



**PRELIMINARY CONSERVATION PLAN OF THE  
ARARIPE MANAKIN (*Antilophia bokermanni*),  
CEARÁ, BRAZIL**



*Final Report of the Araripe Manakin project  
and Action Plan for 2006-2007*

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# Chapter 1

## Introduction

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### **1.1. General Introduction and Objectives**

This Preliminary Conservation Plan has two main purposes: (1) to produce a **strategic planning for the priority actions** required to pursue the immediate steps in this long term integrated effort for the conservation of the Araripe Manakin (i.e., Action Plan 2006-2007); and (2) to produce a condensed baseline document as a **starting reference for the discussions of the Conservation Plan for the Araripe Manakin**.

As a collective planning exercise, the team has built the preliminary Conservation Plan and the Action Plan for 2006-2007 in two workshops conducted in late 2005, followed by consultations with Protected Area managers and other stakeholders during early January 2006.

The officially recognized Conservation Plan, led by the Aquasis team in partnership with Birdlife/Brasil Programme, the Ministry of Environment (National Fund for the Environment and IBAMA, the Brazilian environmental agency) should be broadly discussed with stakeholders during the first semester of 2006, and is scheduled to be ready by July. Two key documents will be instrumental for this process: the **Feasibility Study for the Conservation Plan of the Araripe Manakin**, prepared in April 2005 as result of field research and an extensive environmental and socio-economic assessment; and this **Preliminary Conservation Plan**.

In this sense, this plan is expected to identify the main problems related to the conservation of the Araripe Manakin and its habitat, propose measures to stop/minimize these impacts, organize them to facilitate future discussions and analyses, and present a list of priorities based on the team experience, facilitated by the logic construction process conducted during the workshops. Thus, this document is the first systematic attempt to translate the findings and assessments presented in the Feasibility Study for the Conservation Plan of the Araripe Manakin into short, medium, and long term priority actions to ensure the conservation of this endangered species.

To present the results of these workshops and subsequent discussions, Chapter 2 initially describes the methods employed in the workshops (see 2.1 and Figure 1), the spatial range of the Conservation Plan (Figure 2) and a desired scenario that should help the team to focus in the short, medium, and long term objectives to be attained (Table 2). It then presents the results of the initial exercises to group and narrow down the impacts identified in the Feasibility Study. After grouping the similar impacts to avoid repetition (Tables 3-6), Chapter 3 presents the measures proposed to stop/minimize each impact in the study areas (Tables 7-9), and then organized these measures in priority order (Tables 10-11).

Finally, Chapter 4 presents the main elements of the Preliminary Conservation Plan, including a summary of **priority actions** for short, medium and long term (Table 12); a description of the five **strategies** identified to organize the priority measures by similar themes (Tables 13-17); and the **Action Plan for 2006-2007** (Table 18), identifying and outlining the main actions to be conducted

in this period, and serving as a **strategic planning** for the immediate actions of the executive team and partners.

Thus, the reader with specific interests in the building process of the Preliminary Conservation Plan - especially the adaptive methods employed and developed for the workshop, and the dynamics and logic sequence of the several Tables presented - is encouraged to read through the whole of this document. Those more interested in the outcomes of this process for the conservation of the Araripe Manakin can save some time by jumping straight to Chapter 4 after reading the overview presented in this Introduction.

Although it was an extensive exercise to narrow down the findings of the Feasibility Study and come up with a practical Action Plan (including the detailing of short term projects), it also proved to be very rewarding for the field team and executive partners at this moment, since it provided in-depth reflections that should help the team to conduct the process of consolidating the official Conservation Plan of the Araripe Manakin.

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## Chapter 2

### Building the Preliminary Conservation Plan

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#### **2.1. Overview of the building process of the Preliminary Conservation Plan**

As mentioned above, the Preliminary Conservation Plan was collectively built by the executive team and partnerships involved in the Araripe Manakin conservation effort, i.e., the Aquasis team (Weber Silva, Ciro Albano, Thieres Pinto and Alberto Campos), the Birdlife/Brasil Programme team (Jaqueline Goerck, Priscila Napoli and Pedro Develey), the geneticist Péricles Sena (Federal University of Pará), and representatives of the two protected areas (Jackson Antero, Araripe Environmental Protection Area, and Willian Brito, Araripe National Forest).

The core document was produced in two workshops held in November and December 2005, in Aquasis office in Caucaia, Ceará, and was reviewed by internet (e-mail, online discussions) in early January 2006.

The workshop initially produced a **summary of past activities** (1996-2005) related to the conservation of the Araripe Manakin, since the discovery of the species in 1996, in order to give the team an overall picture of the ongoing conservation process, and to highlight the importance of the Preliminary Conservation Plan in the planning of future integrated and synergistic actions (Table 1).

A **desired scenario** was then discussed, to establish some conservation goals (mainly related to habitat recovery, since habitat losses are the major problem identified in the Feasibility Study, as will be detailed in 2.3), and to define the timeframe for short, medium, and long term actions. The **spatial range** of the Conservation Plan was also discussed and defined.

A second phase of the workshop tried to identify all **major impacts and threats** to the Araripe Manakin and its habitat (presented in the Feasibility Study), and start grouping them to avoid repetition during the next steps. Then, several **measures to stop/minimize** each impact were discussed and proposed, followed by the most extensive exercises during the workshop: grouping the proposed measures (which also started to shape the themes of the strategies proposed in 4.2) and assigning priorities, resulting in Tables 10 and 11.

The last phase of the workshop is basically presented in Chapter 4, and consisted in establishing short, medium, and long term strategies and actions to compose the Conservation Plan, and determining the immediate actions to produce the Action Plan for 2006-2007.

The building process of the workshop used an adapted ZOP methodology, using coloured cards to write down impacts/threats and then the related measures to solve them. Since this is a very dynamic and adaptive method, the Tables presented here are like still pictures of intermediate moments of the construction process, and some of them may seem repetitive, but the team decided to include the most representative moments of discussion to illustrate and allow an understanding of the logic behind the process. An overview of this building process is illustrated in Figure 1.

