granitic bases, frequently fractured and eroded by weathering. It has several "pontoes" (bulky peaks) and a conspicuous outcrop ridge called Sumare. It is in itself remarkable for a city of the size of Rio de Janeiro to have grown around ragged peaks ranging from 720 m (Corcovado) to 1,021 m (Tijuca, the park's summit) right in the middle of its urban area, some of them less than 5 linear kilometers away from the nearest seashore. Both peaks lie within park boundaries. Rio's beaches are easily visible from the park's belvederes.

Cachoeira and Maracana rivers, two modest and short streams, divide Tijuca NP into two main sections: Serra da Carioca and Serra da Tijuca (or Tres Rios). Serra da Carioca comprises the hills of Santa Tereza, Corcovado, Dona Marta, Cochrane, Gavea and Pedra Bonita. Annual average rainfall is between 1.7 and 2.4 m. The average yearly temperature is a pleasant 22° C. The park has 153 days of rain a year and rainfall is consistently higher than in the low parts of the city. Park temperatures are consistently lower than the city's. The famous statue of Christ the Redeemer (on the top of Corcovado peak) is in this section of Tijuca NP. It is the city's major tourist attraction. On a clear day Rio can be seen in its entirety from there. Serra da Carioca is a "water dispersal center" for Rio's lower areas, through a number of streams

including Trapicheiro, Comprido (which flow down to Rio's North sector), Carioca (flowing towards the neighborhood of Laranjeiras), Cabeca, Rainha and Macacos (which flow into Rodrigo de Freitas lagoon).

The Serra da Tijuca section of the park is higher and not so entrenched in the city's urban center. Even though it also disperses water into many of Rio's neighborhoods, through streams called Jacare, Joana, Maracana, Anil, Panela, Retiro e Cachoeira. Rainfall and temperatures are similar to Serra da Carioca. Soils in Tijuca NP slopes are composed mainly of incompletely eroded sediments. They have varying textures and depths. The original vegetation was the common one in Brazil's Southeastern coastal slopes: "tropical rain forest of altitude", with its usually "complex and diversified structure common to stable tropical systems".[2]

Human Occupation

A good deal of Rio de Janeiro city's history has been dealt with in Chapters 6 and 7. Original and Tupinamba natives and first Europeans (Portuguese and French) preferred to live along the coastline or along the marshy edges of Guanabara bay. The Natives' preference for the coastal areas is thus evaluated by a careful study of the park's origins:

> ...[The Natives] concentrated themselves mainly on the coastline, living off fishing, hunting and cassava planting. Although they had a relatively developed agricultural technology, they do not seem to have lived in the forested areas. They located their plots

> in areas with a more sparse vegetation. Of course, they searched the nearby forests for game, essences and fruit.[3]

An anecdote with environmental coloring must be mentioned here. Extremely efficient sailors and explorers, the Portuguese were fooled by Guanabara bay. The first Portuguese expedition to sail into it, in 1502, called it Rio de Janeiro (which means "River of January"). They thought it was the outlet of some big river comparable to the Plate or the Amazon. Even after they discovered the mistake - the bay receives only the waters of small rivers and streams - the name continued to be used and was eventually sanctioned by tradition despite lack of geographical support. The anecdote is relevant because it suggests the exact reason for the extensive replanting of forests in the Serra da Carioca area, more than 350 years later: the protection of the small streams that supplied the already big city with most of its drinking water. This 19th century watershed management effort was actually the origin of **Tijuca** NP, as will be shown in this chapter.

It is important to mention that both Native Americans and the first French and Portuguese colonizers in Rio de Janeiro city relied almost solely on the small streams rolling down from the nearby slopes for their water supply. As noted, no major river existed around Guanabara bay. Wells on coastal lowlands more often than not suffered from salt water intrusion. Although modest in their water flow, these streams (Carioca and Maracana were the most important) were permanent and close to the city. Their water

was remarkably clean and it was cheaply tapped with the help of gravity into public fountains located in downtown Rio de Janeiro and in the main residential neighborhoods.

In fact, by 1720 the Carioca river was channeled by the city's government through a huge aqueduct leading its waters to downtown Rio. This grand urban improvement was conceived in 1602, started in 1657 and concluded only in 1720. By 1750 it was being expanded due to increasing demand for water. Public water fountains were fed by this aqueduct. Even after the city began to grow faster in the 1760's these fountains were the main source of drinking water for all residents (rich, poor and slaves) throughout the 19th Century and, in some parts of the city, until the early 20th Century. One of the main occupations of domestic slaves in Rio de Janeiro was fetching water in public fountains for their masters' houses.[4]

The first small Portuguese trading posts in Guanabara bay had sugar cane plots. In 1569 jesuits ran a sugar mill on the lower slopes of Jacarepagua. This is the first recorded permanent European settlement in Tijuca NP areas. Later, in the 17th and 18th centuries, sugar cane plantations and mills existed in several areas around Guanabara bay. Obviously lands were opened for crops and trees were burned as fuel for them. Although the scale of these enterprises seems to have been small they must be mentioned as the first source of systematic exploitation of the nearby forests by the Portuguese in the Rio de Janeiro area. Significantly, these sugar cane plantations do not seem to have

"climbed" the forested slopes. They remained at lower altitudes in the city's outskirts.[5]

The nearby forested slopes of Serra da Carioca were useful to the local human population in another curious way. In 1711 French pirates attacked Rio and part of the population took cover in the forested hills. This, of course, was an emergency. On a more stable basis, though, the area's first permanent inhabitant were most probably small "loggers" and "coal-makers", free Blacks or mixed-blood mulatos who supplied city dwellers with construction wood and fuel. It is a general opinion that the forests on the higher terrains that today comprise Tijuca NP remained "virtually untouched" until 1750. Some stretches of those forests survived long enough to shelter a large quilombo, an illegal community of escaped Black slaves, all the way up to the early 1800's.[6] Serra da Carioca and Serra da Tijuca forests were therefore an immediate frontier for Rio de Janeiro city, much as the Serra do Mar and Paraiba do Sul Valley forests were a frontier for the Rio de Janeiro area as a whole.

Rio's local forest frontier was the first victim of large-scale coffee plantations in Brazil. Rio had been growing quickly ever since its port thrived with mining region trade. In 1763, when it became colonial capital, Rio had an estimated population of 40,000 and was growing fast. In the late 1760's coffee farms spread from 6 to 8 km around Rio's core area. A few years later some coffee plantations were established on Serra da Carioca and Serra da Tijuca slopes. They excelled, both in productivity and

quality. Some steep Serra da Carioca slopes (Sumare and Paineiras) were spared but lower or gentler ones (Gavea, Andarai, Grajau and Jacarepagua) were covered with Coffea arabica before 1800. Serra da Tijuca slopes were affected at the same time.

From the 1780's until the 1820', roughly, a curious combination of local farmers, Portuguese nobles, French nobles (exiles from the Revolution, or from Napoleonic wars or from Napoleonic defeat), English soldiers and foreign diplomats made fortunes with big coffee plantations inside or on the outskirts of Rio de Janeiro. Some farms had 60,000 to 100,000 coffee plants. Sugar cane plantations, cassava, corn and other staples were dislodged from established fields. Dozens of square kilometers of virtually untouched neighboring forests were ravaged in two decades, starting in the mid-1780's. By the early 1800's Rio's mountain coffee was considered, in fact, the very best produced in Brazil.[7] Rio's mountains were therefore the testing ground for coffee as a major plantation crop in Brazil.

Besides its status of capital, its busy port and its booming coffee farms, the early 19th century brought a new stimulus to Rio's growth. In 1808, fleeing Napoleonic troops that invaded Portugal, Regent Prince Joao VI hastily packed his precious belongings and scrambled over the Atlantic Ocean. He took with him his crazy mother, Maria I, the official Queen of Portugal, and more than 20,000 people, between nobles and their families, soldiers, administrative personnel and clergymen. Between 1808 and 1821 (the year prior to Brazil's independence) Rio de Janeiro

played the ambiguous role of colonial capital and seat of the Portuguese Empire.

The shift in international political status was important in itself. But the sudden arrival of 20,000 new and powerful inhabitants probably meant a 20% overnight increase in the city's population, estimated as less than 80,000 before 1808. This brought deep changes in Rio's social life multiplied the city's stress on the local environment. Recently arrived nobles, soldiers, politicians and priests were given privileged access to available housing and land. The Tijuca area, already penetrated by lucrative coffee plantations and populated by a part of the city's "native" elite, was a naturally attractive option for these uprooted but still rich and powerful arrivals.[8]

"Imperial Tijuca", as it was unofficially called after 1822, when Brazil became an Empire, therefore received an influx of new residents. They were attracted by its lucrative coffee plantations, its still mild climate and its easy access to and from downtown, only 15 to 20 km away on good roads and streets. Some families had summer houses in "Imperial Tijuca". There still were no established summer resort towns in the neighboring mountains of the Province of Rio de Janeiro which Europeans could use to escape Rio's stuffy summer.[9] So, pre-existing demographic and economic pressures on local forests grew sharply in the years after 1808.

As early as August of 1817 Joao VI, still living in Rio de Janeiro despite Napoleon's final defeat in 1815, ordered the end of tree cutting in watersheds and stream banks near Rio. A year

later he ordered land appraisals for government acquisition of watershed areas. His royal ordinances are the first recorded attempt at public management of the city's outlying hill and mountain sections.[10] This blue-blooded, conservative, Portuguese king had to spend his royal time to guarantee the city's water supply against pressures inflicted or worsened by his own pathetic and massive escape from Portugal.

Indeed, action was needed. Rio's environment quickly responded to population growth and to coffee's imperial plundering. The city was hit by severe draughts in 1824, 1829, 1833 and 1844. The destruction of watershed vegetation combined with lower than average rainfalls to produce major water supply deficits. The small streams dwindled or dried up. When the rainy summer season reestablished their flow their once crystal-clear waters were now silted with eroded particles from the naked hills. One chronicler estimates than in those years only 15% of the city's water needs were satisfied through the all-important public fountains. This figure is probably exaggerated because the city's population was overestimated. A safer figure for the water supply of those years is 35% of the city's needs, still very low indeed. Whatever the deficit, the 1844 draught was so evidently severe that the Brazilian Imperial government, which ran the capital's administration, admitted for the first time the necessity of acquiring private lands near watersheds in order to protect or restore their forest cover.[11]

By the decade of 1840-1850, as mentioned before, the main

coffee plantations no longer were inside Rio or even in its immediate outskirts. Coffea arabica was spreading along the Coastal Plain, up the Serra do Mar and in the Paraiba do Sul Valley, sometimes more than 150 km away from Rio. If ever a country of European culture had a clear warning of what its commercial agriculture was leading to, that country was Brazil in the first half of the 19th century. There in the nation's very capital were the eloquent and unmistakable signs of coffee's aftermath: naked, scoured, eroded slopes, sometimes covered with local and alien (European and African) grasses and ferns, depleted flora and fauna and - most important from the point of view of this chapter - a sharp decline in the volume and quality of the city's water supply.

The alternative of reaching for a more distant and abundant water supply source was not seriously considered before 1870. Therefore, the city's administrators in the 1840's were pressed to protect the modest local streams that quenched the thirst of the nation's capital and largest city. An expert on the Tijuca area, Raymundo Ottoni de Castro Maya, considers that the replanting of local forests, even in those trying circumstances, was a "chance" development.[12] This author believes that the barren slopes of Serra da Tijuca and Serra da Carioca would most certainly have remained exactly as they were or used for pastures or housing, if not for the pressing water supply issue. As it was, though, they had to be managed for watershed restoration. This was the remote origin of Tijuca NP.

Rio de Janeiro's continual growth from a remote trade post to an important city, colonial capital and national capital was by 1840 threatened by the severe damages inflicted on the sources of its water supply. The fact that there was no "River of January" was making itself painfully evident now. Beginning in 1844 and for a period of almost 50 years, a series of environmental policy decisions was enacted in order to secure the city's watersheds. Although the situation was pressing the Imperial government was remarkably slow to start and displayed very little determination in its task of restoring the health or, better stated, the very existence of the Tijuca forests and streams.

After coffee moved on to other areas, "...the great farms [in the Tijuca area] were gradually broken down into smaller holdings in which important members of the Imperial Court took residence". Therefore, "Imperial Tijuca" continued to be a very pleasant place to live in Rio de Janeiro even after the 1830's, thanks to its altitudes and to the remains of its own forest and of nearby and much less disturbed ones (like Paineiras and Grajau). The mild climate and easy access downtown were still attractive to Rio de Janeiro`s elite.[13] It should be recalled that the Imperial family, ranking politicians and foreign diplomats were at that precise time starting to seek refuge in the cool forested slopes of Teresopolis and Petropolis, considerably further away from Rio. It is facile to state that the Tijuca Forest was restored because of its rich and powerful neighbors. But a careful look at the chronology of the issue reveals that government action

was far too slow for the sake of Rio's urban growth and the welfare of the nation's elite. Besides, water shortage affected the whole population, rich and poor alike.

Joao VI's original 1817 and 1818 orders for protecting watersheds and making appraisals of private properties for government acquisition were simply ignored for more than 30 years. Several tanks and reservoirs were built in the 1830's and 1840's in the Tijuca and Paineiras forests and small streams were diverted towards these facilities. In 1833 and in 1837 the national government created unspecified "forest preserves" in the Tijuca area, without any practical effects.[14] The basic issue was being avoided by government. A dependable flow of water was needed before any significant storage could be done.

In 1844 the national Department of the Empire (equivalent to a Department of the Interior) finally started evaluating a number of properties in the nearby hills. But it took another 12 years before money actually changed hands. In 1856 the Imperial government finally bought a number of strategically located farms and properties along Serra da Carioca watersheds, streams, slopes and ridges. At that time Joao VI's original ordinances were 40 years old. Between 1845 and 1848 small-scale tree planting and forest protection measures had been tried on public and private lands in the Tijuca forests, under government supervision. Coincidence or not, the streams affected by these initiatives held their water flow during those years. But water shortages still occurred and further damages were being inflicted on private

forests by logging and coal production.[15]

In 1853 the Tijuca hills gained a strategic ally inside Emperor Pedro II's Cabinet: Luis Pedreira do Couto Ferraz, later Viscount of Bom Retiro. He lived in "Imperial Tijuca" and was a personal friend of the Emperor. It was in his tenure as head of the Department of the Empire that the appraisals of private properties were actually done and that government appropriated money for the 1856 and later acquisitions. The areas acquired in 1856 were on the slopes of the Papagaio and Tijuca peaks, between the Alto da Boa Vista, the Pedra do Conde and the Acude da Solidao.[16] Government was finally spurred to action by the personal advocacy of a Tijuca forest "friend" and resident who also happened to be the Emperor's friend and close political aide.

Still, actual forest management practices did not get under way immediately. The water supply problem was in 1859 transferred to the newly created Department of Agriculture, Commerce and Public Works. After a fair number of adjoining properties had been purchased by government the first head of the new Department, Manuel Felizardo de Souza, published on December 11, 1861 "provisional instructions" for the area's management. This document for the first time tried to set rational regulations for reforestation and conservation. Today these instructions are considered the founding document of Tijuca National Park. They called for "regular planting of trees" in the "Tijuca and Paineiras Forests", based on a "system of seedlings" of "native species". Each forest would have an "administrator" - a paid position - an

overseer and a number of slaves.[17]

At this point, stepped in Manuel Gomes Archer (1821-1905), the main character of the Tijuca Forest story. He was designated as "Tijuca Forest administrator" on December 18, 1861. Six black slaves were assigned to him: Eleuterio, Constantino, Manuel, Mateus, Leopoldo and Maria, together with an overseer. Brazilian government owned many black slaves illegally shipped into the country, apprehended by the authorities and withheld from the regular slave market. It was rather common for them to be employed in public works. "Major" Archer, as he was and still is referred to, was not an officer of the Imperial Army. Although available sources do not mention the possibility, he might very well have been a regular officer of the Guarda Nacional (National Guard), a civilian militia that at the time was more important than the professional Army. Born in Rio de Janeiro, Archer was a farmer and land owner in Guaratiba, about 80 km South of the city. He seemingly lacked any formal training in botany or forestry but was already known in 1861 as an expert in local vegetation, especially in forests.[18]

Archer commanded the most important part of the actual restoration of a crucial section of Rio's forests. The 16 km^2 of forests replanted by Archer and his crew became known as the Tijuca Forest. It is still considered the first and only large scale experiment in tropical, multiple species reforestation in the world. Archer started working two weeks after his appointment: on January 4, 1862 he was in the field planting the first set of the

thousands of seedlings introduced in the area under his jurisdiction in the 12 years of his tenure. He worked systematically, covering selected slopes with certain combinations of species, attending first the more severely eroded areas. Although the possibility is not mentioned in available sources, Archer's combination of species might have reflected his knowledge of natural floral populations and distributions in successional or climax stages.

He used seedlings, as opposed to seeds or young trees employed before by others. The origins of his seedlings provide further insights on Rio's environmental history. He initially employed many seedlings gathered directly in the neighboring and better preserved Paineiras Forest, which had another administrator. He received seedlings from Rio de Janeiro's Botanical Garden, established in 1810 at the edge of the Gavea Forest. This forest had also been victimized by coffee and was originally connected to the Tijuca Forest. The "provisional instructions" in fact recommended the use of the Garden's seedlings. This was probably the origin of the exotic specimens introduced by Archer because the Botanical Garden was widely used to adapt exotic plant species. Archer also used seedlings developed at the nursery on his farm in Guaratiba or collected in local undisturbed forests. Later he created and ran a tree seedling nursery in the Tijuca Forest itself.

In 1867 government acquired more properties in the Tijuca area. By 1873 Archer was already cutting some isolated "wild

trees" whose canopies had protected the young planted seedlings. The use of proper seedlings - natural or from nearby nurseries - with a methodical, long-range plan in mind was enough to contrast Archer's work from the scattered, discontinuous and technically faulty reforestation efforts of the 1840's. In 1870 a new draught hit Rio and gave his work more publicity and further government support.[19] But Archer's work had at least three other aspects that made it a unique and pioneering experience in forestry: the rate of planting, the rate of survival and the option of using many species of trees, mostly native and local species. The first two aspects will be analyzed here. The third one will be addressed later in this chapter.

Between 1862 and 1874, when he resigned his post, Archer must have worked with an average of less than 10 slaves and one overseer. Frequently he had no more than the six original ones. One of the reasons for his resignation in 1874 was precisely the shortage of workers. In 1865, for example, Archer lost a number of workers. All chores fell upon the small crew: clearing and surveying the land, marking out the area's limits, falling of sick or dead trees, digging plantation, transportation and planting of seedlings, continuous checking for their survival, providing replacements, caring for successful seedlings, running the local nursery, purchasing and transporting implements, home-keeping and so on. Archer himself, besides his activities in the field, wrote extraordinarily detailed annual reports of his activities. He surely had to go downtown for eventual administrative matters at

the Department of Agriculture. He also went frequently to his farm, which at that time must have been at a distance of more than two days travel from Rio.[20]

The data in Table 32 gives an idea of the intense rate and the great amount of work done by Archer and his overworked crew of slaves between 1862 and 1872:

Table 32

Number of Seedlings Planted in the Tijuca Forest For Selected Years or Periods Between 1862 and 1872 (including survival rates)

Year	Number of Trees Planted	Survival Rate
1862	13,613	79%
1865 [1]	11,282	84%
1868 [2]	12,932	77% [3]
1869-1871	23.658	79%
1872	3,585	--

Notes
1 - Probably 1863-1865
2 - Probably 1866-1868
3 - Estimation

Source: Atala et al, Floresta da Tijuca, pp. 31-35, citing Archer's official reports.

Although available sources do not present a precise total of planted seedlings, 60,000 is a good estimate for Archer's whole tenure. His own figure is 61,852. These figures refer only to surviving trees, though. Considering the available survival rates (averaging around 80%), we can suppose that at least 20% more trees (12,000) were planted and died. The total number of planted

seedlings in Archer's tenure must have been, therefore, 72,000. Considering an average of 6 slaves for the period, each one must have planted 12,000 trees in 12 years, or a 1,000 trees per year. This figure, by today's standards, may seem ridiculously low. But it impresses this author as a very good rate, considering that (1) the operation was run by government, (2) the workers were unpaid slaves, (3) most of the planting was done on very steep slopes, (4) no modern equipment or technology was available and (5) all preparation, maintenance and complementary chores were done by the same crew.

The 80% survival rate of seedlings seems extremely high. The intensive use of native species and of locally produced seedlings seems to have been a basic reason for this success. In 1874, in his last report as administrator, Archer complained about the small number of workers at his disposal:

> If the number of workers does not reach 30, as is indispensable, it will be necessary to interrupt further planting in order to care exclusively for the trees already planted; if the present workers cannot perform all the chores demanded by the 61,852 planted trees, how would they be able to open up new plantations?[21]

Actually, Archer's question was derived from the very success of his work. So many trees had been planted and had survived that his crew became overworked with the mere task of caring for them. Further replanting, which was still necessary to consolidate the Tijuca Forest, required more labor.

In the same report he mentioned another eloquent proof of his good work, stating that all "...stream headwaters that have been covered with trees have released more water or remained at a stable level [as compared to the period before 1862]". After all, this had been the major objective of the reforestation project. The growing city needed that water. The first official Brazilian Census, in 1872, found 275,000 inhabitants in the city of Rio de Janeiro. Its population had almost tripled in the 50 years since 1822, when it had an estimated 95,000 inhabitants.[22]

It should be added that a large part of the government acquired properties on Rio's slopes remained untouched by Archer's reforestation efforts. They were left to successional second-growth and established as union protective forests in the mid-20th century. This helps explain the concentration of this type of conservation unit in the Rio de Janeiro city area. With a larger number of workers it is conceivable that Archer could have reforested much of these slopes as well as he did in the 16 km^2 of the Tijuca Forest.

Apparently skeptical about the response to his demands for more workers, Archer resigned his post in mid-1874. It is very significant that he was invited to work in Petropolis, the imperial resort city established 80 km away from Rio de Janeiro, in the mountains of the Province of Rio de Janeiro. Rio's elite now spent summers in cool Petropolis and Archer was hired by the Emperor Pedro II himself to work on the preservation of Petropolis' forests. Archer was hired to save Petropolis forests from the

depletion that had crippled the ones in Tijuca. He eventually occupied the position of Petropolis Imperial Palace administrator.[23] Available sources yielded nothing about Archer's achievements in Petropolis, but this Brazilian conservation pioneer might well have been involved in the preservation of areas later included in **Serra dos Orgaos** NP and other local preservation units in the Petropolis area.

Archer and his slave crew performed the basic groundwork of restoring the Tijuca Forest. They saved its streams and reestablished their modest water supply. For three years, the post of Tijuca Forest administrator was vacant. In 1877 Archer's successor, lieutenant-colonel Gastao de Escragnolle, an ex-Army officer and descendant of a French family that lived for many years in the Tijuca area, continued the work. Escragnolle seems to have had much more support than Archer. He completed the task of planting trees, although working on a much smaller scale. The crucial Serra da Carioca slopes had been mostly covered by 1874. So Escragnolle concentrated his efforts on making the replanted Tijuca Forest accessible and pleasant to its neighbors (including himself and his family) and visitors.

No available policy documents indicate an official government decision to add leisure and visitation to what until then had been strictly a reforestation and watershed management effort. With the help of a French naturalist and landscaper, Auguste F. M. Glaziou, Escragnolle seems to have decided on his own to open roads, parks, belvederes, fountains, trails, bridges and artificial lakes.

Glaziou, it should be recalled, was one of the many naturalists who explored the Itatiaia region and added to its fame. He also landscaped two important Rio public parks (Passeio Publico and Campo de Santana) and the Emperor's Palace grounds in Rio.[24] Escragnolle's administration was therefore the first to manage the Tijuca Forest as a leisure area intended for the general population.

Watershed restoration was still important, though. It is worth mentioning that in his tenure of 11 years (1877 to 1887) Escragnolle planted 21,500 new seedlings, less than a third of Archer's total for a similar period. No figure for survival rates is available but they probably remained stable at 80%. So we can estimate that the Tijuca Forest was replanted from 1862 to 1887 with some 95,000 seedlings, which translates into 76,000 surviving trees. An unspecified number of survivors from the original forest and seedlings naturally generated from planted trees push this figure up. The Tijuca Forest was therefore reestablished with at least 4,750 planted trees per km^2 over a period of 25 years.[25]

A last note on Rio's water supply issue is relevant to the fate of the Tijuca Forest and other government owned slopes. In 1889 the Imperial government hired the engineer Paulo de Frontin to tap water from watersheds of the Cachoeira da Serra Velha e Sao Pedro River. Besides having a much larger volume of water these sources were considerably further away from the city. Frontin was immediately and completely successful in his task and in the following years the Tijuca Forest's streams soon became unimportant

for Rio's general water supply.[26] If accomplished earlier Frontin's waterworks would certainly have affected the replanting of the Tijuca Forest in a negative way. An alternative source of water supply would have certainly meant still more government procrastination and lack of initiative in the Tijuca Forest restoration effort.

From the point of view of the local population's life quality, therefore, Frontin's water works came just in time. Not only did they bring more water but they allowed for the completion of Archer's and Escragnolle's reforestation. Significantly, after the early 1890's the Tijuca Forest went through 50 years of almost total administrative abandonment. Fortunately the water supply shortage lasted long enough for the reforestation and conservation policies to be almost fully implemented.

Available information about the fate of the extensive government owned lands inside the national capital becomes scarce for the 54-year period between 1889 and 1943. The third and last 19th century Tijuca Forest administrator recorded by available sources was Luis Pedreira de Magalhaes Castro. His tenure was short, 1890-1894. Nothing was found about the administrator or his activities.[27]

An excellent and very detailed study of the area's human occupation, by Tereza Scheiner, reveals nothing more than numerous jurisdiction shifts for the half century between 1890 and 1940. From 1874 to an unspecified date the Tijuca Forest and other government owned areas were considered "forest preserves" of the

Department of Agriculture. From an unspecified date until 1941 they were under the Department of Education and Health. Decree Law 3889, December 5, 1941, returned them to the Department of Agriculture's Servico Florestal Federal, which by then managed three Brazilian national parks through its Secao de Parques Nacionais. The replanted Tijuca Forest, a smaller but more urban part of the area, was put under Federal District government responsibility in 1944, either by Decree Law 7182 or Decree Law 7459. It was managed by a local water supply and waste water agency. In 1946 the Tijuca Forest was shifted inside the Federal District government, landing in another Servico Florestal, under the district's Department of Agriculture, Industry and Commerce.[28] No information about tree planting or forest management is available for the period between 1887 and 1943. The replanted Tijuca Forest and other outlying second growth forest preserves seem to have held their flora and boundaries despite Rio's enormous population growth between 1890 and 1940.

This shift to the federal capital's jurisdiction was the resurrection of the Tijuca areas as far as active conservation and preservation are concerned. Other government owned areas remained under loose federal jurisdiction and were subsequently transformed into union protective forests. The mayor of Rio, Henrique Dodsworth, invited Raymundo Ottoni de Castro Maya in 1943 to "restore the Tijuca Forest". Maya was a rich local industrialist and a patron of art and community activities. His tenure went from 1943 to 1947. Maya is proud to say that he was a "one dollar man",

a volunteer administrator, and that he put some of his own money into the area's development. 20 years later he stated his objectives in the following words:

> I wanted to show the general public what a national park could be; the Tijuca Forest would be a miniature sample of what could be done throughout the whole country, taking advantage of scenic beauties and protecting them from "civilization", which comes in with destructive axes and falls the forests, only to use its humus and soon abandon it.[29]

Maya did not criticize the area's prior administration. All he says is that until 1943 no one was "responsible" for it. Indeed, he probably was the area's first specific administrator since 1894. Maya himself stated vaguely that after 1894 the Federal District's government maintained roads, while the federal Agriculture Department, and later the Education and Health Department, cared for forests and watersheds. He emphasized that forests and watersheds remained protected. Much of Glaziou's improvements had been reclaimed by the forest, though. Plazas, trails, roads, houses, lakes and other features were in "very bad" condition. Some of the forest's limits were unclear. As his restoration works proceeded Maya felt his efforts "rewarded" by the regular stream of visitors attracted to Tijuca Forest on Sundays, with crowds he estimated at "5,000" big (the year was probably 1947). An interesting detail: Maya says he found "systematic opposition" from the federal Servico Florestal against his intentions to make a "miniature" national park out of the area.[30]

Inter-agency rivalries might have played a role in either retarding or selecting the Tijuca area for future choice as a national park area. Anyway, Maya's brief administration saved many of the area's visitation and leisure installations and equipments from almost 50 years of neglect. Considering the enormous growth of the city in those five decades it is surprising that the artifacts could be restored at all. No further forest management or tree planting seems to have done by him, though. Replanted, successional and remaining original forests were already well established and formed a continuous green canopy that enhanced Rio's fame for natural beauty.

A few observations about Tijuca NP's flora are relevant here. The park's forests are considered by its present day managers to be in a state of "regeneration". Natural reproduction of trees was restored. A lush and continuous green canopy covered all preserved slopes and a rich selection of bushes, herbs, vines, flowers and grasses reconstituted itself. Technically, the park's flora is considered a second growth forest whose maturity was accelerated by proper reforestation. At least 148 streams still roll down the park's slopes and some of them furnish drinking water to isolated houses, farms and small neighborhoods on the park's Southern and Western outskirts.[31] The replanted garden fared well, considering the rate of growth of the urban machine that surrounds it. Surprisingly ,the replanting of the Tijuca Forest has had little or no influence on Brazilian forestry practices, management or law. It seems to be a forgotten episode of pioneering tropical, large

scale, multi-species reforestation.

Forests inside Tijuca NP are "...mostly similar to the ones occurring in other coastal areas of Brazil; [there are] a large number of species in small areas, a humid environment and convoluted terrains". The Tijuca Forest (replanted), the disturbed original ones (such as Paineiras) and the successional second-growth forests in the park have consolidated "...a continuous series of vegetation forms, from trees, bushes and herbs to vines and epiphyts", besides grasses and flowers. A dense canopy created a heavily shaded, humid environment that sustains ideal conditions for the forest's regeneration and succession.[32]

Archer's tree planting and natural regeneration have engendered a rich and diversified floral community. The trees' age distribution reveals to experts' eyes that the Tijuca Forest is replanted. Successional communities in <u>capoeiras</u> can also be identified by the expert. Even though, both scientists and laypersons are struck by the diversity and richness of floral life inside the park. At least 30 species of native hardwoods and some 10 species of exotic fruit trees are present. Hundreds of native shrubs, bushes, herbs, flowers, ferns, vines, epiphyts and lianas crowd the forest floors. Lichens, algae, mosses and grasses add to the "authentic biological treasure" of Tijuca NP.[33]

Two final observations on the park's flora are relevant. First, Archer's reforestation was deliberately done with a large number of tree species - mostly native - a detail that obviously distinguishes it from other large scale reforestation practices

executed at the time and from 20th century reforestation canons. This directive was decided by Archer himself for reasons that remained unclear. Second, the combination of the restored Tijuca Forest with original remaining ones and with successional second growth forests makes the park a unique living laboratory for studies in tropical forest ecology, enabling scientists to develop long range, comparative observations. In 1988, replanted, remaining and second growth forests inside Tijuca National Park and in nearby union protective forests still covered the considerably large area of 175 km², almost six times the area of the park itself. The relative abundance of information about Archer's techniques is another asset for these scientific observations.[34]

Creation of Tijuca National Park

In 1960 the Tijuca Forest was passed on to the ephemeral government of Guanabara State, created in the Rio area when Brasilia became Brazil's capital. In 1961 the federal government created Tijuca National Park, with the original name of Rio de Janeiro. It was not possible to establish if the park was created contrary to park service personnel opinion, as suggested by Maya's remarks written later in the 1960's. Managed by the Department of Agriculture's Secao de Parques Nacionais, Tijuca NP indeed became what Maya had envisioned: a miniature national park inside a major city. The park was composed with the replanted Tijuca Forest, its leisure facilities and nine union protective forests (their names: Tijuca, Andarai, Trapicheiro, Gavea Pequena, Paineiras, Silvestre,

Sumare, Tres Rios and Covanca). The Tijuca Forest proper, though, remained under Guanabara state jurisdiction until 1975, when the state was extinguished.[35]

The Maracana river basin divides the park into two separate but neighboring parts. The dividing valley floor and lower slopes have highly developed Rio neighborhoods. A third section is separated from the other two by public roads and private lands. The whole park is surrounded by urbanized areas of Rio de Janeiro city and cut by public roads connecting them with each other. Two major urban tunnels have been carved through the base of the mountains. They absorb much of the traffic of cars, trucks and buses between Rio's neighborhoods. Tijuca NP is a mountain top national park inside a bristling Third World metropolis. Rio is actually the ninth largest urban agglomeration in the world. This location has been from the start a serious handicap to the park's integrity.

In 1967 the park was redefined and renamed as Tijuca. Part of Covanca and Andarai areas were lost to encroaching favelas (urban mountain slope slums). In 1967 Tijuca NP was inherited by the Instituto, which manages it jointly with Rio de Janeiro city government, still responsible for managing the Tijuca Forest section of the park.[36]

Administration of the Tijuca National Park

As might be expected Tijuca NP is a highly visible national park and abundant information is available about its virtues and

problems. Only a few dimensions will be discussed to convey its current situation. The Fundacao Brasileira de Conservacao da Natureza, for example, has dedicated much attention to Tijuca NP. In 1967 it created its Natural and Historic Monument Preservation Committee. The initial work of this committee was entirely dedicated to Tijuca NP and the park's administration provided office space for it in the modest building of the park's Fauna Museum. Since 1967 park lands have been extensively researched by Archeologist Carlos Manes Bandeira and a team of Historians, Architects and Museologists. This is the longest continuous archeological project ever done in Brazil. Bandeira and his team have located, plotted and excavated 86 remains of farm houses, slave houses, warehouses, waterworks, fountains, stretches of roads and other artifacts belonging to the coffee farms acquired by the Imperial government in the 1850's and 1860's or simply abandoned at the same time. All sites were described in detail and several thousand objects have been retrieved, restored and identified.

Bandeira today wants to create a "Coffee Farms Museum" inside the park. This museum will have originals or reprints of all known paintings, engravings, drawings and photographs of the Serra da Tijuca area. Its main attraction, though, will be a sampling of the plethora of household and farm objects retrieved by his team, which include clocks, pottery, silverware, kitchen implements, stoves, chairs, pens, tools and so on. Interestingly, Bandeira located at least one extensive remain of a coffee plantation, where "thousands" of doomed Coffea arabica bushes hopelessly compete with

capoeira second growth.[37] The educational importance of this work and of the proposed museum is enormous. Nowhere else in Rio can the general population so easily be informed about the city's coffee farm past. This archeological project owes much more to the environmental group's initiative than to Instituto interest, even though the park administration has consistently supported it.

An important park administration project, mentioned in Chapter 5, was developed between 1969 and 1974. Antonio Aldrighi, Tijuca NP director, and Adelmar Coimbra Filho, a Biologist from the Museu Nacional do Rio de Janeiro, directed a pioneer and carefully conceived project of floral and faunal management. The project consisted of two parts. The first was the planting of floral species capable of supporting certain animal species. Fruit trees and berry bushes were planted, some of them native, some of them exotic species that already existed in the park's forests, introduced by Archer or Escragnolle. Rare native orchids were also planted The second part was the introduction of animals. Modest numbers of specimens of 30 species of mammals, 100 species of birds and several species of reptiles were released into park areas.

Coimbra Filho and Aldrighi described their work in three articles which reveal several aspects of the park's natural conditions. The reintroduction of the locally extinct, endemic golden marmoset (Leontopithecus rosalia), for example, was frustrated by the existence of an introduced marmoset species (Callithrix jacchus) which successfully occupied the specific niche. This introduced species, originally from the Brazilian

Northeast, is a common pet. Strayed specimens successfully reproduced in the "wilderness" of the park's forests. Golden marmoset populations were later reintroduced in Poco das Antas National Biological Preserve, 100 km to the North, as described in Chapter 4.

Other locally extinct, native species were reintroduced: lesser anteater (Tamandua t. tetradactyla), common sloth (Bradypus infuscatus brasiliensis), striped sloth (Bradypus torquatus), mammals. Many birds, including psitacides (parrot-like species), ranphastides (toucans) and songbirds were released. At least two species of snakes, two species of marsupials and several species of butterflies were released, besides some amphibians. This project was mentioned in Chapter 5 to illustrate a problem that plagues some of Brazil's national parks: insufficient area to support viable populations of native fauna. Coimbra Filho and Aldrighi considered their prospects limited by Tijuca NP's small size (33 km²). The "isolation" of the Serra da Tijuca from the nearby Serra do Mar range slopes is also mentioned as a restrictive factor to the local fauna's survival. Indeed, the two mountain areas are separated by large and mostly urbanized stretches of the Coastal Plain.

Coimbra Filho and Aldrighi mention how the intense lights that illuminate the statue of Christ, the Redeemer, kill insects that integrate the food chain and/or pollinate floral species. In the third and last article describing the project, the authors acknowledge a "clear improvement" in the local flora and fauna

since the beginning of their work. Years later Aldrighi still mentioned the positive effects of the 1969-1974 effort and considered the possibility of closing the park's gates at night in order to restrict access of a new wave of human plant and fruit gatherers and hunters attracted by the improvement of the park's flora and fauna.[38] It should be recalled here that this was the only project of its kind done in a Brazilian national park.

Another curious aspect of the park's ecology is that many stray pets find their way into the forests and remain there, even if not necessarily well adapted to them. Besides the marmoset Callithrix jacchus mentioned above, many cats and dogs live and reproduce on park fringes or near visitor areas. Birds from other regions or countries take shelter in the dense park canopies. Helmut Sick, a leading ornithologist in Brazil, made a checklist of birds sighted in the municipality of Rio de Janeiro, based on travellers' and naturalists' accounts and on his own observations. He found the impressive total of 410 species, of which only five have become locally extinct. He included native, Southern and Northern "visitors", stragglers and introduced species.[39] The diversified landscape of the municipio, with beaches, marshes, mangroves, lagoons and forested mountains is responsible for the variety of the bird fauna. Tijuca NP forests certainly help shelter bird species attracted to closed, shaded, isolated environments, including alien species.

Some floral management has been done recently in Tijuca NP. An anonymous and undated report, probably from 1978, describes a

flora "restoration" project developed by a scientific consultant and a landscaping firm on some of the park's boundaries. The objective of this work, contracted by the park's administration, was to "reduce" the possibilities of fires by upgrading the vegetation of some of the park's edges. Although "90%" of the park were described as "covered with forest canopy", the remaining 10% were "degraded" and easily invaded by grasses, coloniao (Panicum maximum), gordura (Melinis minutiflora) and sape (Imperata contracta). In Rio's relatively dry winter these three species of grass are highly subject to fire.

The project's rationale was to control grasses and enhance conditions for "climax" tropical rain forest communities, naturally resistant to fire. The consultant selected 28 species of trees, bushes and ground cover vegetation, combined in a way to control grasses. The selection favored native, fast-growing and wind-resistant species.[40] The report indicates that actual planting was started but its completion is uncertain. Fires are still common in and around Tijuca NP, specially in the dry months of June and July.