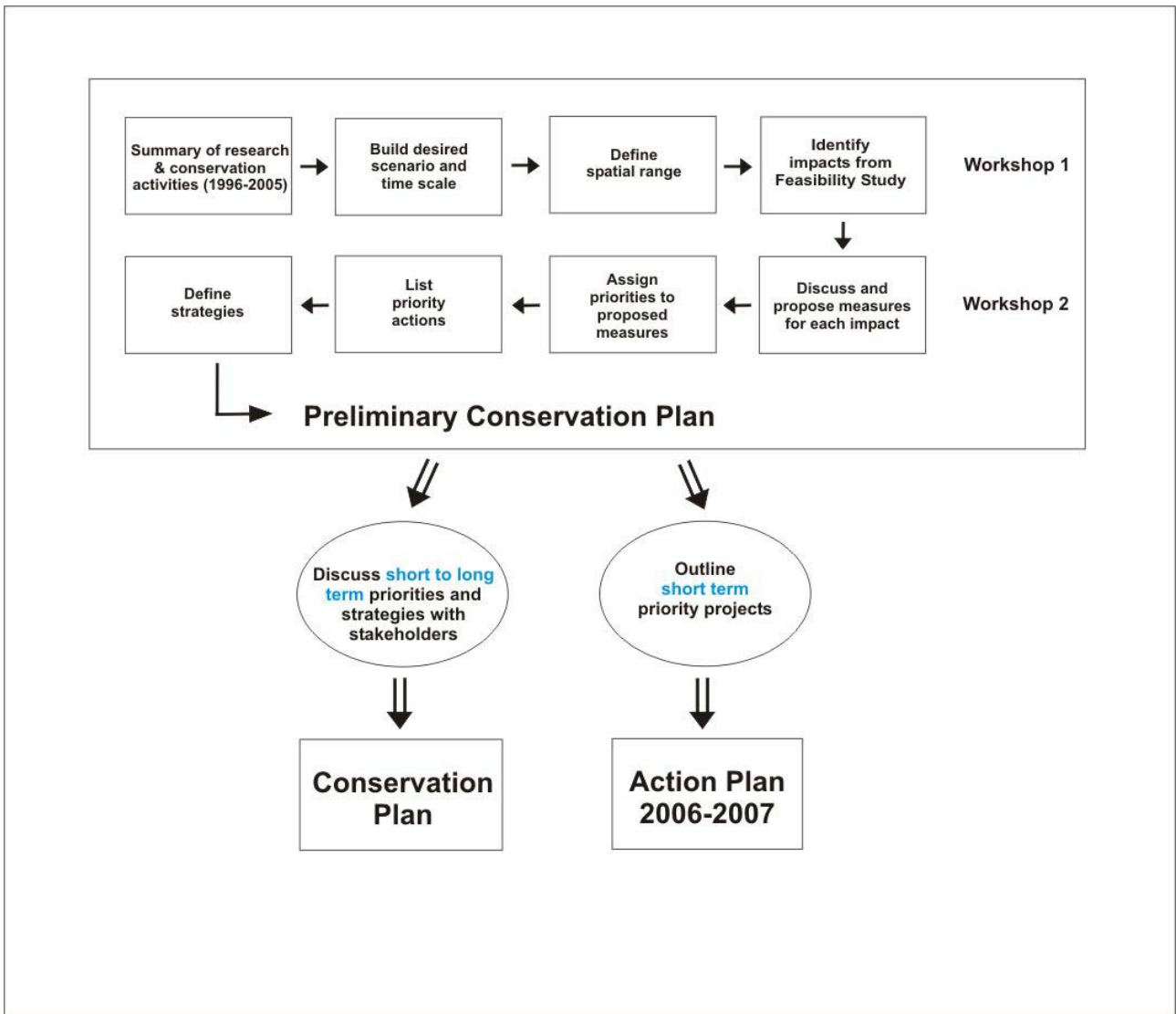


Figure 1 – Schematic drawing of the building process of the Preliminary Conservation Plan, and expected outcomes.

Table 1 - Summary of past activities (1996-2005) and expected short term actions (2006-2008).

<b>Phase</b>	<b>Year</b>	<b>Goals and Activities</b>	<b>Results</b>	<b>Team</b>	<b>Institutions</b>	<b>Funding</b>
<b>1. Discovery and description of the species</b>	1996-1998	Collect type specimens, deposit them in collection <sup>1</sup> , describe the species (Coelho & Silva, 1988)	New species described (Araripe Manakin, <i>Antilophia bokermanni</i> ) and deposited in collection	Weber Silva and Galileu Coelho	Federal University of Pernambuco State, Federal University of Ceará State	Personal initiatives
<b>2. Preliminary field research</b>	1999-2002	Preliminary behavioural observations	New sightings, confirm relation with gallery forests	Weber Silva, Péricles Sena, Thieres Pinto and Ciro Albano	n/a	Personal initiatives
	2002-2003	Field research to determine reproductive period	Describing reproductive behaviour and cycle <sup>4</sup>	Weber Silva	Federal University of Pernambuco State	MSc scholarship provided by CAPES
	2003-2004	Field research to determine the population status, increase known range, and genetic studies	Preliminary population status determined, 12 new spots found, 26 samples collected for genetic studies <sup>2</sup>	Weber Silva, Péricles Sena, Ciro Albano, Thieres Pinto	OAP (Birdwatchers of Pernambuco), IBAMA (Brazilian Federal Environmental Agency), Federal University of Pará	“O Boticário” Foundation for the Protection of Nature <sup>3</sup>
<b>3. Continuing Research &amp; Monitoring and building the Conservation Plan</b>	2004-2005	Field research and assessments to produce a Viability Study and Preliminary Conservation Plan	First nests discovered, complete reproductive cycle monitored, Viability Study and Preliminary Conservation Plan (strategic planning),	Weber Silva, Alberto Campos, Péricles Sena, Ciro Albano, Thieres Pinto, Jaqueline Goerck, Priscila Napoli	Aquasis, Birdlife Brasil, IBAMA	BP Conservation Programme (Silver award)
	2004-2006	Consolidate an officially recognized Conservation Plan for the Ministry of Environment (IBAMA)	Preliminary Plan consolidated, discussion with stakeholders being conducted, Conservation Plan scheduled for June '06.		Aquasis, Birdlife Brasil, IBAMA, Federal University of Pará	Ministry of Environment, National Fund for the Environment
	2005-2006	Reproductive Biology research and nest monitoring	Discovered the effect rains regime have a strong influence over Araripe Manakin's reproduction		Aquasis, Birdlife Brasil	Disney Wildlife Conservation Fund
<b>4. Continuing Research &amp; Monitoring and implementing the Conservation Plan</b>	2006-2007	Continuing research, awareness campaign and developing conservation tools (according to the priorities of this Preliminary Conservation Plan)	See Action Plan (item 4.3 below)	Weber Silva, Alberto Campos, Péricles Sena, Ciro Albano, Thieres Pinto, Jaqueline Goerck, Priscila Napoli	Aquasis, Birdlife Brasil, IBAMA	BP Conservation Programme (Follow up)
	2007-2008	Implementing some of the strategies proposed in the Conservation Plan (according to the priorities of this Preliminary Conservation Plan)	See Action Plan (item 4.3 below)		Aquasis, Birdlife Brasil, IBAMA, Federal Universities of Pará, Pernambuco and Ceará	Ministry of Environment, National Fund for the Environment

<sup>1</sup> The type specimens (one male and one female) are deposited at the ornithological collection of the Federal University of Pernambuco.

<sup>2</sup> Report available at [www.aquasis.org/download/livro.pdf](http://www.aquasis.org/download/livro.pdf) (in Portuguese).

<sup>3</sup> One of the main funding institutions from the private sector for the conservation of endangered species in Brazil.

<sup>4</sup> As part of Weber Silva MSc. research.



## 2.2. Defining the spatial range of the Conservation Plan

The most distinctive feature in the Araripe landscape, the *Chapada do Araripe*, clearly presents three fairly homogeneous zones in relation to vegetation cover, terrain and types of pressures over the natural resources. In this sense, the group involved in the building of this Preliminary Conservation Plan decided to use these three homogeneous zones to facilitate the visualization of a desired scenario and the initial identification of impacts and threats (Figure 1):

- 1) Slope Zone: composed mainly of moist forests (the Manakin's habitat) and including the gallery forests along the streams that flow down the slopes (nesting habitats);
- 2) Plateau Zone: transition moist/dry forests along the northeastern slopes of the Chapada (where the water springs are concentrated), and dry forests (*cerrado*, *cerradão*) on top of the plateau, where the Araripe National Forest is located;
- 3) Lowlands: where most of urbanization and human activities concentrate, originally covered by transition moist/dry forests and thorn forests (*caatinga*), and gallery forests along valleys associated with moist forests, possibly original habitats of the Araripe Manakin.

The Feasibility Study also clearly states that the plateau forests have a strong influence on the maintenance of the Manakin's habitat and nesting areas, since it protects and maintain diversity and energy flows with the moist forests, besides improving water infiltration and retention for the formation of springs and streams that maintain the gallery forests.