Human artifacts introduced over the centuries in park areas allow a broad view of its different uses. The most obvious ones are listed below:

1 - ditches, pipes, reservoirs and tanks, an extensive network of waterworks for the city's water supply, some of them underground or hidden, others quite conspicuous and complex pieces of equipment;

2 - roads, streets, bridges, gates, street-car rails and a railroad, a large network of routes for getting into and across the park in vehicles; some more level road stretches have been intensively used in recent last years for jogging and distance

markers have been painted on the asphalt or road-side rocks or nailed to road-side trees;

3 - trails (for hikers, campers, horse riders and off-road vehicles);

4 - power transmission lines that lead to several conversion stations in the lower parts of the hills;

5 - Radio and TV transmitters and antennas, conspicuously located on the park's highest ridges;

6 - More than 40 buildings, including a chapel, Escragnolle's house, administration facilities, sheds, railroad stations, restaurants and others;

7 - plazas, belvederes,lawns, playgrounds and picnic areas;

8 - an unofficial visitor center, with bars, restaurants and souvenir stands;

9 - a hotel with 42 apartments, plazas, parking lots and a railroad station;

10 - The statue of Christ, the Redeemer, about 25 m tall, surrounded by extensive belvederes, stairways, souvenir stands, a restaurant, bars, a railroad station, parking lots, bathrooms, a powerful illumination system and ranger residences;

11 - 10 private houses still occupied by their owners, scheduled to be acquired;

12 - a gliding platform

Less evident artifacts can be found by a careful observer. Some of them are no longer useful: old public water-fountains; artificial, road-side waterfalls; old railings, benches and lamp-posts; old trails; old fence posts, stakes and stone markers. Small and big artifacts somehow found their way up (or more probably down) the slopes, mainly as urban rubbish: car tires, street car rails, decayed and non-identifiable pieces of metal, coins, keys. There are references to Portuguese cannons being set in the 1600's in the city's higher slopes, maybe inside park boundaries, in order to protect Guanabara bay's narrow entrance against invaders. Actual sites or arms have never been found. In the 1930's at least some of the park's roadways were used for car races.[41] All these artifacts trace the variety and intensity of

many centuries of human presence in and around the stranded Tijuca NP.

Environmental education has not been a strong component of Tijuca NP. There is a Federal Fauna Museum which dates back to Maya's administration in the 1940's. Besides not being located inside park boundaries, it is an exceedingly modest museum for a city as large as Rio de Janeiro. In the mid-1970's "guided educational tours" through forest trails were offered by the park administration to the general population. In 1976 they were interrupted for lack of personnel and other administrative problems. As of 1987 a semi-professional theater company hired by the park's administration was conducting tours and skits along the park's trails on weekends, attracting a sizeable public. As mentioned in Chapter 4, no nature trails exist in Tijuca NP.[42]

In 1981 the park's Management Plan was published. It is a deep reflection on the area's past, present and future. Tijuca NP was evaluated as an "important" unit for a number of reasons. It has a "sample of tropical rain forest in regeneration" and several watersheds still used for water supply. It is a "leisure" option" for the local population and it has "exceptional tourism potential". Tijuca NP is ranked as the second most visited national park in Brazil, behind Iguacu. As for "management goals", the park should preserve regenerated forests "inside a metropolitan area", protect endangered species of fauna and flora, preserve watersheds and scenic beauties, allow for scientific research, preserve "historic" sites and provide "interpretative, educational

and recreational programs".

The plan contained important recommendations. Zoning was considered crucial to ease the gigantic pressures on this utterly urban park. The road leading towards the statue of Christ, the Redeemer, should be closed. The modern tram would remain as the only way to reach it by vehicle. Hikers could reach it through trails. This was just one of several proposals designed to restrict the entry of a great number of private automobiles and tour buses into the park's roadways. The plan describes in detail "environmental management", "public use" and "operational" programs to be adopted. Specific projects for construction or repair of facilities were described and budgeted. An ideal personnel chart was proposed with 335 positions (35 administrative, 100 manual laborers and 200 rangers). At the time **Tijuca** NP had a staff of only 98.

Most peaks and high ridge areas were zoned as "primitive", open only to hikers and authorized scientists. Significantly, no "closed" (pristine) zone was proposed. "Extensive use" zones, including more remote trails and a wing gliding platform would buffer "primitive" areas. "Intensive use" areas included roads, easier trails, plazas, picnic areas and environmental education facilities. A "Historic-Cultural" zone was established for a few facilities, such as Mayrink Chapel, Escragnolle's house and restored archeological sites. "Restoration" zones were sprinkled over the park map for areas where natural or cultural restoration projects were proposed.[43] The Management Plan is on the whole

optimistic about the survival of Tijuca NP despite all the many problems generated by its location inside a fast growing metropolis.

An undated report by park director Antonio Aldrighi, probably from the early 1980's, stated that his administration keeps up a "...constant activity of preservation and restoration of its natural aspects", performed by "specialized personnel". He cited the planting of trees and shrubs and the reintroduction of animals, probably referring to the 1969-1974 efforts described a few pages above. He mentioned the existence of "many" biological research projects and papers and the Fauna Museum as an indicator of the park's educational value. He also mentioned that a visitor center would be built (this has not happened). At that time the Tijuca NP administration was receiving private financial support from Brazil's largest cigarette manufacturer, Souza Cruz, for unspecified "improvement" projects.

In 1986, though, Aldrighi was giving a more grim picture of the park. Trash and refuse were increasingly being dumped along public roads; rangers were insufficient; hunters and motocross bikers could not be controlled; park security was being performed by non-trained guards hired from private companies; cleaning services were also hired out. Several favela houses had been torn down. On the good side, more birds and land animals had been released and a small reforestation project had been completed.[44]

Carlos Manes Bandeira, the Archeologist, filed an alarming personal report about Tijuca NP in 1984. Private lands still

subsisted inside the units and absolutely nothing was being done to solve the problem. He identified a "frightening increase" of hunters, tree cutting, stream tapping, flower and fruit gathering and fires. Crops and gardens were cultivated inside park boundaries. The private operator of a park restaurant was openly hiring people to furnish local wood for its fanciful fireplaces. Clearings were in need of reforestation; motocross bikers were damaging hiking trails; rangers were insufficient in number; security officers from private companies knew nothing about park policy or local natural features.

In 1985 Bandeira pointed out other problems: tourism areas were the only ones cared for; ornamental granite miners had actually been authorized by the Instituto to withdraw isolated boulders and proceeded to mine outcrops; hunters left traps along trails, injuring hikers. He concluded saying that **Tijuca** NP should be managed as a "permanent preservation unit", and not as a mere "park and plaza area" for tourists.[45]

Current Situation

Tijuca NP is clearly on the path of disruption if it is not immediately and decisively managed as a national park. The great resilience of the area's flora and fauna in the last 130 years is amazing, specially considering that at least 50 of those years, between 1890 and 1940, were a period of passive management or total abandonment. Rio de Janeiro's population has gone from 275,000 to 5.0 million between 1872 and 1980 and will continue to grow rapidly

for many decades. The millions of coffee bushes that once populated its mountain slopes resulted from a century of total laissez-faire plantation farming. The resulting destruction almost put Rio's growth in check. In historical perspective Rio has had a relentless growth pattern. No landscapes were spared: hills were leveled, marshes, lagoons and mangroves were filled in, beaches were pushed further away into the sea, tunnels punctured mountains, streets and houses climbed hills and mountains, islands were connected with the mainland. Left to laissez-faire, therefore, Tijuca NP will be destroyed, as once were its original forests.

In the 19th century active public management of a part of the destroyed areas restored the city's water supply. The result, today, is the soothing of the landscape, the conservation of soils, opportunities for leisure and recreation, scientific research, sports and so on. A slack government effort was enough to reclaim the park area from depletion. It is time that the local and national community decide whether Tijuca NP is to be preserved or, again, turned into a scar of depleted slopes or, alternatively, a cluster of skyscrapers and slums resembling the rest of the city.

No modern day pirates are available to chase the local population into the forests such as in 1711, but Tijuca NP areas currently perform many other vital services for the chaotic metropolis of Rio de Janeiro. While lack of decision and of environmental concern plagues the community, the Instituto would do well to perform its mandated duties of managing the park for

permanent preservation. Most Rio residents barely envision that the park's forests emerged from scoured and naked slopes. But the Instituto knows much better. Tijuca NP was the result of pioneering experiments in multi-species tropical reforestation, forest and watershed management and urban planning. Any agency with a minimum sense of perpetuating itself would welcome the chance to manage Tijuca NP. The forest garden is once again threatened by the urban machine. Tijuca NP is an improbable legacy of the city's social and environmental history but it is also an important asset against thoughtless repetition of destructive trends that can be averted.

Chapter 11

Serra da Bocaina National Park - The Last Frontier

Natural Characteristics

Serra da Bocaina National Park is located in Rio de Janeiro state's extreme Southwest with a section in the Western tip of the state of Sao Paulo. Its boundaries affect seven **municipios** in the two states: Angra dos Reis and Parati (Rio de Janeiro); Ubatuba, Sao Jose do Barreiro, Cunha, Areias and Bananal (Sao Paulo). Its "geographical center" lies roughly on the intersection of latitude 23° (Tropic of Capricorn) and longitude 44.5°. Serra da Bocaina National Park (hereafter **Serra da Bocaina NP**) is plotted on the Eastern slopes and hill tops of the **Serra do Mar**, locally called Bocaina, in a stretch where the mountains come very close or escarp directly into the Atlantic Ocean. It is located in the same phytogeographic and climatic areas as Rio de Janeiro's other national parks.

Serra da Bocaina NP includes a marine island, small bays, beaches, cliffs, narrow coastal plains, gorges, valleys, steep slopes and high meadows, with a large variety of habitats and

ecosystems. Serra da Bocaina mountains run "parallel" to the coast. Higher ridges reach from 800 to 2,000 m, with an average between 1,000 and 1,200 m. Fifteen peaks rise above 1,800 m, although not all of them lie inside the park. Tira Chapeu peak, 2,123 m, is the park's summit. Extremely steep slopes with gneiss or granite outcrops are covered with dense forests dive towards the Atlantic ocean. Facoidal gneiss and biotite predominate in the park's geology, but granite, olivine, feldspar, basalt and bauxite rocks are also found. Podzolic, latosoil and hydromorphic soils are predominant. They are shallow and mostly acidic. 28 short rivers tumble through rapids and falls from the mountains into the narrow coastal plains or sometimes almost directly into the ocean. Some of them flow inland and form Paraiba do Sul tributaries. No major river occurs inside Serra da Bocaina NP.

From sea level to 200 m the climate is "tropical hot and humid", with "lush vegetation" of tropical forests and abundant year around rain. From 200 to 1,800 m the steep slopes are "warm or moderate mesothermal" in climate and have "dense original tropical forests". Above 1,800 m temperatures are moderate and natural meadows are interspersed with islands of tropical humid forests of altitude. Yearly rainfall averages reach 2.5 m at lower altitudes and range between 1,5 and 2,0 m at higher altitudes. 80% is the yearly average relative humidity. The lower sections of the park, next to Parati, have in fact the highest recorded average rainfalls in Brazilian territory, above 4.0 m.

Floral communities found in Serra da Bocaina NP areas are

mangroves, restinga and Atlantic coastal tropical humid forests (interspersed with meadows). The first two are restricted to the slender coastal plains. Serra da Bocaina NP has the most extensive remains of original tropical rain forests in the state of Rio de Janeiro. 60% of its vegetation are native forests; 10% are capoeira; 30% are native high meadows with forest "islands". Communities and species are much like Serra dos Orgaos NP. A conspicuous difference are the large populations of Araucaria augustifolia and Podocarpus lambertii, the two only Brazilian native conifers. They occur at higher altitudes. The park's flora has not been well studied as in the other Rio de Janeiro national parks. Scientists suspect of many endemisms and they are almost sure about the existence of many non-described species. Fauna is the richest in the state. There are many forms of primates, felines, deer, rodents, edentates, peccary, birds, reptiles, amphibians, fish and shellfish. At least 16 endangered species occur in the park. The area's insects remain to be studied.[1]

Human Occupation

Some of the region's history was given in Chapters 6 and 8. In January of 1502 the first Portuguese explorers sailed into a wide bay which they named Angra dos Reis. They met Goiana Natives, from the Tupinamba nation. Angra dos Reis bay offered good protection and had abundant fresh water rolling down the nearby mountain slopes. It immediately became a stopover for South bound Portuguese and Spanish fleets. The first Portuguese colonists, the

sons of Antonio de Oliveira, established residence in Angra dos Reis in 1556. Vicente da Fonseca and his family followed in 1559. Angra dos Reis was officially founded as a settlement in 1560, five years before Rio. It was already a "busy" port. By 1580 Angra dos Reis was indeed a stable settlement, connecting with Rio de Janeiro, 130 km to the North and with several coastal settlements to the South, on the coast of Sao Paulo. By that time small sugar-cane farms and mills were recorded in Angra dos Reis. In 1593 it became a district and in 1608 a village, with the name of Vila dos Reis Magos da Ilha Grande.

For unclear reasons, in 1624 the village moved to a new site which proved to be permanent. In 1626 the population started to build a new stone church in order to earn the ranking of freguesia. By 1749 Angra dos Reis was an established city and port, with 15 large sugar mills and 91 small ones producing much sugar, molasses and brandy. Since 1700 it had been connecting with the Minas Gerais mining district, shipping gold and precious stones to Rio or directly to Portugal. For some years the Portuguese crown ordered that all gold and stones be shipped out exclusively from Rio, hoping to control smugglers. This restriction was eventually dropped but Angra dos Reis had a taste of what would happen permanently in the second half of the 19th century, when it lost its competition with Rio as a port.

But in the early 19th century Angra dos Reis agriculture and port thrived with new coffee plantations. Even if its own coffee stands did not prove to be very productive, its port was flooded

with coffee bags brought by "donkey trains" from the highly productive plantations of nearby Sao Joao Marcos, Barra Mansa, Resende, Cunha, Bananal, Barreiro and other areas. Besides having some agriculture and industry of its own, Angra dos Reis was Rio de Janeiro's second port probably from 1800 until 1865.

Prosperity was short lived, though. As Rio was connected by rail directly with inland coffee producing regions fewer "donkey trains" made the strenuous trip over the Serra da Bocaina ridge to reach Angra's port. In 1864 Angra dos Reis still exported a substantial volume of coffee but in 1870 its port was virtually stagnant. 18 years later slavery abolition disrupted local coffee and sugar-cane plantations.

Only in 1926 Angra dos Reis woke up from decades of stagnation, when its port was renewed. A railroad reached the port in 1928, connecting it with Rio de Janeiro's interior and with the states of Sao Paulo and Minas Gerais. Agricultural and mineral products began a modest but steady flow through the renovated port. In the 1950's a major shipyard was built in Angra dos Reis.

Economic stagnation and the aggressive geomorphology combined to preserve flora and fauna in large sections of the municipio, in stark contrast with the rest of the state. Only in the 1930's was Angra dos Reis permanently connected by a steep mountain road to the interior of Rio de Janeiro and Sao Paulo states. Access had been mainly through the sea until then. In the early 1970's a major federal road was extended from Rio to Angra. The area was opened for tourism, resort hotels and weekend residences. The new

stream of tourists generated what one source calls "irrational exploitation of the environment" and "social conflicts".

Angra dos Reis has today around 67,000 inhabitants. It is the 20th most populated **municipio** in Rio de Janeiro's 64. Besides port activities, tourism and ship building, it has fisheries, fish processing, sugar-cane farms, orchards, food industries and handcrafts. The mountain sections produce dairy, fruit, wild birds and coal. Angra dos Reis has also the dubious privilege of hosting Brazil's only operational nuclear plant, an obsolete facility that will probably closed down soon. Next to it are the foundations of two new nuclear plants. Their construction has been interrupted for almost five years.[2]

Parati is the other Rio de Janeiro **municipio** affected by Serra da Bocaina NP. Its history is quite similar to that of neighboring Angra dos Reis, which lies only 50 km away. The same Goiana Natives lived there when the Portuguese arrived. A good port and abundance of fresh water attracted ships and fleets. Parati's official date of foundation is 1646, but it seems that some Angra dos Reis inhabitants leased and occupied sesmarias in the Parati area much earlier. A very modest original urban settlement was abandoned when the 1646 site - "more favorable" - was occupied. In 1660, over the protests of Angra dos Reis residents, Parati was raised to the rank of district, with the name Vila de Nossa Senhora dos Remedios. In 1667 Parati became a village, again with protests from Angra dos Reis.

Parati's "golden days" were right in the beginning of the

mining boom in Minas Gerais, around 1700. The first major "donkey train" trail between the coast and the mining district started in Parati. Much of Brazil's gold was shipped to Portugal through Parati. Obviously, slaves, merchants, officials, supplies, equipment and animals followed the same route. But in 1725 a "new trail" from Angra dos Reis shifted mining traffic away from Parati.

Almost a century of stagnation followed. A new boom came when Resende coffee plantations started their prime, in the 1820's. The "old trail" was reactivated and for some time Parati was probably the third port in the province of Rio de Janeiro. Around 1865 Angra dos Reis and Parati were jointly pushed out of the coffee export activity by Rio and its railroads. Local agriculture, very modest, suffered from slave reform in 1888. So complete was the agricultural disruption of Parati that lowland rivers and channels became silted and obstructed. The results were swamps and marshes which contributed to lower health standards.

Parati's location, once a privilege, became a handicap. It was extremely difficult to reach by land and its port was silted. After decades of virtual isolation, Parati was finally connected to Cunha (Sao Paulo) by a permanent steep road in the 1950's. The same federal road that reached Angra dos Reis in the 1970's was later extended to Parati, connecting it more easily with a growing tourism and resort trade.

Parati's original urban center was declared a "national monument" by Decree 58007, March 24, 1966. Its external architecture and urban design cannot be altered. Surrounding

forests were protected by the same act. Parati's colonial architecture thus became a major tourist attraction in Brazil. With 23,000 permanent residents, Parati today is the 40th most populated of Rio de Janeiro's 64 **municipios**. It remains a very remote area in the state.[9]

A rather recent federal government colonization project affected areas later included in **Serra da Bocaina** NP. In 1952 a "Senador Vergueiro Colonial Settlement" was established by the Department of Agriculture in the **municipio** of Angra dos Reis. It attracted thousands of small farmers and squatters to the relatively unoccupied Eastern slopes of the Serra da Bocaina. Poor soils quickly stifled agricultural efforts. Government official tried to keep the project alive by stimulating settlers to start commercial reforestation with introduced conifers. The Department of Agriculture operated a small experimental orchard, also called Senador Vergueiro, to acclimate temperate fruit plants. The orchard was active between 1954 and 1968.

Walter Wolf Saur, a member of the Fundacao Brasileira de Conservacao da Natureza, presented a report about Serra da Bocaina NP to its chairmen in 1977. According to him the Instituto created in 1968 a committee to evaluate the "alarming" situation in the area of the colonization project. Social conflict and resource destruction were rampant. The failed colonization project had attracted scores of squatters who were ravaging forests on soils known to be unstable and of poor agricultural quality.

The federal land reform agency worsened things by ranking a

nearby area with a "priority" status for land reform. Hundreds of other family of landless families flocked to the area. Despite social tensions, the committee recommended the creation of a national park in the area. In 1969 the land reform agency recommended on its own the creation of a "Parati Biological Preserve". Its intended area was in 1971 incorporated into the proposed national park limits.[4] One government agency brought in thousands of settlers and failed to settle them. Now another agency was trying to buy them out to establish a national park. A pool of other agencies was stimulating mass tourism in the region. All this indeed added to a very complex setting for a national park

Creation of Serra da Bocaina National Park

Serra da Bocaina NP was created in 1971. Its ambitious proposed area of 1,340 km² made it at that time the largest national park in the Southeast. The proposed park included (1) the area of a Mambucaba National Park proposed by Rio de Janeiro Senator Vasconcellos Torres, (2) a "botanical preserve" belonging to the federal government's railroad company, (3) the entire colonial settlement, (4) the government operated orchard and (5) private lands. The complex land ownership situation has until this day made it impossible for the Instituto to take possession of park lands. The park still lacks a defined perimeter.