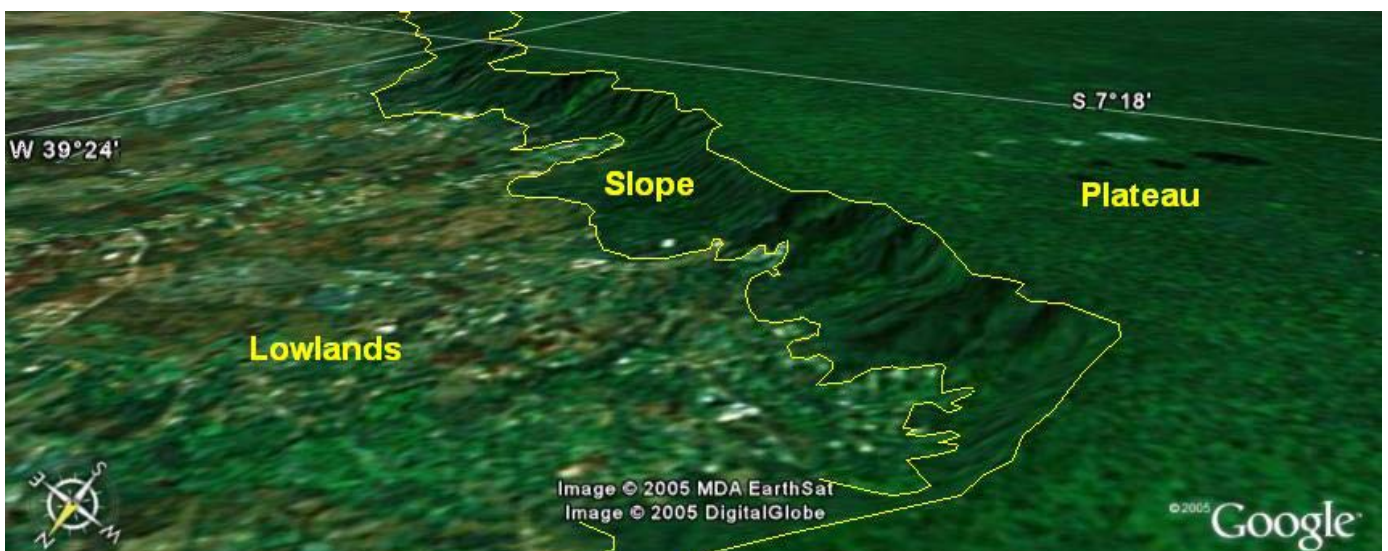


Figure 2 – Distinctive zones identified in the Araripe region.

### ***2.3. Desired scenario and timeframe***

A desired scenario was discussed with two purposes: (1) to produce a common view of the results expected with the implementation of conservation actions proposed in this Plan; and (2) to establish a timeframe for the achievement of these results, defining the time scale for short, medium, and long term actions.

During the collective construction of the desired scenario, in order to avoid the generalization experienced in the initial discussions and to focus in the most relevant outputs expected from the conservation work, the group decided to concentrate in habitat quality.

As stated in the Viability Study, “the major threat for the Araripe Manakin comes from the consistent reduction in its already limited habitat”, and since there are no major direct threats to the Araripe Manakin (e.g., hunting, pet trade), and the studies conducted so far indicate that the present viable habitats are fairly occupied, population increase would heavily depend on habitat recovery. In this sense, **Table 2** presents the desired scenario for habitat recovery to be attained with the implementation of the Conservation Plan.

The time scale was thoroughly discussed and, since this is also intended as a strategic planning for the short term actions, the group decided to establish a fairly short time scale, i.e., short term (1-3 years), medium term (4-7 years), and long term (8-12 years).

### ***2.4. Major impacts and their driving forces over the Manakin’s habitat***

The major impacts presented here are a summary of all impacts/threats to the Araripe Manakin and its habitat identified in the Feasibility Study. Thus, it involved a comprehensive reading of the Study to select these impacts and organize them in a single table to produce an overview that could help defining the next phases of the workshop.

After the impacts/threats were selected and transported to the cards, the group did several exercises to group them as direct and indirect impacts to the Manakin’s habitat, and to identify the main drivers of these impacts, and the result is presented in **Table 3**.

Table 2 – Desired scenario to be attained with the implementation of the Conservation Plan.

Impact	Time Frame (years)	Desired Scenario		
		Chapada do Araripe		Cariri Valley
		Slope Area (moist forests, Manakin's habitat)	Plateau Area (transition moist/dry and dry forests)	Lowlands (gallery forests)
<b>Forest habitat losses</b>	<b>Short term (1-3)</b>	<ul style="list-style-type: none"> <li>- Reduce the pace of moist forest habitat loss;</li> <li>- Stop gallery forest loss in key nesting areas.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the pace of dry forest habitat loss;</li> <li>- Stop deforestation along the northeastern border of the plateau, in the Araripe National Forest.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the pace of gallery forest habitat loss.</li> </ul>
	<b>Medium term (4-7)</b>	<ul style="list-style-type: none"> <li>- Increase habitat quality in the actual range of the Manakin (i.e., Crato, Barbalha and Missão Velha);</li> <li>- Stop moist forest loss;</li> <li>- Reduce the pace of moist and gallery forest habitat loss beyond the actual range of the Manakin (i.e., Porteiras, Jardim, Santana and Nova Olinda).</li> </ul>	<ul style="list-style-type: none"> <li>- Increase forest cover and habitat quality along the border of the plateau;</li> <li>- Stop deforestation in the Araripe National Forest.</li> </ul>	<ul style="list-style-type: none"> <li>- Stop deforestation in the lowland valleys along the actual range of the Manakin (i.e., Crato, Barbalha and Missão Velha municipalities).</li> </ul>
	<b>Long term (8-12)</b>	<ul style="list-style-type: none"> <li>- Increase habitat area and quality beyond the actual range of the Manakin.</li> </ul>	<ul style="list-style-type: none"> <li>- Increase dry forest cover in the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Increase gallery forest cover in the lowland valleys along the actual range of the Manakin;</li> <li>- Increase gallery forest cover in the lowlands of the Cariri Valley.</li> </ul>
<b>Degradation of water resources</b>	<b>Short term (1-3)</b>	<ul style="list-style-type: none"> <li>- Reduce the pace of spring and stream degradation in the actual range of the Manakin (i.e., Crato, Barbalha and Missão Velha municipalities);</li> <li>- Stop stream degradation in key nesting areas.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the pace of dry forest habitat loss.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce the pace of water resource degradation in the lowland valleys along the actual range of the Manakin.</li> </ul>
	<b>Medium term (4-7)</b>	<ul style="list-style-type: none"> <li>- Increase spring and stream quality in the actual range of the Manakin (i.e., Crato, Barbalha and Missão Velha municipalities);</li> <li>- Reduce the pace of spring and stream degradation beyond the actual range of the Manakin (i.e., Porteiras, Jardim, Santana and Nova Olinda municipalities).</li> </ul>	<ul style="list-style-type: none"> <li>- Increase forest cover and habitat quality along the border of the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Stop water resource degradation in the lowland valleys along the actual range of the Manakin.</li> </ul>
	<b>Long term (8-12)</b>	<ul style="list-style-type: none"> <li>- Increase spring and stream quality beyond the actual range of the Manakin.</li> </ul>	<ul style="list-style-type: none"> <li>- Increase dry forest cover in the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Increase water resource quality along the actual range of the Manakin.</li> </ul>
<b>Biodiversity losses and pressures on natural resources</b>	<b>Short term (1-3)</b>	<ul style="list-style-type: none"> <li>- Reduce biodiversity loss and unsustainable use of natural resources along the actual range of the Manakin.</li> <li>- Stop biodiversity loss and illegal resource use in nesting areas.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce biodiversity loss and unsustainable use of natural resources in the Araripe National Forest, especially along the border of the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce biodiversity loss and unsustainable use of natural resources in the lowland valleys along the actual range of the Manakin.</li> </ul>
	<b>Medium term (4-7)</b>	<ul style="list-style-type: none"> <li>- Stop biodiversity loss and unsustainable use of natural resources along the actual range of the Manakin;</li> <li>- Reduce biodiversity loss and unsustainable use of natural resources beyond the actual range of the Manakin (i.e., Porteiras, Jardim, Santana and Nova Olinda municipalities).</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce biodiversity loss and unsustainable use of natural resources in the dry forests of the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce biodiversity loss and unsustainable use of natural resources in the lowland valleys along the actual range of the Manakin.</li> </ul>
	<b>Long term (8-12)</b>	<ul style="list-style-type: none"> <li>- Stop biodiversity loss and unsustainable use of natural resources in moist forest habitats;</li> <li>- Recover wildlife originally present in moist forest habitats.</li> </ul>	<ul style="list-style-type: none"> <li>- Stop biodiversity loss and unsustainable use of natural resources in the Araripe National Forest;</li> <li>- Recover wildlife originally present in the Araripe National Forest and surrounding dry forest habitats of the plateau.</li> </ul>	<ul style="list-style-type: none"> <li>- Recover wildlife originally present in the lowland valleys along the actual range of the Manakin.</li> </ul>

Table 3 – Main impacts to the Araripe Manakin’s habitat and surrounding areas, identifying their causes and driving forces.

Area		Chapada do Araripe		Cariri Valley	Drivers
		Slope Area (moist forests, Manakin’s habitat)	Plateau Area (transition moist/dry and dry forests)	Lowlands (gallery forests)	
Impact					
		<b>DIRECT</b>	<b>Forest habitat losses</b>	Deforestation caused by monocultures (banana)	Deforestation caused by subsistence cultures (beans, mandioca)
Gallery forest (nesting habitats) loss due to walking paths along streams	Forest fires caused by "slash and burn" agriculture			Forest fires caused by "slash and burn" agriculture (beans, rice, mandioca, corn)	
Forest fires caused by honey collectors	Forest fires caused by honey and 'pequi' collectors				<b>Extractivism</b>
Wood extraction for fuel and building materials	Wood extraction for fuel and building materials			Wood extraction for fuel and building materials	
	Forest clearing for cattle and goat raising			Forest clearing for cattle and goat raising	<b>Livestock raising</b>
	Grazing pressure			Grazing pressure	
	Forest fires caused by ranchers			Forest fires caused by ranchers	
Urban expansion over moist forests			Urban expansion over valleys	<b>Urbanization</b>	
Deforestation and slope erosion caused by recreational facilities					
<b>Degradation of water resources</b>	Suppression of vegetation along springs and streams, causing erosion and silting		Suppression of vegetation on top of the plateau, reducing water retention capacity, and causing spring outflow reduction	Suppression of vegetation along rivers, causing erosion and silting	<b>Agriculture</b>
	Channeling of springs and streams for monocultures				
	Spring and stream pollution by pesticides			River pollution by pesticides	
	Channeling of springs and streams by recreational clubs			River pollution by solid wastes and effluents	<b>Urbanization</b>
<b>INDIRECT</b>	<b>Biodiversity losses and pressures on natural resources</b>		Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)	Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)	Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)
			Roads (wildlife roadkill, increasing resource use, risk of fires)	Introduced and opportunistic species (domestic animals)	
		General biodiversity losses due to deforestation caused by urban expansion		General biodiversity losses due to deforestation caused by urban expansion	<b>Extractivism</b>
		Wildlife trade (pet) and hunting (food)	Wildlife trade (pet) and hunting (food)	Wildlife trade (pet) and hunting (food)	
		Wood extraction for fuel and building materials	Wood extraction for fuel and building materials	Wood extraction for fuel and building materials	<b>Agriculture</b>
		Introduced and opportunistic species ( <i>babaçu</i> palm trees)			
		Reduced diversity caused by monocultures, pesticides and 'slash-and-burn' agriculture	Reduced diversity caused by 'slash-and-burn' agriculture	Reduced diversity caused by monocultures, pesticides and 'slash-and-burn' agriculture	
	Forest clearing for cattle and goat raising and grazing pressure	Forest clearing for cattle and goat raising and grazing pressure	<b>Livestock raising</b>		

Before proceeding to determine measures to stop/minimize each of the impacts identified in Table 3, the team decided to group some of these impacts in order to avoid repetition, and to start narrowing down the amount of similar information to facilitate further steps. **Tables 4-6** present the results of this grouping of impacts, which will be used in Tables 7-9 to relate to proposed measures.

Table 4 – Grouping impacts and causes to propose conservation measures for the Slope Area (moist forests, Manakin’s habitat).

Drivers	Impacts and causes (from Table 3)	Impacts and causes (grouped for Table 7)
Agriculture	Deforestation caused by monocultures (banana)	Moist forest loss caused by monocultures
	Channeling of springs and streams for monocultures	Nesting habitat loss (gallery forest loss and channeling of springs and streams) due to agriculture
	Gallery forest (nesting habitats) loss due to walking paths along streams	
	Suppression of vegetation along springs and streams, causing erosion and silting	
	Spring and stream pollution by pesticides	Spring and stream pollution and biodiversity loss caused by pesticides and other pollutants
	Reduced diversity caused by monocultures, pesticides and 'slash-and-burn' agriculture	
	Introduced and opportunistic species ( <i>babaçu</i> palm trees)	Introduced and opportunistic species ( <i>babaçu</i> palm trees)
Extractivism	Forest fires caused by honey collectors	Forest fires caused by honey collectors
	Wood extraction for fuel and building materials	Wood extraction for fuel and building materials
	Wood extraction for fuel and building materials	
	Wildlife trade (pet) and hunting (food)	Wildlife trade (pet) and hunting (food)
Urbanization	Urban expansion over moist forests	Deforestation, biodiversity losses and increasing pressure on natural resources caused by urban expansion over moist forests
	Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)	
	General biodiversity losses due to deforestation caused by urban expansion	
	Deforestation and slope erosion caused by recreational facilities	Deforestation, slope erosion and channeling of springs and streams caused by recreational facilities
	Channeling of springs and streams by recreational clubs	

Table 5 – Grouping impacts and causes to propose conservation measures for the Plateau Area (transition moist/dry and dry forests).

<b>Drivers</b>	<b>Impacts and causes</b> (from Table 3)	<b>Impacts and causes</b> (grouped for Table 8)
Agriculture	Deforestation caused by subsistence cultures (beans, mandioca)	Dry forest losses (deforestation, fires) and reduced diversity caused by subsistence agriculture
	Forest fires caused by "slash and burn" agriculture	
	Suppression of vegetation on top of the plateau, reducing water retention capacity, and causing spring outflow reduction	
	Reduced diversity caused by 'slash-and-burn' agriculture	
Livestock raising	Forest clearing for cattle and goat raising	Dry forest losses (deforestation, fires, grazing pressure) by livestock raising
	Grazing pressure	
	Forest fires caused by ranchers	
	Forest clearing for cattle and goat raising and grazing pressure	
Extractivism	Forest fires caused by honey and 'pequi' collectors	Forest fires caused by honey and 'pequi' collectors
	Wood extraction for fuel and building materials	Wood extraction for fuel and building materials
	Wood extraction for fuel and building materials	Wood extraction for fuel and building materials
	Wildlife trade (pet) and hunting (food)	Wildlife trade (pet) and hunting (food)
Urbanization	Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)	Increasing resource use, wildlife roadkill and risk of fires caused by roads crossing the plateau
	Roads (wildlife roadkill, increasing resource use, risk of fires)	

Table 6 – Grouping impacts and causes to propose conservation measures for the Lowlands (gallery forests).