There is no administration to discuss in the case of Serra da Bocaina NP. All the Instituto's managerial energies have been

consumed in land ownership issues. Otavio Caldas de Oliveira, a Soils Engineer, was the park's first director. The original design of the park included a continuous stretch from a marine island to Serra da Bocaina summits, including shallows, beaches, mangroves, foothills and slopes. This design was reinforced by a suggestion from the federal cultural heritage agency, IPHAN. It proposed the inclusion of the small coastal caicara village of Mambucaba in the park.[5] Recall that caicaras are small farmers and fishermen descending from Natives living in non-tribal villages.

The Instituto's identification procedures quickly realized that the cost of real estate in the expensive beach areas was prohibitive for the agency's budget. So a 1972 decree redefined Serra da Bocaina NP's proposed limits, extending them to Ubatuba (Sao Paulo), where better preserved forests existed. The same decree excluded areas close to Parati city limits and densely populated rural areas. Instituto officials estimated that 90% of the 10,000 people inhabiting the original park area were now outside the new park limits.

Saur's 1977 report considered that the new "described park limits" were still not ideal because they still included expensive beach real estate and "excluded forests and stream headwaters of great interest to the park". The new proposed area had 1,140 km², slightly lower than the original area. In 1977 50 km² of privately owned land were being "acquired" by the Instituto. At the time the Instituto held only the 45 km² of the colonial settlement and the 10 km² of the orchard, a dismal 4.5% of the intended park area. 65

km² of Sao Paulo state public lands and 100 km² of federal railroad company lands awaited only the Instituto's initiative to take them over.

Despite all compromises 3,200 people were still living inside the new park area in 1977. Saur described the land ownership situation as "complex", mentioning sky-high prices, illegal squatting, speculation and false land deeds. He suggested that the Instituto should "give up" expensive coastal areas and take care to include more original forests.

Saur pointed out that until 1977 no visitation infra-structure had been built. Only 200 people officially visited the park that year. A staff of 25 included the director and 21 rangers, watchmen, custodials, drivers and three unspecified "tourism" personnel. Saur proposed that at least 50 rangers were necessary to man the 12 outposts built in crucial park areas. Saur had suggestions. Fences should be raised around some sensitive park boundaries. Radios and telephones should connect rangers. Roads should be built (a very ambivalent suggestion indeed). Saur recommended also a management plan, scientific research zoning and fire control services.[6]

Therefore, in 1977 Serra da Bocaina NP was less than a hypothetical choice for leisure and recreation, although plotted halfway between the two major metropolitan areas in the country. The situation remains today. A primitive camping grounds and a small picnic area are all the park has to offer to its visitors as of early 1988.

The Fundacao Brasileira de Conservacao da Natureza, active as usual, planned and executed a detailed survey on the land ownership situation in the park in 1977. 422 private plots were measured and described. Their assets and titles were evaluated. A total sum was presented for their acquisition by the Instituto. The 422 properties had a combined area of 865 km². The survey also described 250 km² of Instituto or otherwise government-owned land.7 The total of 1,115 km² was still consistent with the original intended area for the park. Budget shortages, inflation and lack of Instituto action outdated many aspects of this thorough survey, specially property evaluations and title assessments. Any comprehensive acquisition drive will probably require a whole new survey.

Current Situation

As of 1988 the Instituto owns no more than 30% of Serra da Bocaina NP land. The park's limits are currently being "redefined" for the third or fourth time. Apparently the Instituto has given up about all beach areas because recent printed material announces 100 m as the park's lowest altitude. The park tends, therefore, to be another hilltop national park, similar to other three in the state of Rio de Janeiro. If this happens, not a single stretch of Rio de Janeiro's internationally famous coast will be included in a federal preservation unit. Two park experts consider Serra da Bocaina NP as the single most "difficult" Brazilian national park to consolidate, due to "high real estate values".8

Although the park includes ecologically valuable areas of both Rio de Janeiro and Sao Paulo states, it does not receive the attention it deserves. **Serra da Bocaina** NP alone has more natural areas to be preserved than Rio de Janeiro's other three national parks combined. It has a great potential for leisure, hiking, mountain climbing and environmental education. It is discouraging to see the last frontier of the nation's two leading states treated by the park service with such lack of decision.

Chapter 12

Conclusions, Prospects and Policy Proposals

The following concluding statements refer specifically to the national parks of Rio de Janeiro state. This author's conclusions and more generic comments about the national park system were stated in Chapter 5, which also contains general recommendations concerning park policy. All these statements are applicable to Rio de Janeiro state national parks and some will be inevitably repeated here.

Rio de Janeiro's four national parks, taken as case studies of the park system, illustrate more park problems than park virtues. The individual chapters on each park have already given many indications of this. But the statement can be further certified through brief references to the topics developed to analyze the park system, in Chapter 4.

In reference to their combined area, Rio de Janeiro's national parks cover only a small percentage - 3.2% - of the state's territory. Although twice the average age of Brazilian national parks, they have not attained an acceptable degree of stability as

public goods. In other words, significantly longer years of management have not contributed to their stability as preservation units. Therefore, age has not been a factor of consolidation.

Private properties survive in all four parks. All of them have undefined limits, even after major concessions to competing land use interests. Three parks rank between small and insufficient in area in term of political stability and ecological sustainability. They need to be expanded but are actually more prone to being reduced. The other, **Serra da Bocaina**, will probably not consolidate its significantly large intended area on account of park service inaction and real estate speculation.

Visitation in **Tijuca** and **Serra dos Orgaos** is intense but follows mostly urban park standards: strolls, quick sport activities, picnics, car rides, bathing. Management of the large flow of visitors is inadequate or non-existent. Park personnel, however, are concentrated in visitation areas, leaving remote park boundaries unprotected. **Itatiaia** has far less visitors and much more infra-structure to receive them for camping, hiking, mountain climbing, backpacking and other forms of recreation more characteristic of park leisure. But visitation management is also faulty there. **Serra da Bocaina** has almost no infra-structure for visitation although located in a highly attractive area for tourists. Visitation potential of all four parks will remain great because (1) the resident state population is large and dense, (2) tourists from other states and countries are attracted to the parks' areas and (3) access is easy and permanent.

The environmental education potential of all four parks is equally great but still very far from being developed in a minimally acceptable level. Tijuca and Serra dos Orgaos are particularly suited for permanent environmental education activities for a large public of visitors and students. Community interest and support for parks will certainly rise if education is adequately developed. In the case of youths, educational activities in national parks will surely help develop a wider public of visitors and nature appreciators.

The ecological qualities of the four parks are very different from each other. Itatiaia is a unique sample of Brazilian geology, morphology, flora and fauna. It contains original and slightly altered natural areas, together with deeply altered ones. It is unfortunately too small to support viable populations of some animal species. Additional areas would necessarily include second growth or depleted stretches of land. It remains as one of the most intensely studied landscapes in Brazil and its continual scientific observation is an asset for better knowledge of Brazilian ecological processes.

Serra dos Orgaos has precious samples of the dominant original landscape of Rio de Janeiro. Unfortunately it is too is small for the proper protection of some animal species. Tijuca is for all practical purposes an urban park. But its social history has given it a combination of replanted, successional second growth and disturbed original forests. This blend can allow important scientific observations in the field of forest ecology. Location

inside Rio de Janeiro has been a source of enormous stress for Tijuca but it can still support scientific studies. Serra da Bocaina encompasses the largest state areas untouched by coffee plantations and covered with the dominant original flora. In a sense, it is the state's last frontier. Its continual ecological quality of course depends on the consolidation of its intended area, including the proposed marine and shoreline stretches.

Being one of the country's most ravaged states, Rio de Janeiro's national parks are located in areas of fair and high ecological quality. This was not their prime motivation, though. All four parks were created before the park service developed explicitly ecological criteria. The rationales for these four parks were scenic value, scientific research, tourism and recreation. But the four parks are partially redundant in the sense that all of them are forested slopes and mountains.

This leads to the topic of ecosystem representation. Unfortunately, no other type of landscape in the state benefits from federal preservation units. The four parks are, of course, important remains or reminiscences of the state's dominant original landscape. But Rio de Janeiro state still has a variety of landscapes not covered by national parks. Even the biological preserve and the ecological station existent in the state contain basically forested slopes and mountains. The point is that many other important natural areas, even though disturbed or altered, would deserve federal preservation status. They are on the Coastal Plain, on the Atlantic shoreline and even in the lower Paraiba do

Sul Valley. Rio de Janeiro's parks therefore suffer from a bias that favored mountain forests.

Rio de Janeiro's national parks are and will continue to suffer from growing agricultural, industrial, urban and recreational pressures. The state's economy is still the second in the country. The large population, although mostly poor, lacks significant leisure areas, with the exception of ocean beaches. Rio's middle class is one of the sources of the not very numerous ranks of hikers, mountain climbers, backpackers and bird watchers. Local national parks will be safe from these pressures only if they are adequately managed.

Itatiaia and Serra dos Orgaos still have good infra-structure and sound management plans. With funding, adequate zoning and professional staffing they can continue to attract visitors and still provide protection of their natural features. Of course their lands must be defined and secured. Tijuca, on the contrary, must be protected from visitation. Many roads and trails must be closed, some of them permanently. Motor vehicle circulation must be controlled. A nature trail through the replanted forest area should be established, together with natural history and social history museums. Park gates should close at specified hours. Serra da Bocaina, the least consolidated of the state's national parks, should have its land acquired and controlled. This is currently much more important than creating infra-structure for visitation.

It is a blessing for a state as ravaged as Rio de Janeiro to

have four national parks and maybe gain a new one this year. Maybe it is too much to expect other parks in shoreline and lowland areas before the existing ones are consolidated. The most difficult problems remain, though. Effective control and management of national parks as public goods is lacking. The historic trend of governmental lack of control over public lands will have to be checked and reversed before any national parks or any preservation units in Brazil become stable political entities protecting significant sections of the country's landscapes.

ADDENDUM

The final draft of this text was concluded in February of 1989, in Rio de Janeiro. Ninety days in Brazil allowed the author to gather information relevant to several topics discussed in the text.

In January the federal government created an Institute for the Environment and Renewable Natural Resources. It was composed by the assets, personnel and mandates of three "extinguished" agencies: the Instituto Brasileiro de Desenvolvimento Florestal (manager of national parks and biological preserves), the Secretaria Especial do Meio Ambiente (Brazil's equivalent to the US EPA) and the Superintendencia de Desenvolvimento da Pesca (fisheries authority). The three agencies were responsible for most of what was done in the fields of conservation and preservation in Brazil. The unification was, in fact, one of the policy suggestions presented in Chapter 5. The new institute will be under the Interior Department. It was obviously designed as a response to growing environmental problems in Brazil, specially in the face of international pressures towards effective policies.

Most environmentalists seem to have approved the fusion of the

three agencies. In fact, this unification had been suggested for many years by several environmental activists and organizations. In this author's view, the most desirable development for park and preserve policy in this new institutional framework would be the prevalence of the Secretaria's personnel and directives. It was by far the most effective of the three agencies. Preservation policy proper can indeed enter a new era in Brazil if the Secretaria's higher professional standards and stronger political will is applied to the park service's 1979 policy directives.

Last December, at the opening of the Brazilian summer vacation season, the Instituto officially announced that 22 of the 28 national parks would be closed to visitation. The alleged reason, most probably true, was lack of personnel to manage visitation. The Instituto's chronic loss of personnel, discussed in Chapter 5, finally caused a major breakdown in national park management. A legion of nature appreciators and potential park constituents was therefore deprived of the possibility of visiting the country's national parks.

The recent assassination of Francisco (Chico) Mendes has sent shockwaves throughout Brazil and abroad. His violent death gave further publicity to a type of protected land not mentioned in Chapter 4: "extractivist preserves". At least four such units were established by the state government of Acre, in Brazil's extreme West, where Mendes lived and worked as a rubber tapper. Their legal status is unclear. Although created with the objective of sustained yield of forest products, they are not State Forests

as defined by the 1965 Forest Code.

Their concept was developed by the rubber tappers unions, who have been resisting deforestation for the obvious reason of defending the natural populations of Hevea brasiliensis trees scattered in Acre's dense tropical rain forests. Mendes was a union leader and the national spokesman for the rubber tappers, and not a scientist or an environmental activist proper.

Rather than being preservation units, though, "extractivist preserves" are typical conservation units. They aim at the sustained yield of raw rubber and a few dozen other forest products (fruit, leaves, roots, barks, etc) supposedly harvestable on a stable basis. There should be some caution about the claim that the extraction of these products is not harmful to tropical forest ecology. The intensive exploitation of any floral or faunal resource in such a complex ecosystem may have unsuspected implications, even on a short-term basis. Hevea brasiliensis trees, for example, can and have been killed by excessive tapping.

Nonetheless, extractivist preserves are obviously much more appropriate for the Amazon region than grazing, farming, clearcutting and monocultural reforestation. Their widespread adoption throughout the region would indeed mean a radical shift in current land use patterns for the simple fact of aiming at ecological sustainability. For park and preserve policy, though, this author does not believe that extractivist preserves would necessarily eliminate pressures on Amazonian preservation units. Pressures might change in degree, but systematic extraction of

floral and faunal resources remains incompatible with preservation.

Notes

Chapter 2

1 - Wanderley Guilherme dos Santos. "A Pos-Revolucao Brasileira". Brasil, Sociedade Democratica. Rio de Janeiro, Jose Olympio, 1985, p.233.
2 - Santos, "A Pos-Revolucao...", p.233.
3 - Santos, "A Pos-Revolucao...", pp.234-238.
4 - Santos, "A Pos-Revolucao...", pp.234,239,243-245.
5 - Santos, "A Pos-Revolucao...", pp.247-249,251,256-257,265; FIBGE. Anuario Estatistico do Brasil - 1986. Rio de Janeiro, FIBGE. 1987, p.102, Table 8.1.
6 - Santos, "A Pos-Revolucao...", p.255.
7 - Santos, "A Pos-Revolucao...". pp.268-275,276-309.
8 - Departamento de Parques Nacionais e Reservas Equivalentes. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975], p.3.
9 - Thomas E. Skidmore. Politics in Brazil, 1930-1964: An Experiment in Democracy. Oxford University Press, 1967; Alfred C. Stepan. The Military in Politics: Changing Patterns in Brazil. Princeton University Press, 1971, are both good English language analysis of contemporary Brazilian politics and institutions.
10 - Tasso Vilar de Aquino. "Importancia da Estacao Ecologica no Sistema Nacional de Conservacao do Meio Ambiente". Boletim FBCN, 14, pp.82-83.
11 - IBASE News Files, Jornal do Brasil, 2/5/88; O Globo, 7/18/86, 11/16/86; Eduardo Viola. O Movimento Ecologico no Brasil (1974-1986): Do Ambientalismo a Ecopolitica. Cadernos de Ciencias Sociais, Volume 5, Numero 4. Florianopolis, Universidade Federal de Santa Catarina, 1986, p.18.
12 - Legislacao de Conservacao da Natureza. Sao Paulo, CESP; Rio de Janeiro, FBCN, pp.491-505,592-596; IBASE Files, Jornal do Brasil, 9/19/85, O Globo, 9/27/1986, 12/2/1986, 5/26/85.
13 - Legislacao..., pp.586-587; Almanaque Abril - 1988. Sao Paulo, Editora Abril, 1987, p.703; IBASE Files, Jornal do Brasil, 6/10/86; O Globo, 6/12/86; Fundacao Instituto Brasileiro de Geografia e Estatistica - SUPREN. Proposta para um Plano de Zoneamento Ecologico-Economico do Brasil. [Brasilia], May 1986. [typewritten]; Wanderbilt Duarte de Barros. "Legislacao de Conservacao da Natureza". FBCN - Boletim Informativo, 9, p.34.

14 - David Quammen. "Brazil's Jungle Blackboard". Harpers Magazine, March 1988, pp.65-70; IBASE Files, Folha de Sao Paulo, 8/23/86, 3/11/87; O Globo, 2/7/86, 6/10/86.
15 - IBASE Files, O Globo, 6/22/1986, 6/17/1986; Jornal do Brasil, 6/6/1983.
16 - Data for the last four paragraphs came from many clips and abstracts in IBASE Files, 1983-1988.
17 - IBASE Files, Visao, 4/29/1985; Isto E, 12/31/1986; O Globo, 9/6/1987.
18 - Almanaque Abril - 1987. Sao Paulo, Editora Abril, 1986; Barros, "Legislacao...", p.35.
19 - Maria Tereza Jorge Padua, [Esboco Historico da Legislacao Fundiaria Brasileira.] n.p., 1980. [typewritten], pp.1-2.
20 - Padua, [Esboco...], pp.2-3; Wanderbilt Duarte de Barros. Parques Nacionais do Brasil. Rio de Janeiro, Servico de Informacao Agricola do Ministerio da Agricultura, 1952, pp.15,17; Sonia Maria Pereira. "Legislacao Ambiental: Problemas Fundiarios". Boletim FBCN, 15, p.10; Jair Tovar, "Parques Nacionais". Revista do Servico Publico, 87(3),p.131; Warren Dean. "Forest Conservation in Southeastern Brazil, 1900 to 1955". Environmental Review, 9, p.56, mentions the lack of "any real control" over public lands by the Brazilian government and the systematic favoring of the "richest and most powerful of the pretenders" to them.
21 - Padua, [Esboco...], pp.3-4; Pereira, "Legislacao...", p.11.
22 - Pereira. "Legislacao...", p.9; Maria Tereza Jorge Padua et Adelmar Coimbra Filho. Os Parques Nacionais do Brasil. Madrid, Instituto de la Caza Fotografica y Ciencias de la Natureza; Instituto de Cooperacao Ibero-Americana, 1979, p.8; Barros, Parques Nacionais do Brasil, p.14.
23 - The point is made by Luiz Claudio Pereira Leivas. "A Legislacao Patrimonial da Uniao e a Conservacao do Meio Ambiente: Um Elemento Esquecido". FBCN - Boletim Informativo, 12, pp.55-58.
24 - Legislacao..., pp.3-6.
25 - Codigo Florestal, Decree 23793, January 23, 1934, Articles 1,4,5,6,7,8; Warren Dean. "Forest Conservation...", pp.57,63.
26 - Codigo Florestal, Articles 9,11,37,101.
27 - Maria Tereza Jorge Padua. Interview. Brasilia, May 19, 1988; Angela B. Quintao Tresinari. "Evolucao do Conceito de Parques Nacionais e sua Relacao com o Processo de Desenvolvimento". Brasil Florestal, XIII(54), p.19; Jose Candido de Melo Carvalho. "Dia Mundial do Meio Ambiente: Consideracoes sobre a Participacao do Brasil em Organizacoes, Programas e Convencoes Relativas a Conservacao do Meio Ambiente". Boletim - FBCN, 14, p.8; Dean, "Forest Conservation...", pp.60,63.
28 - Legislacao..., pp.25,122.
29 - Legislacao..., pp.104-113; Dean, "Forest Conservation...", p.64.
30 - Legislacao..., p.105 ; Harold Edgard Strang et al. Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas mais Importantes. Campos do Jordao (SP), 12-18 de setembro de 1982. [mimeographed] I did not find a single instance of this actually happening. Although I did not do a search any such developments

would be mentioned in many of my sources.
31 - Maria Tereza Jorge Padua. "Sistema de Parques Nacionais e Reservas Equivalentes do Brasil". Revista do Servico Publico, 111(4), p.17. I did not find any acts creating hunting parks. I heard media references to State Hunting Parks in Rio Grande do Sul but I could not check their legal status.
32 - Legislacao..., p.221.
33 - Legislacao..., p.421.
34 - Eugenio Camargo Bruck et al. "Unidades de Conservacao". Revista do Servico Publico, 111(4),p.22; Legislacao..., pp.456-467.
35 - The last three paragraphs are based on Legislacao..., pp.467-474.
36 - IBASE Files, specially Folha de Sao Paulo, 10/12/1984, 10/17/1984.
37 - IBASE Files, Folha de Sao Paulo, 7/25/1985; Jornal do Brasil, 10/9/1985; Legislacao..., pp.610-612; O Estado de Sao Paulo, 5/20/1986.
38 - J. L. Belart. "Por uma Politica Nacional de Conservacao". FBCN - Boletim Informativo, 11, pp.47-48; Legislacao..., pp.662-667.
39 - IBASE Files, Jornal do Brasil, 5/26/1988.
40 - Ibsen de Gusmao Camara. "Necessidade de uma Politica Nacional de Conservacao do Meio Ambiente"". FBCN - Boletim Informativo, 11, p.32.
41 - Barros, "Legislacao...", pp.32-33.