<b>Drivers</b>	<b>Impacts and causes</b> (from Table 3)	<b>Impacts and causes</b> (grouped for Table 9)
Agriculture	Deforestation caused by monocultures (sugar cane)	Gallery forest loss (deforestation, forest fires) and reduced diversity caused by monocultures and subsistence agriculture
	Forest fires caused by "slash and burn" agriculture (beans, rice, mandioca, corn)	
	Suppression of vegetation along rivers, causing erosion and silting	
	River pollution by pesticides	Gallery forest pollution and biodiversity losses caused by pesticides
	Reduced diversity caused by monocultures, pesticides and 'slash-and-burn' agriculture	
Livestock raising	Forest clearing for cattle and goat raising	Gallery forest losses (deforestation, fires, grazing pressure) by livestock raising
	Grazing pressure	
	Forest fires caused by ranchers	
	Forest clearing for cattle and goat raising and grazing pressure	
Extractivism	Wood extraction for fuel and building materials	Wood extraction for fuel and building materials
	Wood extraction for fuel and building materials	
	Wildlife trade (pet) and hunting (food)	Wildlife trade (pet) and hunting (food)
Urbanization	Urban expansion over valleys	Deforestation, biodiversity losses and increasing pressure on natural resources caused by urban expansion over gallery forests in the lowland valleys
	Increasing pressure on natural resources (wood, honey, fruit, forest products, wildlife)	
	General biodiversity losses due to deforestation caused by urban expansion	
	Introduced and opportunistic species (domestic animals)	River pollution by solid wastes and effluents
	River pollution by solid wastes and effluents	

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## **Chapter 3**

### ***Priority Measures for the Conservation of the Araripe Manakin***

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#### ***3.1. Discussing and Proposing Conservation Measures***

The second phase of the workshop was aimed at listing several possible measures to stop/reduce the impacts and threats over the Araripe Manakin and its habitat, and to group and assign priorities for these measures.

To achieve this, every impact grouped in Tables 4-6 was treated individually, and a brainstorming of measures was produced and discussed for each impact. The extensive lists of measures are presented in **Tables 7-9**, for each area (Slope, Plateau, Lowlands), and the team then proceeded to group these measures in one single table in order to assign priorities (see 3.2).



Table 7 – Proposed measures to achieve the desired scenario in the Slope Area (moist forests, Manakin’s habitat).

Drivers	Impacts and causes	Measures		
		Short term (1-3)	Medium term (4-7)	Long term (8-12)
Agriculture	Moist forest loss caused by monocultures	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers;</li> <li>2. Enforcement (moist forest cutting is illegal);</li> <li>3. Discuss with Araripe Protected Area (APA) managers and stakeholders the creation of a Wildlife Refuge Zone, as part of the Zoning and management Plan of the APA (as precluded in the Federal law that created the national regulation for Protected Areas) in the slope area;</li> <li>4. Research &amp; Development of low impact, sustainable agroforestry systems in the slopes of the Chapada that could function as ecological corridors between gallery forest nesting territories;</li> <li>5. Research &amp; Development on moist forest ecology and habitat restoration/recovery;</li> <li>6. Discuss with Protected Area managers and stakeholders the implementation and location of pilot project for moist forest restoration/recovery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (moist forest cutting is illegal);</li> <li>2. Informative campaign with farmers;</li> <li>3. Create a Wildlife Refuge Zone, as part of the Zoning and management Plan of the APA (as precluded in the Federal law that created the national regulation for Protected Areas) in the slope area;</li> <li>4. Pilot project to recover moist forest habitats, especially between gallery forest nesting territories.</li> <li>5. Discuss with Protected Area managers and stakeholders the implementation and zoning of agroforestry systems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (moist forest cutting is illegal);</li> <li>2. Informative campaign with farmers;</li> <li>3. Develop permanent mechanisms to recover degraded areas of moist forest in the range of the Manakin (including research on forest ecology and biodiversity);</li> <li>4. Pilot project to develop sustainable agroforestry systems in the slopes of the Chapada that that could function as ecological corridors between gallery forest nesting territories.</li> </ol>
	Nesting habitat loss (gallery forest loss and channeling of springs and streams) due to agriculture	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers and landowners;</li> <li>2. Enforcement (gallery forest cutting and water resource channeling are illegal);</li> <li>3. Conduct Research &amp; Monitoring in nesting areas during reproductive period;</li> <li>4. Discuss with Araripe Protected Area (APA) managers and stakeholders the existing legal instruments related to gallery forest protection, and establish the minimum distance from the streams to compose the Preservation Area specified in federal laws (i.e., Forest Code);</li> <li>5. Discuss management tools with stakeholders and APA managers to regulate water use in the slopes, including concessions and possible uses;</li> <li>6. Research &amp; Development of techniques to recover the gallery forests;</li> </ol>	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers and landowners;</li> <li>2. Enforcement (gallery forest cutting and water resource channeling are illegal);</li> <li>3. Reorientate some traditional access trails along selected streams in the nesting territories to avoid gallery forest suppression;</li> <li>4. Develop a long term project to recover gallery forests and start a pilot project in selected areas;</li> <li>5. Conduct Research &amp; Monitoring on nesting areas during reproductive period;</li> <li>6. Pilot project to recover original course of degraded streams and springs;</li> <li>7. Update APA Management Plan with the results of nesting monitoring activities.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (gallery forest cutting and water resource channeling are illegal);</li> <li>2. Develop a long term project to recover gallery forests and the original course of streams along slopes;</li> <li>3. Regularly update APA management plan with the results of nesting monitoring activities;</li> <li>4. Reorientate traditional access trails along streams along the Manakin’s range to avoid gallery forest suppression.</li> </ol>

		7. Research & Development of alternative methods of using stream water without channeling and piping the main water course.		
	Spring and stream pollution and biodiversity loss caused by pesticides and other pollutants	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers, landowners and other users;</li> <li>2. Enforcement;</li> <li>3. Research &amp; Development of 'organic agriculture' methods to avoid using pesticides and other pollutants.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement;</li> <li>2. Informative campaign with farmers, landowners and other users;</li> <li>3. Pilot project of 'organic agriculture' to avoid using pesticides;</li> <li>4. Developing specific areas for washing clothes away from springs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement;</li> <li>2. Develop permanent mechanism to support 'organic agriculture' farmers (techniques, marketing, aggregate value, etc.) and replace pesticide use.</li> </ol>
	Introduced and opportunistic species ( <i>babaçu</i> palm trees)	<ol style="list-style-type: none"> <li>1. Study to identify introduced and opportunistic species in the slope area.</li> </ol>	<ol style="list-style-type: none"> <li>1. Monitoring the populations of introduced and opportunistic species in the slope area;</li> <li>2. Creating mechanisms in the APA Management Plan to avoid/reduce introduction of non-native species, and management of established ones.</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement mechanisms to avoid/reduce introduction of non-native species;</li> <li>2. Implement mechanism for the management of deleterious introduced species.</li> </ol>
Extractivism	Forest fires caused by honey collectors	<ol style="list-style-type: none"> <li>1. Discuss with APA managers and stakeholders ways to increase the funding and the scope of the existing Environmental Fire Brigade to include the slope area (presently they are restricted to the more critical areas of plateau dry forest);</li> <li>2. Discuss with APA managers and stakeholders the regulation of honey collecting activities, including the registration of collectors and issuing of permits;</li> <li>3. Study the honey collecting activity and the sustainability of its present methods.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the funding and the scope of the existing Environmental Fire Brigade to include the slope area;</li> <li>2. Informative campaign aimed at fire prevention with honey collectors;</li> <li>3. Regulate the activity of honey collecting in the APA through the Management Plan;</li> <li>4. Develop alternative methods for honey collecting without the use of fire;</li> <li>5. Develop alternatives and methods for sustainable honey harvesting (there are already initiatives, e.g., the CERAPI company, who produces honey in low impact ways in moist forest areas where the Manakin can be found).</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop permanent mechanism to increase the funding and the scope of the existing Environmental Fire Brigade to include the slope area;</li> <li>2. Implement alternative methods for honey collecting without the use of fire;</li> <li>3. Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey production in the moist forests.</li> </ol>
	Wood extraction for fuel and building materials	<ol style="list-style-type: none"> <li>1. Informative campaign about the importance of fallen wood for the maintenance of soil and forest quality in the moist forest;</li> <li>2. Enforcement (wood extraction of living plants is illegal in moist forest areas);</li> <li>3. Discuss with APA managers and stakeholders the regulation of fallen wood extraction, restricting the collection to drier areas prone to fire;</li> <li>4. Study alternatives for fuel and building materials for the communities that live close to the slope,</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (wood extraction of living plants is illegal in moist forest areas);</li> <li>2. Informative campaign about the importance of fallen wood for the maintenance of soil and forest quality in the moist forest;</li> <li>3. Develop and implement the Zoning of the APA, identifying drier areas prone to fires where extraction of fallen wood would be permitted;</li> <li>4. Implement pilot projects aimed at the substitution of wood as fuel and building materials.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (wood extraction of living plants is illegal in moist forest areas);</li> <li>2. Develop a permanent program for the substitution of wood as fuel and building material.</li> </ol>

		and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.)		
	Wildlife trade (pet) and hunting (food)	<ol style="list-style-type: none"> <li>1. Informative campaign with communities along the slopes and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food;</li> <li>2. Enforcement (wildlife trade is illegal).</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (wildlife trade is illegal);</li> <li>2. Informative campaign with communities along the slopes and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food;</li> <li>3. Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement;</li> <li>2. Use monitoring results to develop management tools.</li> </ol>
Urbanization	Deforestation, biodiversity losses and increasing pressure on natural resources caused by urban expansion over moist forests	<ol style="list-style-type: none"> <li>1. Enforcement (moist forest cutting is illegal);</li> <li>2. Discuss with municipal authorities, initially in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range), to include the conservation of moist forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for new developments toward the slope moist forests.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (moist forest cutting is illegal);</li> <li>2. Promote the creation of municipal laws for the protection of the moist forest and the Araripe Manakin.</li> </ol>	<ol style="list-style-type: none"> <li>3. Enforcement (moist forest cutting is illegal);</li> <li>4. Promote the creation of municipal laws for celebrating the Araripe Manakin (e.g., the Araripe Manakin Day).</li> </ol>
	Deforestation, slope erosion and channeling of springs and streams caused by recreational facilities	<ol style="list-style-type: none"> <li>1. Enforcement of recreational facilities in the slopes to stop deforestation and water resource channeling and privatizing;</li> <li>2. Discuss with environmental and municipal authorities to immediately stop issuing (irregular) permits to establish new recreational facilities along the slopes, involving federal legal institutions if necessary (i.e., Ministério Público);</li> <li>3. Discuss with APA environmental authorities and stakeholders the situation of the dozen large facilities along the slopes of the Chapada.</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop technical reports together with environmental authorities to promote habitat restoration and environmental compensations for the conservation of the moist forests and streams, which should be performed or paid by the developers with recreational facilities along the slopes;</li> <li>2. Produce clear regulations in the Management Plan of the APA to avoid the establishment of new recreational clubs;</li> <li>3. Develop a long-term program to gradually decrease the impact of the recreational clubs over the moist forests and water resources, recovering slope forests and streams;</li> <li>4. Use the existing facilities of recreational clubs for education, research and monitoring (e.g., Parque Riacho do Meio)</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement a long-term program to gradually decrease the impact of the recreational clubs over the moist forests and water resources, recovering slope forests and streams;</li> <li>2. Implement a long-term program (partly) financed by the recreational clubs aimed at education, research, monitoring and biodiversity recovery.</li> <li>3. Involve the recreational clubs in the implementation of the Management of the APA.</li> </ol>

Table 8 – Proposed measures to achieve the desired scenario in the Plateau Area (transition moist/dry and dry forests).

Drivers	Impacts and causes	Measures		
		Short term (1-3)	Medium term (4-7)	Long term (8-12)
Agriculture	Dry forest losses (deforestation, fires) and reduced diversity caused by subsistence agriculture	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers;</li> <li>2. Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA);</li> <li>3. Discuss with FLONA managers and stakeholders the creation of a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) in the high diversity area of the transition forests along the border of the plateau, where human activities would be limited (e.g., education, ecotourism, research);</li> <li>4. Research &amp; Development of agroforestry techniques for the dry forests, without using fire;</li> <li>5. Discuss with FLONA managers and stakeholders the regulations for agroforestry in the National Forest.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA);</li> <li>2. Informative campaign with farmers;</li> <li>3. Create a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) in the high diversity area of the transition forests along the border of the plateau, where human activities would be limited (e.g., education, ecotourism, research);</li> <li>4. Create regulations for agroforestry in the FLONA;</li> <li>5. Research &amp; Development of techniques to recover degraded areas of transition moist/dry forests areas along the border of the plateau.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA);</li> <li>2. Pilot project for implementing agroforestry techniques in the vicinity of the FLONA;</li> <li>3. Pilot project for the recovery of the transition moist/dry forest along the border of the plateau.</li> </ol>
Livestock raising	Dry forest losses (deforestation, fires, grazing pressure) by livestock raising	<ol style="list-style-type: none"> <li>1. Informative campaign with ranchers;</li> <li>2. Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA);</li> <li>3. Discuss with FLONA managers and stakeholders the creation of a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA;</li> <li>4. Discuss with FLONA managers and stakeholders the regulations for livestock raising in the National Forest.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA);</li> <li>2. Informative campaign with ranchers;</li> <li>3. Create a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA;</li> <li>4. Create regulations for livestock raising in the FLONA.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA);</li> <li>2. Pilot project for the recovery of the transition moist/dry forest along the border of the plateau.</li> </ol>
Extractivism	Forest fires caused by honey and 'pequi' collectors	<ol style="list-style-type: none"> <li>1. Discuss with FLONA managers and stakeholders ways to increase the funding of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border;</li> <li>2. Discuss with FLONA managers and stakeholders the regulation of honey and 'pequi' (the plant <i>Caryocar brasiliensis</i>) collecting activities,</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the funding of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border;</li> <li>2. Informative campaign aimed at fire prevention with honey and 'pequi' collectors;</li> <li>3. Regulate the activity of honey and 'pequi' collecting in the FLONA through the Management</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop permanent mechanism to increase the funding and the scope of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border;</li> <li>2. Implement alternative methods for honey collecting without the use of fire;</li> </ol>