Chapter 3

1 - Jose Augusto Padua. Natureza e Projeto Nacional: As Origens da Ecologia Politica no Brasil. Rio de Janeiro, IUPERJ, 1986. [mimeographed], p.26; see also Padua, "Sistema ...", p.17.
2 - Padua, Natureza e Projeto Nacional..., pp.3,4-6,8.
3 - Padua, Natureza e Projeto Nacional..., pp.12-24; Donald Worster. Nature's Economy - A History of Ecological Ideas. Cambridge, Cambridge University Press, 1985, divides ecological thinkers into two broad categories, "arcadians" and "imperialists".
4 - Padua, Natureza e Projeto Nacional..., pp.24-26.
5 - Padua, Natureza e Projeto Nacional..., pp.29-31.
6 - Padua, Natureza e Projeto Nacional..., pp.32-46; Jose Candido de Melo Carvalho. "O Papel das Entidades Nao-Governamentais na Conservacao da Natureza". FBCN - Boletim Informativo, 12, pp.49-53; Dean, "Forest Conservation...", pp.58-59; Barros, Parques Nacionais do Brasil, p.15, implies that Torres read Pinchot and used the term "conservation" in a "correct" way.
7 - Padua, Natureza e Projeto Nacional..., p.47.
8 - Atala et al, Floresta da Tijuca. Rio de Janeiro, Centro de Conservacao da Natureza, 1966, pp. 40-41, expands on Archer's "vision" of forestry; Dean, "Forest Conservation...", p.56, mentions that the city of Sao Paulo decided in the 1890's to protect its watersheds, probably spurred by Rio's troubles in

replanting its own watersheds.
9 - Herman von Ihering. "Devastacao e Conservacao das Matas". FBCN - Boletim Informativo, 7, pp.40-51; Dean, "Forest Conservation...", p.57. Dean mentions other Brazilian conservationists of the early and mid-20th century.
10 - Carvalho, "Dia Mundial do Meio Ambiente...", pp.6,7; Sampaio was a scientist and a leading conservation activist, as shown by Dean in "Forest Conservation...", pp.60-61.
11 - Carvalho, "Dia Mundial do Meio Ambiente...", pp.8,9,10,11,12,13,14,15; see also Carvalho, "O Papel...".
12 - Padua, Interview; Dean, "Forest Conservation...", p.63.; Tresinari, "Evolucao..." , p.14; Tovar, "Parques Nacionais", p.126; Barros, Parques Nacionais do Brasil, p.21, written in 1947, also mentions Argentina's pioneer parks.
13 - Padua, Interview; Alceo Magnanini. Politica e Diretrizes dos Parques nacionais do Brasil. Rio de Janeiro, IBDF, 1970, pp.3,4.
14 - This controversy was publicized in O Globo, 6/19/1945 and 6/20/1945; I thank Jairo Cesar Marconi Nicolau for retrieving these news clips from Maya's papers in the Fundacao Castro Maya.
15 - Barros, Parques Nacionais do Brasil, pp.9,10,20.
16 - IBDF-FBCN. Plano de Manejo - Parque Nacional da Tijuca. Brasilia, 1981, p.44; Legislacao..., pp.163-170; Almanaque Abril - 1988, p.703.
17 - Legislacao..., pp.173-184; Padua, Interview; Margarene Maria Lima Bezerra. Interview. Brasilia, May, 20, 1988. I could not obtain precise dates for this administrative evolution, which happened in the early 1970's.
18 - Dean, "Forest Conservation...", p.63.
19 - Instituto Brasileiro de Reforma Agraria et Instituto Brasileiro de Desenvolvimento Florestal. Parques Nacionais e Reservas Equivalentes no Brasil: Relatorio com Vistas a uma Revisao da Politica Nacional nesse Campo. Rio de Janeiro, IBRA-IBDF, 1969. [mimeographed], "Nota Explicativa", pp.1,2,6-10,11,20,69,72,88-94.
20 - Alceo Magnanini et Maria Tereza Jorge Padua. "Situacao dos Parques Nacionais no Brasil". FBCN - Boletim Informativo, 4, pp.28-58.
21 - Alceo Magnanini. Politica e Diretrizes dos Parques Nacionais do Brasil. Rio de Janeiro, Instituto Brasileiro de Desenvolvimento Florestal, 1970, pp.3,6-10.
22 - Paulo Azevedo Berutti. "Politica de Conservacao da Natureza". Brasil Florestal, V(20), pp.4-5; "Parques Nacionais e Reservas Equivalentes". Resolution of the XXVII Annual Meeting of the Brazilian Society for the Advancement of Science. n.p., 1975. [typewritten].
23 - Padua, Interview.
24 - Instituto Brasileiro de Desenvolvimento Florestal. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975], pp.1-2.
25 - IBDF, Projeto de Implantacao..., pp.4-5,7-8.
26 - IBDF, Projeto de Implantacao..., pp.20-24, 28, "Anexo 1-A".
27 - Padua, Interview; "I Curso sobre Administracao e Manejo de Parques Nacionais". Brasilia, October 17-29, 1977. File in

Fundacao Brasileira de Conservacao da Natureza's library. Some lectures unfortunately are missing. Also Marc J. Dourojeanni. Informe sobre Asesoramento al Instituto Brasileno de Desarollo Florestal en Parques Nacionales. n.p., 1977. [typewritten] . Dourojeanni is an Argentine park expert who lectured in the course.
28 - Instituto Brasileiro de Desenvolvimento Florestal. Diagnostico do Subsistema de Conservacao e Preservacao de Recursos Naturais Renovaveis. Brasilia, 1978, "Introducao" and pp.53-54.
29 - IBDF, Diagnostico..., pp.55-56, also Table 2; pp.111-133, Tables 03-25; pp.61-65.
30 - IBDF, Diagnostico..., pp.75,77.
31 - Padua, Interview; Padua, "Situacao...", p.86.
32 - Diagnostico..., p.57.
33 - Maria Tereza Jorge Padua et Jose Manuel C. Vasconcellos. Parques Nacionais e Reservas Equivalentes. n.p., n.d., [circa 1978]. [typewritten], pp.1-2.
34 - Padua et Vasconcellos, Parques Nacionais..., pp.2,3,4,7.
35 - Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza. Plano do Sistema de Unidades de Conservacao do Brasil - II Etapa. Brasilia, 1982. Hereafter cited as IBDF-FBCN, Plano do Sistema... . I used only the "second stage" issue of the plan, because it contains the first stage's premises, proposals and results and because no "third stage" document has yet been put together. The "first stage" version of the plan was published in 1979.
36 - IBDF-FBCN, Plano do Sistema..., p.11.
37 - IBDF-FBCN, Plano do Sistema..., p.11.
38 - IBDF-FBCN, Plano do Sistema..., "Prefacio" and p.12.
39 - IBDF-FBCN, Plano do Sistema..., "Prefacio"; an example of international recognition is in Paul Ehrlich et Anne Ehrlich. Extinction: The Causes and Consequences of the Disappearance of Species. New York, Ballantine, 1983.
40 - Maria Tereza Jorge Padua. "Aplicacao de Planos Diretores para Parques Nacionais". FBCN - Boletim Informativo, 7,p.17; Barros, Parques Nacionais do Brasil, p.27, in 1947 called for "detailed plans" for park management.
41 - Padua, "Aplicacao...", pp.18-20; Padua, Interview.
42 - Maria Tereza Jorge Padua. "Situacao Atual do Sistema de Parques Nacionais e Reservas Biologicas". Boletim FBCN, 16, p.36; Padua, Interview; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.14, emphasize that IBDF alone could not have produced the management plans, showing how vital was the participation of FBCN, a private group.
43 - Legislacao..., pp.378-387; Barros, Parques Nacionais do Brasil, p.27, suggested for park "rules" in 1947.
44 - IBRA-IBDF, Parques Nacionais e Reservas..., p.67; Padua, Interview, agrees that "scenic beauty" was the most important criteria for creating national parks until 1974; Barros, Parques Nacionais do Brasil, pp.26, 30-35.
45 - Padua, "Situacao...", p.35.
46 - Padua, "Situacao...", p.35.
47 - IBDF-FBCN, Plano do Sistema..., p.29.

48 - IBDF-FBCN, Plano do Sistema..., p.29,31,39.; Padua, Interview; Stone, Dreams..., pp.27-28,111,112 mentions the scientific studies leading to the pleistocene refuge theory.
49 - IBDF-FBCN, Plano do Sistema..., pp.39-40,42.
50 - IBDF-FBCN, Plano do Sistema..., pp.44-45.
51 - IBDF-FBCN, Plano do Sistema..., pp.45,48.

Chapter 4

1 - IBDF-FBCN, Plano do Sistema..., pp.20,25.
2 - Strang et al, Parques Estaduais..., pp.2,3,5,8-10; FIBGE, Anuario Estatistico..., p.30, Table 2.6; Padua, Interview, states that Sao Paulo's numerous state units are generaly "well managed".
3 - IBDF-FBCN, Plano do Sistema..., pp.21,26.
4 - Legislacao...; IBRA-IBDF, Parques Nacionais e Reservas..., pp.20-27; Padua, Unidades..., pp.13-21; Padua, Interview. Recent press stories announced the imminent creation of new national forests in 1988, but I did not obtain confirmation.
5 - IBDF-FBCN, Plano do Sistema..., pp.20,26.
6 - FIBGE, Anuario Estatistico..., p.32, Table 2.7; Strang et al, Parques Estaduais do Brasil..., pp.8-10; Herbert Martins. Breve Relatorio Incompleto do "Parque Ambiental" de Minas Gerais. Belo Horizonte, 1988. [typewritten]
7 - IBDF-FBCN, Plano do Sistema..., pp.19-20.
8 - Legislacao..., pp.441-443; Paulo Nogueira Neto. "Um Novo Conceito de Estacao Ecologica". Boletim FBCN, 15, pp.37-39; the theme of scientific optimism in environmental matters is explored by David Ehrenfeld. The Arrogance of Humanism. Oxford, Oxford University Press, 1981.
9 - Bruck et al, "Unidades de Conservacao", p.22.
10 - Secretaria Especial de Meio Ambiente. Programa de Estacoes Ecologicas. Brasilia, 1977, p.5; SEMA. Estacao Ecologica de Jureia. Brasilia, 1984, pp. 10,12,27-41; SEMA. Estacao Ecologica de Taim. Brasilia, 1984, pp.29-37; Bruck et al, "Unidades de Conservacao", p.24.
11 - IBASE Files, Isto E, 8/3/1983, p.33; SEMA. Areas de Protecao Ambiental: Abordagem Historica e Tecnica. Brasilia, 1987, p.11; Aquino, "Importancia da Estacao Ecologica...", p.83; the computation of combined ES areas is mine.
12 - Padua, Interview.
13 - IBASE Files, O Globo, 2/9/1986; Strang et al, Parques Estaduais do Brasil..., p.i.
14 - Legislacao..., pp.441-443.
15 - Bruck et al, "Unidades de Conservacao", p.25.
16 - SEMA, Areas de Protecao Ambiental..., pp. 9-12,14,16-17.
17 - SEMA, Areas de Protecao Ambiental..., pp.20,23; SEMA. Area de Protecao Ambiental de Sao Bartolomeu. Brasilia, n.d.; IBASE Files, O Globo, 10/24/1987; Legislacao..., pp. 505-508.
18 - IBASE FIles, Jornal do Brasil, 2/9/1986, 9/25/1987; O Globo, 3/9/1986; Jairo Cesar Marconi Nicolau, Personal Communication. Rio

de Janeiro, April 1988.
19 - Legislacao..., pp.509,510-511,512,529-530,544-546; SEMA, Areas de Protecao Ambiental..., pp.10,26.
20 - Legislacao..., pp.554-546,579,580,618-617; Quammen, "Brazil's Jungle Blackboard"; Roger Stone, Dreams of Amazonia. New York, Penguin, 1986, Chapter 6.
21 - Legislacao..., pp.354-356.
22 - Legislacao..., pp.21,24,21-45; Bezerra, Interview; Fabio de Jesus. Interview. Brasilia, May 19, 1988; Antonio Domingues Aldrighi. Parque Nacional da Tijuca. n.p., IBDF, n.d. [typewritten], p.1; IBDF, Projeto de Implantacao..., Anexo IV; Barros, director of Itatiaia National Park, mentions the 1946 union protective forest as a buffer for the park; see Barros, Parques Nacionais do Brasil, p.17. I found nothing about the fate of protective forests outside Rio de Janeiro state.
23 - Legislacao..., pp.70-83; Padua, Interview; area computations are mine.
24 - Claudia Meneses, Personal Communication. Espirito Santo, December 1987, informed me about the current status of Native American lands; Magnanini et Padua, "Situacao...", p.21.
25 - Legislacao..., p.20.
26 - IBDF-FBCN, Plano do Sistema..., pp.20,25.
27 - IBDF-FBCN, Plano do Sistema..., pp.20,25.
28 - IBDF-FBCN, Plano do Sistema..., pp.21,25.
29 - IBDF-FBCN, Plano do Sistema..., pp.20,25.
30 - IBDF-FBCN, Plano do Sistema..., pp.21,26; Padua, Interview.
31 - IBDF-FBCN, Plano do Sistema..., p.21; Padua, Interview; Padua, Unidades..., pp.12-13.
32 - IBDF-FBCN, Plano do Sistema..., pp.22,26.
33 - IBDF-FBCN, Plano do Sistema..., pp.22,26; Gary B. Wetterberg et al. Decade of Progress of South American National Parks- 1974-1984. Washington D.C., USDI, National Park Service, 1985, pp.16-20, has a brief English language summary of Brazilian protected areas, existent and proposed. The vague legal definition of some existing units is also mentioned.
34 - Two books have used congressional records in analyzing American National Parks: Roderick Nash. Wilderness and the American Mind. 3 ed. Cambridge, Yale University Press, 1982; and Alfred Runte. National Parks:The American Experience. Lincoln and London, University of Nebraska Press, 1984.
35 - Padua, Interview.
36 - IBRA-IBDF, Parques Nacionais e Reservas Equivalentes..., pp.35-37,58-61.
37 - Faleiros, Interview; Padua, [Esboco...].
38 - Jesus, Interview; I thank Fabio de Jesus, Margarene Maria Lima Bezerra and Antonina Ornellas for providing these figures and other data on visitation.
39 - Bezerra, Interview; Jesus, Interview; Herbert Martins. Parque Nacional do Caparao. Belo Horizonte, 1988. [typewitten]
40 - Bezerra, Interview...; Nash, Wilderness..., Chapter 15; Runte, National Parks..., Chapter 8; Joseph 1 Sax. Mountains without Handrails: Reflections on the National Parks. Ann Arbor,

University of Michigan Press, 1987, dedicates a whole book to several controversies which divide specific sub-constituencies of visitors of American national parks.
41 - Carlos Manes Bandeira. "Escavacoes Historicas no Parque Nacional da Tijuca". FBCN - Boletim Informativo, 10, pp.87-93; Carlos Manes Bandeira et al. Pesquisas e Escavacoes Arqueologicas em Sitios Historicos do Parque Nacional da Tijuca e Arredores. Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1984. [typewritten]
42 - Padua, Interview; Padua, Unidades de Conservacao. I thank the author for permission to cite provisional figures of this on-going study about Brazilian conservation units.
43 - Bezerra, Interview.
44 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.184-188; Barros, Parques Nacionais do Brasil, p.17.
45 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.181-182.
46 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.176-177.
47 - IBDF-IBRA, Parques Nacionais e Reservas Equivalentes..., p.43.
48 - IBRA-IBDF, Parques Nacionais e Reservas Equivalentes..., pp.40-42; Padua, Interview; Augusto Ruschi. Beija-Flores do Estado do Espirito Santo. Sao Paulo, Editora Rios, 1982, has some references to Ruschi's pioneer preserve creation campaign; Strang et al, Parques Estaduais do Brasil..., p.26, also mentions Ruschi's role.
49 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.183-184.
50 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p. 180; Padua et Audi, "Especies ...", p.58.

Chapter 5

1 - Padua, Interview.
2 - Padua, Interview; Stone, Dreams..., pp.160-161; Bezerra, Interview.
3 - Adelmar Coimbra Filho et Antonio Domingues Aldrighi. A Restauracao da Fauna do Parque Nacional da Tijuca, Guanabara, Brasil. Publicacoes Avulsas, numero 57. Rio de Janeiro, Museu Nacional do Rio de Janeiro, 1971, p.6; Runte, National Parks..., chapter 7.
4 - Padua et Audi, "Especies...", pp.49,50,52,55-75,77.
5 - Padua, "Situacao...", pp.37-40.
6 - Maria Tereza Jorge Padua. "Areas de Preservacao: Parques Nacionais e Reservas Biologicas". Brasil Florestal, VII(31), p.9.
7 - Tresinari, "Evolucao...", pp.20-22; it is by now obvious that my "generational" classification of Brazilian national parks is akin to Tresinari's "stages".
8 - Tresinari, "Evolucao...", pp.22-23.
9 - SEMA, Projeto Nacional do Meio Ambiente; Bezerra, Interview.

10 - Barros et Strang, "Capacitacao...", pp.12-13; Wetterberg et al, Decade..., p.19, mentions "lack of qualified personnel" as a major problem for Brazilian NP's.
11 - IBASE Files, O Globo, 6//1/1986, 10/24/1987, 3/5/1988; Folha de Sao Paulo, 10/21/1986.
12 - Bezerra, Interview; Padua, Interview; Wetterberg et al, Decade..., p.19.
13 - IBASE Files, Folha de Sao Paulo, 4/5/1986. I used area figures from Tables in Chapter 4; Padua, Unidades..., p.1, mentions other countries' figures; Ibsen de Gusmao Camara. "A Licao de Itatiaia". Conservacao da Natureza, XI(2),p.1.
14 - IBASE Files, O Globo, 5/9/1988; Bezerra, Interview; Padua, Interview; Wetterberg et al, Decade..., pp.101-103 mentions four other Brazilian parks scheduled for imminent creation.
15 - IBASE Files, O Globo, 2/27/1988, 4/28/1988; Runte, National Parks..., dedicates Chapter 1 to the recurrent preservationist argument of parks as part of American national identity.
16 - IBDF-FBCN, Plano do Sistema..., pp.42-43; IBASE Files, O Globo, 6/1/1986.
17 - Padua, Interview; IBDF-FBCN, Plano do Sistema..., pp.83,84, mentions community support for Caparao and Serra da Canastra NP's; Wetterberg et al, Decade..., p.19, mentions the problem of "lack of public recognition and support".
18 - Padua, Interview.
19 - Nash, Wilderness... consistently refers to urbanization as an underlying cause for the emergence of a significant social movement of American nature appreciation; Viola, O Movimento Ecologico no Brasil...; Eduardo Viola. Movimento Ecologico e Partido Verde no Brasil: Notas Sobre uma Relacao Muito Complexa. Tese Apresentada ao XI Encontro Anual da ANPOCS. Aguas de Sao Pedro, October 20-29, 1987; both are pioneer studies of the different strands of emerging environmental groups in Brazil. Jose Augusto Padua et Antonio Lago. O que e Ecologia. Sao Paulo, Brasiliense, 1981, explores different emphasis of environmental groups, inside and outside Brazil.
20 - IBASE Files, O Globo, 5/31/1987; Senhor, 3/7/1988; Jornal do Brasil, 9/1/1985; Santiago to Richa, official letter 167/1986. Brasilia, March, 3, 1986. FBCN Files. Jose Richa was elected by popular vote and through an opposition party; Viola considers him to have a good environmental record; Viola, O Movimento Ecologico no Brasil..., p.18.
21 - Padua, Interview.

Chapter 6

1 - Cited in Ernani da Silva Bruno. Historia do Brasil - Geral e Regional: Espirito Santo, Rio de Janeiro, Guanabara e Minas Gerais. Sao Paulo, Cultrix, 1967, p.143. Nilo Pecanha was a major Rio de Janeiro politician, President of Brazil in 1909-1910.
2 - Stone, Dreams..., pp.29-30; the upward tendency of the

estimates is due mainly to the consideration of the life-sustaining capability of Native American agriculture.

3 - Warren Dean, "Indigenous Populations of the Sao Paulo-Rio de Janeiro Coast: Trade, Aldeamento, Slavery and Extinction". Revista de Historia, 117, pp.3-9; the estimate for the population of the entire Rio de Janeiro area is mine. Dean notes that his estimate for 1555 is probably below the "contact" population of 1500, due to epidemic diseases that wiped out thousands of Natives over 50 years of constant contact with European sailors.

4 - Dean, "Indigenous Populations...", pp.12-14,16-17,24; Frederick Turner. Beyond Geography - The Western Spirit Against the Wilderness. New Brunswick, New Jersey, Rutgers University Press, 1983.

5 - Warren Dean. "Ecological and Economic Relationships in Frontier History: Sao Paulo, Brazil". George Wolfskill and Stanley Palmer, eds. Essays on Frontiers in World History. Arlington, University of Texas Press, n.d., p.77.

6 - Sergio Buarque de Holanda. Visao do Paraiso - Os Motivos Edenicos no Descobrimento e na Colonizacao do Brasil. 4 ed. Sao Paulo, Nacional, 1985, is a superb historical account of "visions of paradise" and "conquest myths" developed by different European colonizers in their contact with the American continent; Viana Moog. Bandeirantes e Pioneiros. 12 ed. Porto Alegre, O Globo, 1971, also compares European colonial enterprises in Brazil and North America.

7 - Alfred W. Crosby. Ecological Imperialism - The Biological Expansion of Europe, 900-1900. Cambridge, Cambridge University Press, 1986, specially Chapter 5, "Winds", expounds Portuguese sailing technology; Gilberto Freyre. Casa Grande e Senzala. 23ed. Rio de Janeiro, Jose Olympio, 1984, specially Chapter 1, has plenty of social and cultural background on the Portuguese and Spanish colonial and missionary efforts. There is an English language edition of this basic book on Brazilian social history, entitled The Masters and the Slaves.

8 - Freyre, Casa Grande..., defends the colonialist virtues of the Portuguese, as compared with European rivals and evaluates their sugar cane plantations as a distinctly Portuguese colonial effort.

9 - Gilberto Freyre. Nordeste. 5 ed. Rio de Janeiro, Jose Olympio; Recife, Fundacao do Patrimonio Historico e Artistico de Pernambuco, 1985; Freyre, Casa Grande...; Dean, "Deforestation...", pp.53-56.

10 - Sergio Buarque de Holanda, Raizes do Brasil. 19 ed. Rio de Janeiro, Jose Olympio, 1987, pp.17,18; Dean, "Deforestation...", p.55, discusses the economics of swidden agriculture.

11 - Bruno, Historia do Brasil..., pp.16,185; Padua, Natureza e Projeto Nacional..., p.14.

12 - Bruno, Historia do Brasil..., pp.19,21.

13 - Dean, "Indigenous Populations..."; Bruno, Historia do Brasil..., pp.16,32.

14 - Turner, Beyond Geography..., explores the different geographies of Natives and Europeans in Central and North America colonial processes; Bruno, Historia do Brasil..., p.23.

15 - IBDF-FBCN. Plano de Manejo - Parque Nacional da Tijuca, pp.23-24 was the basis for this geographical description; I have added numerous personal observations.
16 - IBDF-FBCN, Plano de Manejo - Parque Nacional da Tijuca, p.25; Alves Motta Sobrinho, A Civilizacao do Cafe. 3 ed. Sao Paulo, Brasiliense, 1978. p.11; Dean, "Indigenous Populations...", p.4; Dean, "Forest Conservation...". p.55; Warren Dean. "Deforestation in Southeastern Brazil". Richard B. Tucker and J.F. Richards, eds. Global Deforestation and the Nineteenth Century World Economy. Durham, North Carolina, Duke University Press, 1983, pp.50-67, describes in more detail the coastal forests in the Sao Paulo-Rio de Janeiro area, which he calls "sub-Tropical Atlantic Coastal Forest".
17 - Bruno, Historia do Brasil..., pp.33,34,35,39.
18 - Holanda, Raizes..., pp.66-73, evaluates the Portuguese preference for Brazil's coastal areas and compares it to the Spaniards' tendency to create all their main colonial cities in the mountain ranges of Central and South America.
19 - Bruno, Historia do Brasil..., pp.24,28; Dean, "Indigenous Populations...", p.19.
20 - Freyre, Nordeste, gives a detailed statement of the ecological effects of sugar cane plantations in the Brazilian Northeast, in all similar to case in study here; Bruno, Historia do Brasil..., p.25, mentions how little cattle the Rio de Janeiro area had in comparison to all other colonial settlements in Brazil; Dean, "Deforestation...", pp.60-61.
21 - Bruno, Historia do Brasil..., pp.58,62-63,67; Freyre, Casa Grande..., both mention the incidence of free Blacks in the mining business; Dean, "Deforestation...", briefly explains the environmental impacts of mining in the Minas Gerais area.
22 - Orlando Valverde. Estudos de Geografia Agraria Brasileira. Petropolis, Vozes, 1985, pp.22; Bruno, Historia do Brasil..., p.61.
23 - Charles Darwin. The Voyage of the Beagle. New York, Doubleday and American Museum of Natural History, 1962, Chapter 2.
24 - Valverde, Estudos..., pp.17-18.
25 - Affonso d'E. Taunay. Historia do Cafe no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1939, v 1, p.60; v 2, p129; Valverde, Estudos..., p.19.
26 - Taunay, Historia do Cafe..., v 2, p.129; Fuad Atala et al. Floresta da Tijuca. Rio de Janeiro, Centro de Conservacao da Natureza, 1966; Raymundo Ottoni de Castro Maya. A Floresta da Tijuca. Rio de Janeiro, Bloch 1967.
27 - In my estimation I did not include Minas Gerais and Sao Paulo areas also opened for coffee. Incidentally, I find Dean's estimate of 30,000 km² as the total area of forests cleared for coffee in Brazil during the whole 19th century very conservative, even discounting sizeable Sao Paulo areas where coffee occupied lands already used for sugar cane plantation. See Dean, "Deforestation...", p.63.
28 - Valverde, Estudos..., p.17; Enciclopedia Americana; Dean, "Deforestation...", p.62.
29 - Maria Celina Whateley. O Cafe em Resende no Seculo XIX. Rio

de Janeiro, Jose Olympio, 1987. pp.14-16.; Warren Dean. Rio Claro: A Brazilian Plantation System. Stanford, Stanford University Press, 1976, specially Chapters 1 and 2, has a much longer evaluation of the environmental impacts of coffee plantations in the different landscape of Sao Paulo's Plateau; I also used Valverde, Estudos...; Dean, "Forest Conservation..."; Dean, "Deforestation..."; Bruno, Historia do Brasil..., pp.111-137. I have included in the following pages many observations from personal visits to old and young coffee farms in the Paraiba do Sul Valley.

30 - Warren Dean. Sao Paulo and the Green Wave of Coffee: Beginnings of Scientific Research in the Production of a Tropical Product (1885-1918). [typewritten], p.8. I thank the author for giving me access to this unpublished text.

31 - Holanda, Raizes..., p.20.

32 - Whateley, O Cafe em Resende..., p.16, briefly describes innovations and shows that at least some Resende area farmers adopted them; Bruno, Historia do Brasil..., p.120, lists some innovations.

33 - Francisco Jose de Oliveira Viana. "Distribuicao Geografica do Cafeeiro no Estado do Rio de Janeiro". O Cafe no Segundo Centenario de Sua Introducao no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1934, p.79; Artur Soffiati Neto. "A Agonia das Lagoas do Norte Fluminense". Ciencia e Cultura, 37(10):1627-1638, presents a contemporary environmental preservation perspective on the drainage of the freshwater lake system in present day Campos.

34 - Viana, "Distribuicao...", p.80; Bruno, Historia do Brasil..., p.51.

35 - Viana, "Distribuicao...", p.82.

36 - FIBGE. Estatisticas Historicas do Brasil - Series Economicas, Demograficas e Sociais de 1550 a 1985. Series Estatisticas Retrospectivas, numero 3. Rio de Janeiro, FIBGE, 1987, Table 6.43; Bruno, Historia do Brasil..., p.85.

37 - Viana, "Distribuicao...", pp.84,88; Valverde, Estudos..., pp.20-22; Caio Prado Junior. Historia Economica do Brasil. Sao Paulo, Editora Brasiliense, 1956, p.165.

38 - Whateley, O Cafe em Resende..., p.14; Viana, "Distribuicao...", p.88.

39 - Affonso d'E. Taunay. Pequena Historia do Cafe no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1945, pp.39-40,50,121,233.; this area is studied by an American scholar, Stanley J. Stein. Grandeza e Decadencia do Cafe no Vale do Paraiba. Sao Paulo, Brasiliense, 1961.

40 - Viana, "Distribuicao...", p.90.

41 - Prado Junior, Historia Economica..., p.165; Dean, "Deforestation...", pp.61-63.

42 - Viana, "Distribuicao...", p.91.

43 - Valverde, Estudos..., pp.31-33.

44 - Padua, Natureza e Projeto Nacional..., p.25; Dean, "Forest Conservation...", p.59.

Chapter 7

1 - Dean, Sao Paulo..., has a brief account on how Sao Paulo's coffee plantations substituted Rio de Janeiro's.
2 - FIBGE, Anuario Estatistico do Brasil - 1983. Rio de Janeiro, FIBGE, 1984, is my source for the data on contemporary Rio de Janeiro agriculture; all rankings and comparisons are mine.
3 - IBASE Files, O Globo, 9/1/1985.
4 - SEMA, Areas de Protecao Ambiental..., pp.20-22.
5 - SEMA, Areas de Protecao Ambiental..., pp.30-32.; SEMA. Area de Protecao Ambiental de Cairucu (Parati, RJ) - Informacoes Basicas. Brasilia, 1987. [leaflet]
6 - SEMA, Areas de Protecao Ambiental..., pp.33-35; SEMA. Area de Protecao Ambiental de Guapi-Mirim (RJ) - Informacoes Tecnicas. Brasilia, 1987. [leaflet]; IBASE Files, Jornal do Brasil, 2/9/1986.
7 - SEMA, Areas de Protecao Ambiental..., pp.43-45.
8 - IBASE Files, O Globo, 9/22/1985.
9 - Padua, Unidades..., p.18.
10 - Jairo Cesar Marconi Nicolau. Personal communication. Rio de Janeiro, May 1988.
11 - Strang et al, Parques Estaduais..., pp.70-72; IBASE Files, numerous clips from 1986-1988.
12 - Flumitur. Angra dos Reis. Rio de Janeiro. n.d., p.3.
13 - IBASE Files, O Globo, 1/25/1987,9/1/1985.
14 - Strang et al, Parques Estaduais..., pp.64,66-67.
15 - Strang et al, Parques Estaduais..., pp.65-66.
16 - Lina Maria Kneip. Reserva Biologica de Barra Nova - Saquarema (RJ). Rio de Janeiro, n.d. [typewritten]
17 - IBASE Files, Jornal do Brasil, 8/19/1984.
18 - IBASE Files, Jornal do Brasil, 8/19/1984; O Globo, 2/16/1986, 3/9/1986.
19 - IBASE Files, several clips from 1986 and 1987.
20 - IBASE Files, several clips from 1985 and 1987.
21 - Brasil Florestal, XIV(61), p.18.
22 - "Tombamentos - Baixada de Jacarepagua". FBCN Files.
23 - IBASE Files, several clippings from 1987 and 1988.
24 - The last four paragraphs are based on Harold Edgard Strang. "Reserva Biologica de Jacarepagua: Um Projeto Frustrado". Boletim FBCN, 16, pp.52-61; Carlos Manes Bandeira. "A Destruicao dos Monumentos Arqueologicos da Baixada de Jacarepagua". FBCN - Boletim Informativo, 5, pp.19-21; FBCN News Clip Files, O Dia, 1/22/1978, 1/23/1978; O Globo, 12/9/1979; Jornal do Brasil, 12/15/1979.

Chapter 8

1 - The preceding paragraphs were based on IBDF-FBCN. Plano de Manejo - Parque Nacional de Itatiaia. Brasilia, 1982, pp.23,30-32,35,38-39,41,43,47,53-54,57,63 (hereafter cited as Plano de Manejo - Itatiaia...); IBDF. Parque Nacional de Itatiaia. n.p., n.d. [leaflet]; Wanderbilt Duarte de Barros. "O Parque Nacional de Itatiaia". Anuario Brasileiro de Economia Florestal. Rio de Janeiro, Instituto Nacional do Pinho, 1958; Barros, Parques Nacionais do Brasil, pp.16, 43-52; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.122-129.

2 - IBDF, Parque Nacional de Itatiaia; Whateley, O Cafe em Resende..., p.7; Conselho Nacional de Geografia et Conselho Nacional de Estatistica. Enciclopedia Brasileira dos Municipios. Rio de Janeiro, IBGE, 1959. v XXII, entry "Resende". Hereafter this reference source will be cited as Enciclopedia, followed by the name of the respective municipio.

3 - Whateley, O Cafe em Resende..., pp.7-9; Enciclopedia, "Resende".

4 - Whateley, O Cafe em Resende..., pp.9,11,45.

5 - Whateley, O Cafe em Resende..., pp.9,11,43,47-48; Stanley J. Stein. Grandeza e Decadencia do Cafe no Vale do Paraiba. Sao Paulo, Brasiliense, 1961.

6 - Whateley, O Cafe em Resende..., pp.20,23,25,28.

7 - Whateley, O Cafe em Resende..., pp.12,51-52, 54; Enciclopedia, "Resende"; Bruno, Historia do Brasil..., pp.142-143.

8 - Whateley, O Cafe em Resende..., pp.35-39,46,65,68; Barros, "O Parque Nacional de Itatiaia", p.327, explains the main succesional species and communities in the Itatiaia area and how they are affected by coffee plantations.

9 - E. Gouvea. "Balanco Ecologico do Parque Nacional do Itatiaia". Boletim FBCN, 20,pp.109-111.; IBDF-FBCN, Plano de Manejo -Itatiaia, p.77; Enciclopedia, "Resende"; I could not check what happened exactly to the colonies after 1918, when they are supposed to have "failed"; Dean, "Forest Conservation...", p.63, states that the areas were "bought" by the federal government, by suggestion of the Botanist Albert Loefgren. This does not seem to be entirely correct because private owners subsist in some of the colonies' plots until today.

10 - Gouvea, "Balanco Ecologico..."; Magnanini, Politica e Diretrizes..., p.4, also mentions the Biological Station as an important background fact in the creation of INP.

11 - Enciclopedia, "Resende".

12 - IBDF-FBCN, Plano de Manejo - Itatiaia, pp.49,50,66,75.

13 - IBDF-FBCN, Plano de Manejo - Itatiaia, pp.15-17,18; Tresinari, "Evolucao...", p.15.; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.122; IBDF, Parque Nacional de Itatiaia; Legislacao..., pp.10-12.

14 - IBDF-FBCN, Plano de Manejo - Itatiaia, pp.17-18.

15 - Oliverio Pinto. "Aves do Itatiaia - Lista Remissiva e Novas Achegas a Avifauna da Regiao". Boletim do Parque Nacional de Itatiaia, 3,pp.1-87. Rio de Janeiro, 1954; Gouvea, "Balanco...", mentions the stuffed bird museum.

16 - Alexandre Curt Brade. "A Flora do Parque Nacional de

Itatiaia". Boletim do Parque Nacional de Itatiaia, 5, pp.1-85. Rio de Janeiro, 1956. I could not locate copies of other editions of this unique park periodical. With the exception of a small project of wildlife management in Tijuca National Park, in the early 1970's, these two scientific investigations were the only ones originated by park service initiative revealed in my sources.
17 - Barros, "O Parque Nacional de Itatiaia"; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.129.
18 - Dourojeanni, Informe..., pp.21,22,23,24; Padua et Audi, "Especies...", p.61, also mention INP's excessively small dimensions for the survival of 12 occurring endangered species of animals.
19 - Mario N. Borgonovi. Relatorio sobre o Parque Nacional de Itatiaia. [Presented to the Fundacao Brasileira de Conservacao da Natureza]. Rio de Janeiro, September 9, 1982. [typewritten], pp. 4,5.; IBASE Files, Jornal do Brasil, 8/19/1984.
20 - Borgonovi, Relatorio...Itatiaia, pp.6-8.
21 - IBDF-FBCN, Plano de Manejo -Itatiaia, pp.72,75,76,77,78,79,82-88,89-102,102-106.
22 - Gouvea, "Balanco..."
23 - IBASE Files, Jornal do Brasil, 8/19/1984; O Globo, 6/21/1987.

Chapter 9

1 - The preceding paragraphs were based on IBDF-FBCN. Plano de Manejo - Parque Nacional da Serra dos Orgaos. Brasilia, 1980, pp.10,14,16,17,18,22-26,27-33,42,44,46,49,56,57,60,hereaftercited as Plano de Manejo - Serra dos Orgaos; Padua et Audi, "Especies...", p.66; IBDF. Parque Nacional da Serra dos Orgaos. n.p., n.d. [leaflet]; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.152, argue that SONP's forests are mostly second growth, but "well evolved" towards climatic forms.
2 - The preceding paragraphs were based on IBDF. Parque Nacional da Serra dos Orgaos. n.p., n.d.. [leaflet]; IBDF-FBCN, Plano de Manejo - Serra dos Orgaos, pp. 38,39; Enciclopedia, "Mage"; Enciclopedia, "Teresopolis"; Enciclopedia, "Petropolis".
3 - IBDF-FBCN, Plano de Manejo - Serra dos Orgaos, p.35.
4 - Padua, [Esboco...]; IBDF-FBCN, Plano de Manejo - Serra dos Orgaos, p.3; IBDF, Parque Nacional da Serra dos Orgaos; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.152; Dean, "Forest Conservation...", p.63.
5 - Oliveira is cited in IBDF-FBCN, Plano de Manejo - Serra dos Orgaos, pp.5-6,7.
6 - Elyowald Chagas de Oliveira. Relatorio sobre o Parque Nacional da Serra dos Orgaos. Teresopolis, Instituto Brasileiro de Desenvolvimento Florestal, December 5, 1967. [mimeographed], pp.2,3,4.
7 - IBDF-FBCN, Plano de Manejo - Serra dos Orgaos, pp.1,65,69,70-72,73-84,116; IBDF, Parque Nacional da Serra dos Orgaos.
8 - Mario N. Borgonovi. Relatorio sobre o Parque Nacional da Serra

dos Orgaos. [Presented to the Fundacao Brasileira de Conservacao da Natureza]. Rio de Janeiro, August 4, 1982. [typewritten], p.2,3,4,8 and "Anexos"; IBDF, Parque Nacional da Serra dos Orgaos.