		<p>including the registration of collectors and issuing of permits;</p> <p>3. Study the honey and '<i>pequi</i>' collecting activities (and other significant extractivism activities) and the sustainability of its present methods.</p>	<p>Plan;</p> <p>4. Develop alternative methods for honey collecting without the use of fire;</p> <p>6. Develop alternatives to reduce the impact of the large number of '<i>pequi</i>' collectors in the dry forest (campfires, wood for fuel, temporary livestock, etc.) during the '<i>pequi</i>' season.</p>	<p>3. Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey and '<i>pequi</i>' production in the dry forests of the plateau.</p>
	Wood extraction for fuel and building materials	<p>1. Informative campaign about the importance of fallen wood for the maintenance of soil and forest quality in the dry forest;</p> <p>2. Enforcement (wood extraction of living plants is illegal in the FLONA);</p> <p>3. Discuss with FLONA managers and stakeholders the regulation of fallen wood extraction, restricting the collection to drier areas prone to fire, and not allowing the extractivism in the transition moist/dry forests along the border of the plateau;</p> <p>4. Study alternatives for fuel and building materials for the communities that live close to the plateau, and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.).</p>	<p>1. Enforcement (wood extraction of living plants is illegal in the FLONA);</p> <p>2. Informative campaign about the importance of fallen wood for the maintenance of soil and forest quality in the dry forest;</p> <p>3. Develop and implement the Zoning of the FLONA, identifying drier areas prone to fires where extraction of fallen wood would be permitted;</p> <p>4. Implement pilot projects aimed at the substitution of wood as fuel and building materials.</p>	<p>1. Enforcement (wood extraction of living plants is illegal in the FLONA);</p> <p>2. Develop a permanent program for the substitution of wood as fuel and building material.</p>
	Wildlife trade (pet) and hunting (food)	<p>1. Informative campaign with communities around the plateau and small towns nearby to halt wildlife trade, and reduce the use of wildlife as a source of food;</p> <p>2. Enforcement (wildlife trade is illegal).</p>	<p>1. Enforcement (wildlife trade is illegal);</p> <p>2. Informative campaign with communities around the plateau and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food;</p> <p>3. Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</p>	<p>1. Enforcement (wildlife trade is illegal);</p> <p>2. Use monitoring results to develop management tools.</p>
Urbanization	Increasing resource use, wildlife roadkill and risk of fires caused by roads crossing the plateau	<p>1. Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires;</p> <p>2. Conduct studies to determine the real impact of roads on wildlife;</p> <p>3. Improve signs on plateau roads that cross the Araripe National Forest about crossing wildlife.</p>	<p>1. Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires;</p> <p>2. Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA;</p> <p>3. Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the number of unpaved roads crossing the FLONA.</p>	<p>1. Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires;</p> <p>2. Implement measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA;</p> <p>3. Implement measures to reduce the number of unpaved roads crossing the FLONA.</p>

Table 9 – Proposed measures to achieve the desired scenario in the Lowlands (gallery forests).

Drivers	Impacts and causes	Measures		
		Short term (1-3)	Medium term (4-7)	Long term (8-12)
Agriculture	Gallery forest loss (deforestation, forest fires) and reduced diversity caused by monocultures and subsistence agriculture	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers about lowland gallery forests (importance, legislation), the impacts of 'slash and burn', and to disseminate sustainable agricultural practices;</li> <li>2. Enforcement (suppression of vegetation along water courses is illegal);</li> <li>3. Research to identify the areas originally covered by gallery forests, and select pilot areas for habitat recovery;</li> <li>4. Research &amp; Development of sustainable agriculture and agroforestry techniques for the lowland areas, especially near gallery forest habitats.</li> <li>5. Discuss with APA managers and stakeholders about the legal instruments that establish a percentage of rural properties that have to be preserved (i.e., '<i>Reserva Legal</i>') and include the results in the Management Plan.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (suppression of vegetation along water courses is illegal);</li> <li>2. Informative campaign with farmers about the percentage of rural properties that have to be preserved (i.e., '<i>Reserva Legal</i>') according to federal laws;</li> <li>3. Conduct a pilot project to recover selected areas of lowland gallery forest associated to the moist forests along the range of the Manakin;</li> <li>4. Conduct a pilot project of agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories;</li> <li>5. Research to identify the original and existing biodiversity of gallery forests in the lowland valleys.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (suppression of vegetation along water courses is illegal);</li> <li>2. Informative campaign with farmers;</li> <li>3. Develop mechanisms to promote the continuous recovering of lowland gallery forest associated to the moist forests, along the range of the Manakin;</li> <li>4. Conduct pilot project to recover selected areas of lowland gallery forest in degraded areas of '<i>Reserva Legal</i>', in partnership with landowners;</li> <li>5. Create long term mechanisms to develop agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories;</li> <li>6. Monitoring of biodiversity in gallery forests, recovered habitats and agroforestry systems in the lowlands.</li> </ol>
	Gallery forest pollution and biodiversity losses caused by pesticides	<ol style="list-style-type: none"> <li>1. Informative campaign with farmers, landowners and other users;</li> <li>2. Enforcement;</li> <li>3. Research &amp; Development of 'organic agriculture' methods to avoid using pesticides and other pollutants.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement;</li> <li>2. Informative campaign with farmers, landowners and other users;</li> <li>3. Pilot project of 'organic agriculture' to avoid using pesticides.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement;</li> <li>2. Informative campaign with farmers, landowners and other users;</li> <li>3. Develop permanent mechanism to support 'organic agriculture' farmers (techniques, marketing, aggregate value, etc.) and replace pesticide use.</li> </ol>
Livestock raising	Gallery forest losses (deforestation, fires, grazing pressure) by livestock raising	<ol style="list-style-type: none"> <li>1. Informative campaign with ranchers;</li> <li>2. Enforcement in the APA (gallery forest cutting is illegal);</li> <li>3. Discuss with APA managers and stakeholders the regulations for livestock raising in the Araripe Protected Area;</li> <li>4. Research &amp; Develop low impact ways to raise livestock.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the APA;</li> <li>2. Informative campaign with ranchers;</li> <li>3. Create regulations for livestock raising in the APA.</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement in the APA;</li> <li>2. Pilot project for low impact livestock raising;</li> <li>3. Implement regulations for livestock raising in the APA.</li> </ol>
Extractivism	Wood extraction for fuel and building materials	<ol style="list-style-type: none"> <li>1. Informative campaign about the importance of fallen wood for the maintenance of soil and gallery forest quality;</li> <li>2. Enforcement (gallery forest cutting is illegal);</li> <li>3. Discuss with APA managers and stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (gallery forest cutting is illegal);</li> <li>2. Informative campaign about the importance of fallen wood for the maintenance of soil and gallery forest quality;</li> <li>3. Implement pilot projects aimed at the</li> </ol>	<ol style="list-style-type: none"> <li>1. Enforcement (gallery forest cutting is illegal);</li> <li>2. Develop a permanent program for the substitution of wood as fuel and building material;</li> <li>3. Create incentives for the development of agroforestry systems for the lowlands that allow</li> </ol>