Chapter 10

1 - This title is obviously inspired by Leo Marx's The Machine in the Garden - technology and the Pastoral Ideal in America. London, Oxford University Press, 1964.
2 - The preceding paragraphs were based on IBDF-FBCN. Plano de Manejo - Parque Nacional da Tijuca. Brasilia, 1981, pp.31,32, hereafter cited as Plano de Manejo - Tijuca ; Encyclopedia Americana; Tereza Cristina Holetta Scheiner. "Ocupacao Humana no Parque Nacional da Tijuca - Aspectos Gerais". Brasil Florestal, VII(28), pp.5,6,7; Carlos Cesar Landini V. de Mattos et al. "Aspectos do Clima e da Flora do Parque Nacional da Tijuca". Brasil Florestal, VII(25),pp.3-12; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.160-171.
3 - IBDF-FBCN, Plano de Manejo - Tijuca, p.39.
4 - IBDF-FBCN, Plano de Manejo - Tijuca, p.39; Gilberto Freyre. Sobrados e Mocambos. 6 ed. Rio de Janeiro, Jose Olympio, 1981, captures this and other urban life scenes in vivid detail; Atala et al, Floresta da Tijuca, p.20, mentions constant brawls between slaves in water fountain lines during draught periods; Scheiner, "Ocupacao Humana...", p.14; Bruno, Historia do Brasil, pp.43,68-69.
5 - IBDF-FBCN, Plano de Manejo - Tijuca, p.38; Scheiner, "Ocupacao Humana...", p.8.
6 - Scheiner, "Ocupacao Humana...", p.8,14.
7 - Scheiner, "Ocupacao Humana...", pp.11,12,13; IBDF-FBCN, Plano de Manejo - Tijuca, pp.40-41; Atala et al, Floresta da Tijuca, pp.15-17; Maya, A Floresta da Tijuca, pp.19-22.
8 - Atala et al, Floresta da Tijuca, pp.16-17, evaluates the impacts of this sudden population increase.
9 - Maya, A Floresta da Tijuca, p.18.
10 - Atala et al, Floresta da Tijuca, p.16; Scheiner, "Ocupacao Humana...", p.14.
11 - Atala et al, Floresta da Tijuca, p.13, presents the 15% estimate; and 12.
12 - Atala et al, Floresta da Tijuca, p.51; IBDF-FBCN, Plano de Manejo - Tijuca, pp.42-43.
13 - IBDF-FBCN, Plano de Manejo - Tijuca, p.41.
14 - Atala et al, Floresta da Tijuca, pp.23-24; IBDF, FBCN, Plano de Manejo - Tijuca, p.9.
15 - Atala et al, Floresta da Tijuca, pp.23-24, lists the acquired properties; and 21.
16 - Atala et al, Floresta da Tijuca, p.22; Scheiner, "Ocupacao Humana...", p.18.
17 - Atala et al, Floresta da Tijuca, pp.28-29.
18 - Atala et al, Floresta da Tijuca, pp.28-29.

19 - Atala et al, Floresta da Tijuca, pp.33-35.; IBDF-FBCN, Plano de Manejo - Tijuca, p.9; Scheiner, "Ocupacao Humana...", p.15.
20 - Atala et al, Floresta da Tijuca, has more details on Archer's routines.
21 - Atala et al, Floresta da Tijuca, p.42.
22 - Atala et al, Floresta da Tijuca p.42; FIBGE, Anuario Estatistico - 1986.
23 - Atala et al, Floresta da Tijuca, p.42; Carlos Manes Bandeira. Personal Communication. Rio de Janeiro, April 1988.
24 - Atala et al, Floresta da Tijuca, pp.46-50; Bruno, Historia do Brasil..., p.130.
25 - Atala et al, Floresta da Tijuca, p.50; the computations are my own.
26 - Atala et al, Floresta da Tijuca, p.51.
27 - Maya, A Floresta da Tijuca, p.28.
28 - Scheiner, "Ocupacao Humana...", pp.18-19; Maya, A Floresta da Tijuca, p.13.
29 - Maya, A Floresta da Tijuca, pp.11,12,14.
30 - Maya, A Floresta da Tijuca, pp.12,13,14,28,29,30,33.
31 - IBDF-FBCN, Plano de Manejo - Tijuca, pp.32,44.
32 - IBDF-FBCN, Plano de Manejo - Tijuca, pp.33-37,37-39.
33 - IBDF-FBCN, Plano de Manejo - Tijuca; R. Laroche et Mariza L. Vieira de Mattos. "Aspectos do Clima e da Flora do Parque Nacional da Tijuca". Brasil Florestal, (?) [1976]; Mattos et al, "Aspectos..."; Nilo Santos. "Plantas Existentes no Parque Nacional da Tijuca". Brasil Florestal, VII(26), pp.54-68. All four sources have partial checklists of TNP flora.
34 - Scheiner, "Ocupacao Humana...". p.19, also mentions this second point; IBASE Files, Jornal do Brasil, 2/14/1988.
35 - Scheiner, "Ocupacao Humana...", pp.20,21.
36 - Scheiner, "Ocupacao Humana...", p.21.
37 - Carlos Manes Bandeira et al. Pesquisas e Escavacoes Arqueologicas em Sitios Historicos do Parque Nacional da Tijuca e Arredores. Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1984. [typewritten], pp.1,3-5; Carlos Manes Bandeira, "Escavacoes Historicas no Parque Nacional da Tijuca". FBCN - Boletim Informativo, 10, p.89; Carlos Manes Bandeira. Personal Communication. Rio de Janeiro, April 1988.
38 - The preceding paragraphs were based on Coimbra Filho et Aldrighi, A Restauracao da Fauna...; Adelmar F. Coimbra Filho et Antonio Domingos Aldrighi. "Restabelecimento da Fauna do Parque Nacional da Tijuca: Segunda Contribuicao." Brasil Florestal, III(11), pp.19,20,22,23-32; Adelmar F. Coimbra Filho et al. "Nova Contribuicao ao Restabelecimento da Fauna do Parque Nacional da Tijuca, Guanabara, Brasil." Brasil Florestal, IV(16), pp.7-25; IBASE Files, O Globo, 8/24/1980. The three articles describing the project have precise listings and numbers of reintroduced floral and fauna species and specimens. Incidentally, it seems that no extensive research on insect species in the Rio area has ever been published.
39 - Helmut Sick. Aves da Cidade do Rio de Janeiro - Lista (Checklist) - 410 Especies. Rio de Janeiro, Fundacao Brasileira

de Conservacao da Natureza, 1983. [leaflet]
40 - Restauracao Florestal em Areas de Vegetacao Degradada no Parque Nacional da Tijuca. [Rio de Janeiro], [1978]. [typewritten], pp.1,2,5.
41 - IBDF-FBCN, Plano de Manejo - Tijuca; Maya, A Floresta da Tijuca, pp.13-14; Scheiner, "Ocupacao Humana...", p.8; many personal observations were included in the two previcus paragraphs.
42 - Brasil Florestal, VII(27), p.62; IBASE Files, O Globo, 9/26/1987.
43 - IBDF-FBCN, Plano de Manejo - Tijuca, pp.39,45,49-50,51-58,71,72-77.
44 - Antonio Domingos Aldrighi. Parque Nacional da Tijuca. n.p., IBDF, n.d.. [typewritten], pp.3,4.; IBASE Files, O Globo, 8/24/1980, 6/29/1986.
45 - Bandeira, Relatorio sobre..., pp.1,2-10; IBASE Files, O Globo, 12/27/1985; Jornal do Brasil, 4/3/1988.

Chapter 11

1 - The preceding paragraphs were based on Padua et Audi, "Especies da Fauna...", p.66; SEMA, Area de Protecao Ambiental de Cairucu...; Walter.Wolf Saur. Parque Nacional da Serra da Bocaina e sua Area Adjacente - Estudo Apresentado a Direcao da Fundacao Brasileira de Conservacao da Natureza. Rio de Janeiro, 1977. [typewritten], pp.7,8,9,10,17,19,21,22,39; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.144-151.
2 - The preceding paragraphs were based on Enciclopedia - "Angra dos Reis"; SEMA, Area de Protecao Ambiental de Cairucu...; Saur, Parque Nacional da Serra da Bocaina..., pp.11,12,14.
3 - The preceding paragraphs were based on Enciclopedia - "Parati"; Saur, Parque Nacional da Serra da Bocaina..., pp.13,14; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, pp.144-151. I have not included a discussion of the quite similar backgrounds of the Sao Paulo municipios affected by SBNP.
4 - Saur, Parque Nacional da Serra da Bocaina..., pp.24,25-26.; IBDF, Diagnostico..., p.18.
5 - Padua e Audi, "Especies...", p.66; Flumitur, Angra dos Reis, p.10; Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.144.
6 - Padua et Coimbra Filho, Os Parques Nacionais do Brasil, p.144; Saur, Parque Nacional da Serra da Bocaina, pp.16,17,24,26,30-31,32,33,36,37,38.
7 - IBDF-FBCN. Parque Nacional da Serra da Bocaina - Levantamento de Dados Cadastrais. Brasilia, IBDF, 1977, pp.19-25 describes the exhaustive survey; "Anexo", v.3, has individual descriptions and evaluations of each holding. Incidentally, the park's management plan was never concluded.
8 - Padua et Audi, "Especies...", p.66.

Sources

I - Books, journal articles, leaflets, booklets, government publications and original documents.

Aldrighi, Antonio Domingos. Parque Nacional da Tijuca. n.p., Insituto Brasileiro de Desenvolvimento Florestal, n.d. [typewritten]

Aquino, Tasso Villar de . "Importancia da Estacao Ecologica no Sistema Nacional de Conservacao do Meio Ambiente". Boletim FBCN, 14:81-84. Rio de Janeiro, 1979.

Atala, Fuad et al. Floresta da Tijuca. Rio de Janeiro, Centro de Conservacao da Natureza, 1966.

Bandeira, Carlos Manes . "A Destruicao dos Monumentos Arqueologicos da Baixada de Jacarepagua". FBCN - Boletim Informativo, 5:19-21. Rio de Janeiro, 1970.

_____ . "Escavacoes Historicas no Parque Nacional da Tijuca". FBCN - Boletim Informativo, 10:87-93. Rio de Janeiro, 1975.

_____ . Relatorio sobre o Parque Nacional da Tijuca e Sua Protecao e Preservacao Ambiental. Rio de Janeiro, Setor de Parques Nacionais e Reservas Equivalentes da Fundacao Brasileira de Conservacao da Natureza, 1984. [typewritten]

_____ et al. Pesquisas e Escavacoes Arqueologicas em Sitios Historicos do Parque Nacional da Tijuca e Arredores. Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1984. [typewritten]

Barros, Wanderbilt D. . "Legislacao de Conservacao da Natureza". FBCN - Boletim Informativo, 9:28-35. Rio de Janeiro, 1974.

_____ . "O Parque Nacional de Itatiaia". Anuario Brasileiro de Economia Florestal, 1:318-337. Rio de Janeiro, Instituto Nacional do Pinho, 1958.

_____ . Parques Nacionais do Brasil. Rio de Janeiro, Servico de Informacao Agricola do Ministerio da Agricultura, 1952.

_____ et Strang, Harold Edgard . "Capacitacao de Pessoal em Parques Nacionais". FBCN - Boletim Informativo, 7:8-16. Rio de

Janeiro, 1972.

Belart, J.L. . "Por uma Politica Nacional de Conservacao". FBCN - Boletim Informativo, 11:47-48. Rio de Janeiro, 1976.

Berutti, Paulo Azevedo . "Politica de Conservacao da Natureza". Brasil Florestal, V(20):3-7. Rio de Janeiro, October-December 1974.

Bezerra, Margarene Maria Lima et Jesus, Fabio de . Situacao Atual das Unidades de Conservacao: Infra Estrutura para Visitacao. [Internal document by the Departamento de Parques Nacionais e Reservas Equivalentes - Instituto Brasileiro de Desenvolvimento Florestal]. Brasilia, February 1988. [typewritten]

Borgonovi, Mario N. . Relatorio Sobre o Parque Nacional da Serra dos Orgaos. [Presented to the Fundacao Brasileira de Conservacao da Natureza]. Rio de Janeiro, August 4, 1982. [typewritten]

_____ . Relatorio Sobre o Parque Nacional de Itatiaia. [Presented to the Fundacao Brasileira de Conservacao da Natureza]. Rio de Janeiro, September 9, 1982. [typewritten]

Bouvier, Leon F. . "Planet Earth 1984-2034: A Demographic Vision". Population Bulletin, 39(1). February, 1984.

Brade, Alexandre Curt . "A Flora do Parque Nacional de Itatiaia". Boletim do Parque Nacional de Itatiaia, 5:1-85. Rio de Janeiro, 1956.

Brasil. Legislacao e Decretos, etc. Codigo Florestal. Decree 23793, January 23, 1934. [leaflet]

_____. Legislacao de Conservacao da Natureza. 4 ed., revised and updated until 1986. Compiled by Carmen Moretzsohn Rocha. Sao Paulo, Centrais Eletricas de Sao Paulo; Rio de Janeiro, Fundacao Brasileira de Conservacao da Natureza, 1986.

Brasil. Ministerio da Agricultura. Instituto Brasileiro de Desenvolvimento Florestal . Diagnostico do Subsistema de Conservacao e Preservacao de Recursos Naturais Renovaveis. Brasilia, 1978.

_____ . Diretrizes para a Politica Florestal Brasileira - Periodo 1979-1985. Brasilia, 1979.

Brasil. Ministerio da Agricultura. Instituto Brasileiro de Desenvolvimento Florestal. Departamento de Parques Nacionais e Reservas Equivalentes. Parque Nacional da Serra dos Orgaos. n.p., n.d.. [leaflet]

_____. Parque Nacional de Itatiaia. n.p., n.d.. [leaflet]

_____. Projeto de Implantacao e Consolidacao de Parques Nacionais, Reservas Equivalentes e Protecao a Natureza. Brasilia, [1975].

_____. Reserva Biologica de Comboios. Brasilia, 1984. [typewritten]

Brasil. Ministerio da Agricultura. Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza . Plano do Sistema de Unidades de Conservacao do Brasil - II Etapa. Brasilia, 1982.

Brasil. Ministerio da Agricultura. Instituto Brasileiro de Reforma Agraria e Instituto Brasileiro de Desenvolvimento Florestal. Parques Nacionais e Reservas Equivalentes no Brasil: Relatorio com Vistas a uma Revisao da Politica Nacional nesse Campo. Rio de Janeiro, IBRA-IBDF, 1969. [mimeographed]

Brasil. Ministerio do Desenvolvimento Urbano e Meio Ambiente. Secretaria Especial de Meio Ambiente. Areas de Protecao Ambiental: Abordagem Historica e Tecnica. Brasilia, 1987.

_____. Projeto Nacional do Meio Ambiente - Resultados Preliminares do Levantamento sobre Unidades de Conservacao. Brasilia, April 1988. [typewritten]

_____. Programa de Gerenciamento das Unidades de Conservacao. Brasilia, 1986.

Brasil. Ministerio da Habitacao, Urbanismo e Meio Ambiente. Secretaria Especial de Meio Ambiente. Area de Protecao Ambiental de Cairucu (Parati, RJ) - Informacoes Basicas. Brasilia, 1987. [leaflet]

_____. Area de Protecao Ambiental de Guapi-Mirim (RJ) - Informacoes Tecnicas. Brasilia, 1987. [leaflet]

_____. Area de Protecao Ambiental do Rio Sao Bartolomeu. Brasilia, n.d..

Brasil. Ministerio do Interior. Secretaria Especial de Meio Ambiente . Estacao Ecologica de Jureia. Brasilia, 1984.

_____ . Estacao Ecologica de Taim. Brasilia, 1984.

_____ . Programa de Estacoes Ecologicas. Brasilia, 1977.

Bruck, Eugenio Camargo et al . "Unidades de Conservacao". Revista do Servico Publico, 111(4):21-27. Brasilia, October-December

1983.

Bruno, Ernani da Silva . Historia do Brasil - Geral e Regional: Espirito Santo, Rio de Janeiro, Guanabara e Minas Gerais. Sao Paulo, Cultrix, 1967. v.4.

O CAFE no Segundo Centenario de sua Introducao no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1944. 15v.

Camara, Ibsen de Gusmao . "A Licao de Itatiaia". Conservacao da Natureza, XI(2):1. Rio de Janeiro, July-September 1987.

_____ . "Necessidade de uma Politica Nacional de Conservacao do Meio Ambiente". FBCN-Boletim Informativo, 11:28-40. Rio de Janeiro, 1976.

Cardoso, Elizabeth Dezouzart et al . Tijuca. Serie Historica dos Bairros - Memoria Urbana. Rio de Janeiro, Joao Fortes Engenharia e Index, 1984.

Carvalho, Jose Candido de Melo . "Aspectos Relativos a Conservacao da Fauna Brasileira". FBCN - Boletim Informativo, 10:5-13. Rio de Janeiro, 1975.

_____ . "Definicoes e Conceituacao de Parque Nacional e Reserva Equivalente". FBCN - Boletim Informativo, 4:33-38. Rio de Janeiro, 1969.

_____ . "Dia Mundial do Meio Ambiente: Consideracoes sobre a Participacao do Brasil em Organizacoes, Programas e Convencoes Relativas a Conservacao do Meio Ambiente". Boletim FBCN, 14:5-16. Rio de Janeiro, 1979.

_____ . "O Papel das Entidades Nao-Governamentais na Conservacao da Natureza". FBCN - Boletim Informativo, 12:49-53. Rio de Janeiro, 1977.

_____ . Parques Nacionais e Reservas Equivalentes. Paper Presented to the XXVII Annual Meeting of the Brazilian Society for the Advancement of Science. n.p., 1975. [typewritten]

Coimbra Filho, Adelmar F. et Aldrighi, Antonio Domingues . A Restauracao da Fauna do Parque Nacional da Tijuca, Guanabara, Brasil. Publicacoes Avulsas, numero 57. Rio de Janeiro, Museu Nacional, 1971.

_____ . "Restabelecimento da Fauna do Parque Nacional da Tijuca: Segunda Contribuicao". Brasil Florestal, III(11):19-33. Rio de Janeiro, 1972.

Coimbra Filho, Adelmar F. et al . "Nova Contribuicao ao Restabelecimento da Fauna do Parque Nacional da Tijuca,

Guanabara, Brasil". Brasil Florestal, IV(16):7-25. Rio de Janeiro, 1973.

Crosby, Alfred W. Ecological Imperialism - The Biological Expansion of Europe, 900-1900. Cambridge, Cambridge University Press, 1986.

Darwin, Charles . The Voyage of the Beagle. Edited by Leonard Engel. New York, Doubleday and American Museum of Natural History, 1962.

Dean, Warren . "Deforestation in Southeastern Brazil", Richard D. Tucker et J.F. Richards, eds, Global Deforestation and the Nineteenth Century Economy, pp 50-67. Durham, Duke University Press, 1983.

_____ . "Ecological and Economic Relationships in Frontier History: Sao Paulo, Brazil", George Wolfskill and Stanley Palmer, eds., Essays on Frontiers in World History, pp 71-100. Arlington, University of Texas, n.d..

_____ . "Forest Conservation in Southeastern Brazil, 1900 to 1955". Environmental Review, 9:55-69. Spring 1985.

_____ . "Indigenous Populations of the Sao Paulo-Rio de Janeiro Coast: Trade, Aldeamento, Slavery and Extinction". Revista de Historia, 117:3-26. Sao Paulo, 1984.

_____ . Rio Claro: A Brazilian Plantation System, 1820-1920. Stanford, Stanford University Press, 1976.

_____ . Sao Paulo and the Green Wave of Coffee: Beginings of Scientific Research in the Production of a Tropical Product (1885-1918). n.p., 1988. [typewritten]

Dourojeanni, Marc J. . Informe sobre Asesoramento al Instituto Brasileno de Desarollo Florestal en Parques Nacionales. n.p., [1977]. [typewritten]

Dunning, Glenda . National Parks and Forests: The Administration of the National Park Service and Forest Service. n.p., n.p., 1985.

Ehrenfeld, David . The Arrogance of Humanism. Oxford, Oxford University Press, 1981.

Ehrlich, Paul et Ehrlich, Anne. Extinction: The Causes and Consequences of the Disappearance of Species. New York, Ballantine, 1983.

Everhart, William C. . The National Park Service. New York, Praeger, 1972.

Flumitur . Angra dos Reis. Rio de Janeiro, n.d.. [mimeographed]

Freyre, Gilberto. Casa Grande e Senzala. 23 ed. Rio de Janeiro, Jose Olympio, 1984.

_____. Sobrados e Mocambos. 6 ed. Rio de Janeiro, Jose Olympio, 1981.

_____. Nordeste. 5 ed. Rio de Janeiro, Jose Olympio; Recife, Fundacao do Patrimonio Historico e Artistico de Pernambuco, 1985.

Fundacao Brasileira para a Conservacao da Natureza . Homem, Ecologia e Meio Ambiente. Rio de Janeiro, FBCN, 1971.

Fundacao Instituto Brasileiro de Geografia e Estatistica. SUPREN. Proposta para um Plano de Zoneamento Ecologico-Economico para o Brasil. [Brasilia], May 1986. [typewritten]

Furtado, Celso. Economic Development of Latin America. Cambridge, Berlinguer Press, 1974.

Gouvea, E. . "Balanco Ecologico do Parque Nacional de Itatiaia". Boletim FBCN, 20:109-111. Rio de Janeiro, 1985.

Hays, Samuel P. . Conservation and the Gospel of Efficiency - The Progressive Conservation Movement. 2 ed. New York, Atheneum, 1980.

Holanda, Sergio Buarque de . Raizes do Brasil. 19 ed. Rio de Janeiro, Jose Olympio, 1987.

_____ . Visao do Paraiso - Os Motivos Edenicos no Descobrimento e na Colonizacao do Brasil. 4 ed. Sao Paulo, Nacional, 1985.

Instituto Brasileiro de Desenvolvimento Florestal. Observacoes Gerais [Sobre a Situacao Fundiaria dos Parques Nacionais e Reservas Biologicas]. Brasilia, [circa 1985]. [typewritten]

Instituto Brasileiro de Desenvolvimento Florestal et Fundacao Brasileira de Conservacao da Natureza . Parque Nacional da Serra da Bocaina - Levantamento de Dados Cadastrais. Brasilia, Instituto Brasileiro de Desenvolvimento Florestal, 1977.

_____ . Plano de Manejo - Parque Nacional da Itatiaia. Brasilia, 1982. [mimeographed]

_____ . Plano de Manejo - Parque Nacional da Serra dos Orgaos. Brasilia, 1980. [mimeographed]

_____ . Plano de Manejo - Parque Nacional da Tijuca. Brasilia, 1981.

Ihering, Herman von . "Devastacao e Conservacao das Matas". FBCN - Boletim Informativo, 7:40-51. Rio de Janeiro, 1972.

Ise, John . Our National Park Policy: A Critical History. Baltimore, Johns Hopkins University Press, 1961.

Kneip, Lina Maria . Reserva Biologica de Barra Nova - Saquarema-RJ. Rio de Janeiro, n.d.. [typewritten]

Laroche, R. et Vieira de Mattos, Mariza L. . "Aspectos do Clima e da Flora do Parque Nacional da Tijuca". Brasil Florestal, (?). Rio de Janeiro, [1976]. [xerox]

Leivas, Luiz Claudio Pereira . "A Legislacao Patrimonial da Uniao e a Conservacao do Meio Ambiente: Um Elemento Esquecido." FBCN - Boletim Informativo, 12:54-62. Rio de Janeiro, 1977.

Machado, Olavo F. . "Conservacao da Natureza". Brasil Florestal, VII(26):32-35. Rio de Janeiro, April-June 1976.

Machliš, Gary E. et Tichnell, David L. . The State of the World's Parks: An International Assessment for Resource Management Policy and Research. n.p., Wsetview, 1985.

Magnanini, Alceo . "Conceitos de Conservacao". FBCN - Boletim Informativo, 1:13-22. Rio de Janeiro, 1966.

_____ . Parques Nacionais e Reservas Equivalentes. n.p., n.d.. [typewritten]

_____ . Politica e Diretrizes dos Parques Nacionais do Brasil. Rio de Janeiro, Instituto Brasileiro de Desenvolvimento Florestal, 1970.

_____ et Padua, Maria Tereza Jorge . "Situacao dos Parques Nacionais no Brasil". FBCN - Boletim Informativo, 4:38-58. Rio de Janeiro, 1969.

Martins, Herbert . Breve Relatorio Incompleto do "Parque Ambiental" de Minas Gerais. Belo Horizonte, 1988. [typewritten]

_____ . Parque Nacional do Caparao. Belo Horizonte, 1988. [typewritten]

Marx, Leo . The Machine in the Garden - Technology and the Pastoral Ideal in America. London, Oxford University Press, 1964.

Mattos, Carlos Cesar Landini V de et al. "Aspectos do Clima e da Flora do Parque Nacional da Tijuca". Brasil Florestal, VII(25):3-12. January-March, 1976.

Maya, Raymundo Ottoni de Castro . A Floresta da Tijuca. Rio de Janeiro. Ioch, 1967.

Merchant, Carolyn. The Death of Nature - Women, Ecology and the Scientific Revolution. San Francisco, Harper and Row, 1982.

Merrick, Thomas W. et PRB Staff . "Population Pressures in Latin America". Population Bulletin, 41(8). July 1986.

Moog, Vianna . Bandeirantes e Pioneiros. 12 ed. Porto Alegre, O Globo, 1971.

Mota Sobrinho, Alves . A Civilizacao do Cafe. 3 ed. Sao Paulo, Brasiliense, 1978.

Nash, Roderick, ed. . The American Environment - Readings in the History of Conservation. 2 ed. New York, Knoph, 1976.

_____ . Wilderness and the American Mind. 3 ed. Cambridge, Yale University Press, 1982.

National Parks Centennial Commision . Preserving a Heritage: Final Report to the President and Congress.

Nogueira Neto, Paulo . "Um Novo Conceito de Estacao Ecologica". Boletim FBCN, 15:37-39. Rio de Janeiro, 1980.

Oliveira, Elyowald Chagas de . Relatorio sobre o Parque Nacional da Serra dos Orgaos. Teresopolis, Instituto Brasileiro de Desenvolvimento Florestal, December 5, 1967. [mimeographed]

Padua, Jose Augusto . Natureza e Projeto Nacional: As Origens da Ecologia Politica no Brasil. Rio de Janeiro, IUPERJ, 1986. [mimeographed]

_____ et Lago, Antonio . O que e Ecologia. Sao Paulo, Brasiliense, 1981.

Padua, Maria Tereza Jorge . "Aplicacao de Planos Diretores para os Parques Nacionais". FBCN - Boletim Informativo, 7:17-20. Rio de Janeiro, 1972.

_____ . "Areas de Preservacao: Parques Nacionais e Reservas Biologicas". Brasil Florestal, VII(31):6-14. Brasilia, 1977.

_____ . "Categorias de Unidades de Conservacao: Objetivos de Manejo". Boletim FBCN, 13:78-84. Rio de Janeiro, 1978.

_____ . [Esboco Historico da Legislacao Fundiaria Brasileira]. n.p., 1980. [typewritten]

_____ . Os Parques Nacionais e as Reservas Biologicas do Brasil. Brasilia, Instituto Brasileiro de Desenvolvimento Florestal, 1983.

_____ . "Sistema de Parques Nacionais e Reservas Biologicas do Brasil". Revista do Servico Publico, 111(4):17-20. Brasilia, October-December 1983.

_____ . "Situacao Atual do Sistema de Parques Nacionais e Reservas Biologicas". Boletim FBCN, 16:35-41. Rio de Janeiro, 1981.

_____ . Unidades de Conservacao. Brasilia, 1988. [typewritten]

_____ et Audi, A. . "Especies da Fauna Silvestre Ameacadas de Extincao - Sua Ocorrencia e Protecao nos Parques Nacionais e Reservas Biologicas". Boletim FBCN, 19:49-80. Rio de Janeiro, 1984.

_____ et Coimbra Filho, Adelmar F. . Os Parques Nacionais do Brasil. Madrid, Instituto de La Caza Fotografica y Ciencias de La Natureza; Instituto de Cooperacao Iberoamericana, 1979.

_____ et Vasconcellos, Jose Manuel C. . Parques Nacionais e Reservas Equivalentes. n.p., [circa 1978]. [typewritten]

PARQUE Estadual do Tabuleiro . Conservacao da Natureza, XI(3):5. Rio de Janeiro, October-December 1987.

PARQUES Nacionais e Reservas Equivalentes. Recommendation of the XXVIII Annual Meeting of the Brazilian Society for the Advancement of Science. n.p., 1975. [typewritten]

Pereira, Sonia Maria . "Legislacao Ambiental: Problemas Fundiarios". Brasil Florestal, X(43):7-15. Brasilia, 1980.

_____ . "Politica e Legislacao Ambiental: Generalidades". Boletim FBCN, 15:67-75. Rio de Janeiro, 1979.

Pinto, Oliverio . "Aves do Itatiaia - Lista Remissiva e Novas Achegas a Avifauna da Regiao". Boletim do Parque Nacional de Itatiaia, 3:1-87. Rio de Janeiro, 1954.

Pires, Fernando Dias de Avila . "Papel dos Parques Nacionais e Reservas Equivalentes na Conservacao dos Ecossistemas". FBCN - Boletim Informativo, 12:13-14. Rio de Janeiro, 1977.

_____ . "Recursos Faunisticos do Estado do Rio de Janeiro". FBCN - Boletim Informativo, 10: 22-28. Rio de Janeiro, 1975.

Prado Junior, Caio. Historia Economica do Brasil. Sao Paulo, Brasiliense, 1956.

PRIMEIRA Semana de Conservacao da Natureza, Rio de Janeiro, Setembro de 1962. [Anais] FBCN - Boletim Informativo, 12:145-52. Rio de Janeiro, 1977.

Quammen, David . "Brazil's Jungle Blackboard". Harpers Magazine, March, 1988: 65-70.

Redden Billy E. . A Socio-Economic Study of National Park and Monument Use. n.p., n.p., 1955.

Reis, Mauro Silva . "Recursos Florestais no Brasil". Revista do Servico Publico, 111(4):7-16. Brasilia, October-December 1983.

RESTAURACAO Florestal em Areas de Vegetacao Degradada no Parque Nacional da Tijuca. Rio de Janeiro, [1978]. [typewritten]

Runte, Alfred . National Parks - The American Experience. Lincoln and London, University of Nebraska Press, 1984.

Ruschi, Augusto . Beija-Flores do Estado do Espirito Santo. Sao Paulo, Editora Rios, 1982.

Saint-Hillaire, Auguste de . Segunda Viagem do Rio de Janeiro a Minas Gerais e Sao Paulo. Sao Paulo, Nacional, 1932.

Santos, Nilo. "Plantas Existentes no Parque Nacional da Tijuca". Brasil Florestal, VII(26):54-68. April-June, 1976.

Santos, Wanderley Guilherme dos . "A Pos-Revolucao Brasileira". Helio Jaguaribe et al, Brasil, Sociedade Democratica. Rio ed Janeiro, Jose Olympio, 1985. pp.223-335.

Saur, Walter Wolf . Parque Nacional da Serra da Bocaina e sua Area Adjacente - Estudo Apresentado a Direcao da Fundacao Brasileira de Conservacao da Natureza. Rio de Janeiro, 1977. [typewritten]

Sax, Joseph L. . Mountains without Handrails: Reflections on the National Parks. Ann Arbor, University of Michigan Press, 1980.

Scheiner, Tereza Cristina Holetta . "Ocupacao Humana no Parque Nacional da Tijuca: Aspectos Gerais". Brasil Florestal, VII(28):3-27. Rio de Janeiro, October-December, 1976.

Shrader-Frechette, K.S. . Environmental Ethics. Pacific Grove, California, Boxwood, 1981.

Sick, Helmut . Aves da Cidade do Rio de Janeiro - Lista (Checklist) - 410 Especies. Rio de Janeiro, Fundacaso Brasileira de Conservacao da Natureza, 1983. [leaflet]

Silva, Eduardo . Baroes e Escravidao. Rio de Janeiro, Nova Fronteira, 1984.

Skidmore, Thomas E. . Politics in Brazil, 1930-1964: An Experiment in Democracy. Oxford Univbersity Press, 1967.

Soffiati Neto, Artur. "A Agonia das Lagoas do Norte Fluminense". Ciencia e Cultura, 37(10):1627-1638.

Stein, Stanley J. . Grandeza e Decadencia do Cafe no Vale do Paraiba. Sao Paulo, Brasiliense, 1961.

Stepan, Alfred . The Military in Politics: Changing Patterns in Brazil. Princeton University Press, 1971.

Stone, Roger. Dreams of Amazonia. New York, Penguin, 1986.

Strang, Harold Edgard . "Reserva Biologica de Jacarepagua: Um Projeto Frustrado". Boletim FBCN, 16:52-61. Rio de Janeiro, 1981.

_____ et al . Parques Estaduais do Brasil: Sua Caracterizacao e Essencias Nativas mais Importantes. Tese Apresentada ao "Congresso Nacional sobre Essencias Nativas", Campos do Jordao (SP), 12-18 de setembro de 1982. [mimeographed]

Taunay, Afonso d'E. . Historia do Cafe no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1939.

_____ . Pequena Historia do Cafe no Brasil (1727-1937). Rio de Janeiro, Departamento Nacional do Cafe, 1945.

Tovar, Jair . "Parques Nacionais". Revista do Servico Publico, 87(3):122-134. Rio de Janeiro, June 1960.

Tresinari, Angela B. Quintao . "Evolucao do Conceito de Parques Nacionais e Sua Relacao com o Processo de Desenvolvimento". Brasil Florestal, XIII(54):13-28. Brasilia, April-June 1983.

Turner, Frederick . Beyond Geography - The Western Spirit Against the Wilderness. New Brunswick, New Jersey, Rutgers University Press, 1983.

Valverde, Orlando . Estudos de Geografia Agraria Brasileira. Petropolis, Vozes, 1985.

Vance, Mary A. . National Parks and Reserves: Monographs. n.p.,

n.p., 1986.

Viana, Francisco Jose de Oliveira. "Distribuicao Geografica do Cafeeiro no Estado do Rio de Janeiro". O Cafe no Segundo Centenario de sua Introducao no Brasil. Rio de Janeiro, Departamento Nacional do Cafe, 1934.

Viola, Eduardo . O Movimento Ecologico no Brasil (1974-1986): Do Ambientalismo a Ecopolitica. Cadernos de Ciencias Sociais, Volume 5, Numero 4. Florianopolis, Universidade Federal de Santa Catarina, 1986.

_____ . Movimento Ecologico e Partido Verde no Brasil: Notas Sobre uma Relacao Muito Complexa. Tese Apresentada ao XI Encontro da ANPOCS. Aguas de Sao Pedro. October 20-29, 1987.

Wetterberg, Gary B. et al. Decade of Progress for South American National Parks - 1974-1984. Washington, D.C., USDI - National Park Service, 1985.

Whateley, Maria Celina . O Cafe em Resende no Seculo XIX. Rio de Janeiro, Jose Olympio, 1987.

Wirth, Conrad Louis . Parks, Politics and the People. n.p., University of Oklahoma Press, 1980.

WORLD Conference on National Parks, 1 (Seattle, Washington, June 30-July 7 1962). Proceedings. n.p., U.S. National Park Service and U.S. Government Printing Service, 1964.

WORLD Conference on National Parks, 2 (Yellowstone and Grand Teton, 1972). Proceedings. n.p., International Union for Conservation of Nature and Natural Resources and National Parks Centennial Commission, 1972.

WORLD Conference on National Parks, 3 (Bali, Indonesia, 11-22 October 1982). Proceedings. Edited by Jeffrey McNeely and Kenton Miller. n.p., International Union for Conservation of Nature and Natural Resources and Smithsonian Institution Press, 1984.

Worster, Donald . Nature`s Economy - A History of Ecological Ideas. Cambridge, Cambridge University Press, 1985.

II - Reference Materials

Almanaque Abril - 1987 . Sao Paulo, Editora Abril, 1986.

Almanaque Abril - 1988 . Sao Paulo, Editora Abril, 1987.

Conselho Nacional de Geografia et Conselho Nacional de Estatistica. Enciclopedia Brasileira dos Municipios. Rio de Janeiro, IBGE, 1959. 22 v.

ENCICLOPEDIA AMERICANA. New York, Americana Corporation, 1971. 30v.

ENCICLOPEDIA MIRADOR INTERNACIONAL . Sao Paulo e Rio de Janeiro, Enciclopedia Brittanica do Brasil, 1975. 20v

GRANDE ENCICLOPEDIA DELTA-LAROUSSE . Rio de Janeiro, Librairie Larousse e Editora Delta, 1970. 15v

Fundacao Instituto Brasileiro de Geografia e Estatistica . Anuario Estatistico do Brasil, 1983,1986. Rio de Janeiro, FIBGE, 1984 and 1987.

_____ : Estatisticas Historicas do Brasil - Series Economicas, Demografias e Sociais de 1550 a 1985. Serie Estatisticas Retrospectivas, numero 3. Rio de Janeiro, FIBGE, 1987.

International Commission on National Parks - United Nation . United Nations List of National Parks and Equivalent Reserves. n.p., Hayez, 1971.

United States National Park Service . Index of the National Park System and Afilliated Areas as of January 1, 1975. n.p., U.S. Government Printing Office, 1975.

III - Files (news clippings, news abstracts and manuscipts)

1 - Fundacao Brasileira de Conservacao da Natureza (FBCN)

a - Newspaper clippings files. 1970-1988.

b - File "I Curso sobre Administracao e Manejo de Parques Nacionais". Brasilia, October 17-29, 1977.

c - File "Tombamentos - Baixada de Jacarepagua". [1971]

d - Jayme Costa Santiago to Jose Richa, official letter 167/86. Brasilia, March 3, 1986.

e - "Exposicao de Motivos - Criacao da Reserva Biologica de Atol das Rocas." [Brasilia], April 1979. [typewritten]

2 - Instituto Brasileiro de Analises Socio-Economicas (IBASE)

a - Newspaper abstracts: "Pesticides", "Ecology", "Accidents". 1983-1988.

b - Newspaper and weekly magazine clippings: "Pesticides", "Ecology", "Accidents". 1983-1988.

IV - Interviews

Margarene Maria Lima Bezerra. Brasilia, May 20, 1988.

Aureo Faleiros. Brasilia, May 24, 1988.

Fabio de Jesus. Brasilia, May 19, 1988

Maria Tereza Jorge Padua. Brasilia, May 18, 1988.

V - Maps

Brasil. Secretaria de Planejamento da Presidencia da Republica. Fundacao Instituto Brasileiro de Geografia e Estatistica. Estado do Rio de Janeiro. 2 ed. Rio de Janeiro, FIBGE, 1975. [Scale 1:400,000]

_____. Regiao Metropolitana do Rio de Janeiro. Rio de Janeiro, FIBGE, 1975. [Scale 1:200,000]

_____. Republica Federativa do Brasil. 13 ed. Rio de Janeiro, FIBGE, 1985. [Scale 1:5,000,000]

Centro Indigenista Missionario et al. Areas Indigenas e Grandes Projetos. Berlin, Institut fur Angewandte Geodasie Berlin, 1985. [Scale 1:5,000,000]