		<p>the regulation of fallen wood extraction, restricting the collection to drier areas prone to fire, and not allowing the extractivism in the gallery forests;</p> <p>4. Study alternatives for fuel and building materials for the communities that live close to the lowland gallery forests, and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.).</p>	<p>substitution of wood as fuel and building materials;</p> <p>4. Develop agroforestry systems for the lowlands that allow sustainable harvesting of wood.</p>	<p>sustainable harvesting of wood.</p>
	Wildlife trade (pet) and hunting (food)	<p>1. Informative campaign with communities in the lowland valleys and small towns nearby to halt wildlife trade, and reduce the use of wildlife as a source of food;</p> <p>2. Enforcement (wildlife trade is illegal).</p>	<p>1. Enforcement (wildlife trade is illegal);</p> <p>2. Informative campaign with communities in the lowland valleys and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food;</p> <p>3. Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</p>	<p>1. Enforcement (wildlife trade is illegal);</p> <p>2. Use monitoring results to develop management tools.</p>
Urbanization	Deforestation, biodiversity losses and increasing pressure on natural resources caused by urban expansion over gallery forests in the lowland valleys	<p>1. Enforcement (gallery forest cutting is illegal);</p> <p>2. Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests;</p> <p>3. Discuss with municipal authorities, initially in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range), to include the conservation of gallery forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for new developments in gallery forests.</p>	<p>1. Enforcement (gallery forest cutting is illegal);</p> <p>2. Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests.</p>	<p>1. Enforcement (gallery forest cutting is illegal);</p> <p>2. Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests;</p> <p>3. Promote the creation of municipal laws for the protection of the gallery forests.</p>
	River pollution by solid wastes and effluents	<p>1. Assessment of existing data on solid waste and effluent production and disposal, especially for the municipalities on the actual range of the Manakin;</p> <p>2. Devise a water quality monitoring program for rivers and streams nearby moist forests and major towns.</p>	<p>1. Informative campaign about the solid wastes and effluents, related to environmental problems and water conservation;</p> <p>2. Discuss with APA managers, stakeholders and municipal authorities about the disposal of solid waste and effluents;</p> <p>3. Research &amp; Development on alternatives to reduce the impact of solid wastes and effluents;</p> <p>4. Conduct a water quality monitoring program for rivers and streams nearby moist forests and major towns.</p>	<p>1. Informative campaign about the solid wastes and effluents, related to environmental problems and water conservation;</p> <p>2. Create mechanisms in the APA Management Plan to regulate the disposal of solid waste and effluents, at least in the buffer zone along the bottom of the plateau, i.e., the lower limit of the moist forest habitats;</p> <p>3. Pilot projects to reduce the impact of solid wastes and effluents, especially in the buffer zone along the bottom of the plateau, i.e., the lower limit of the moist forest habitats.</p>

### **3. 2. Establishing Priorities**

After discussing and listing several possible measures to minimize impacts in the timeframe expected to achieve the desired scenario, the group then proceeded to categorize and set priorities for the proposed measures. This process was conducted in five steps:

- 1) The proposed measures presented in Tables 7, 8 and 9 were grouped by similarity;
- 2) Five themes were identified where all proposed measures could be grouped in (i.e., **Protected Area Management, Enforcement of Environmental Laws, Education and Involvement of Stakeholders, Sustainability of Human Activities, Manakin Research, Monitoring and Habitat Recovery**), to facilitate setting priorities;
- 3) Priority numbers were assigned for each group of measures, identifying the 15 most important measures for short, medium and long term scenarios;
- 4) The team proceeded to carefully discuss and evaluate the results, repositioning some priorities, and then finally colouring the top 15 priority measures to highlight their priority status (red, priorities 1-5; blue, priorities 6-10; and green, priorities 11-15) (**Table 10**);
- 5) The top 15 priorities for short, medium and long term were condensed (from their group of similar measures) and are presented in **Table 11**.



Table 10 – Grouping the proposed measures and assigning priorities.

	Short	Medium	Long
Slope	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with farmers about moist forest loss caused by monocultures. <b>1</b></li> <li>• Informative campaign with farmers and landowners about nesting habitat loss due to agriculture. <b>1</b></li> <li>• Informative campaign with farmers, landowners and users about spring and stream pollution and biodiversity loss. <b>1</b></li> <li>• Informative campaign with communities along the slopes and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food.</li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Moist forest cutting. <b>2</b></li> <li>• Gallery forest cutting and water resource channeling. <b>2</b></li> <li>• Spring and stream pollution. <b>2</b></li> <li>• Wood extraction of living plants in moist forest areas. <b>2</b></li> <li>• Enforcement of recreational facilities to stop deforestation and water resource channeling and privatizing. <b>2</b></li> <li>• Wildlife trade. <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Discuss with Araripe Protected Area (APA) managers and stakeholders the creation of a Wildlife Refuge Zone, as part of the Zoning and management Plan of the APA (as precluded in the Federal law that created the national regulation for Protected Areas) in the slope area. <b>3</b></li> <li>• Stimulate landowners to create and register Private Protected Areas (RPPN). <b>5</b></li> <li>• Discuss with Araripe Protected Area (APA) managers and stakeholders the existing legal instruments related to gallery forest protection, and establish the minimum distance from the streams to compose the Preservation Area specified in federal laws (i.e., Forest Code). <b>4</b></li> <li>• Discuss management tools with stakeholders and APA managers to regulate water use in the slopes, including concessions and possible uses. <b>4</b></li> <li>• Discuss with APA managers and stakeholders ways to increase the funding and the scope of the existing</li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with farmers about moist forest loss caused by monocultures. <b>1</b></li> <li>• Informative campaign with farmers and landowners about nesting habitat loss due to agriculture. <b>1</b></li> <li>• Informative campaign with farmers, landowners and users about spring and stream pollution and biodiversity loss. <b>1</b></li> <li>• Informative campaign with communities along the slopes and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food.</li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Moist forest cutting. <b>2</b></li> <li>• Wood extraction of living plants in moist forest areas. <b>2</b></li> <li>• Spring and stream pollution. <b>2</b></li> <li>• Gallery forest cutting and water resource channeling. <b>2</b></li> <li>• Wildlife trade. <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Create a Wildlife Refuge Zone, as part of the Zoning and management Plan of the APA (as precluded in the Federal law that created the national regulation for Protected Areas) in the slope area. <b>3</b></li> <li>• Discuss with Protected Area managers and stakeholders the implementation and zoning of agroforestry systems. <b>7</b></li> <li>• Reorientate some traditional access trails along selected streams in the nesting territories to avoid gallery forest suppression.</li> <li>• Develop a long term project to recover gallery forests and start a pilot project in selected areas.</li> <li>• Pilot project to recover original course of degraded streams and springs. <b>5</b></li> <li>• Update APA Management Plan with the results of nesting monitoring activities. <b>9</b></li> <li>• Developing specific areas for washing clothes away from</li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with farmers about moist forest loss caused by monocultures. <b>1</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Moist forest cutting. <b>2</b></li> <li>• Gallery forest cutting and water resource channeling. <b>2</b></li> <li>• Spring and stream pollution. <b>2</b></li> <li>• Wood extraction of living plants in moist forest areas. <b>2</b></li> <li>• Wildlife trade (pet) and hunting (food). <b>14</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Develop permanent mechanisms to recover degraded areas of moist forest in the range of the Manakin (including research on forest ecology and biodiversity); <b>3</b></li> <li>• Develop a long term project to recover gallery forests and the original course of streams along slopes; <b>3</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Regularly update APA management plan with the results of nesting monitoring activities. <b>8</b></li> <li>• Use monitoring results to develop management tools. <b>8</b></li> <li>• Reorientate traditional access trails along streams along the Manakin's range to avoid gallery forest suppression.</li> <li>• Implement mechanisms to avoid/reduce introduction of non-native species.</li> <li>• Implement mechanism for the management of deleterious introduced species.</li> <li>• Develop permanent mechanism to increase the funding and the scope of the existing Environmental Fire Brigade to include the slope area.</li> <li>• Promote the creation of municipal laws for celebrating the Araripe Manakin (e.g., the Araripe Manakin Day).</li> <li>• Implement a long-term program to gradually decrease the impact of the recreational clubs over the moist forests and water resources, recovering slope forests and streams. <b>4</b></li> </ul>

	<p>Environmental Fire Brigade to include the slope area (presently they are restricted to the more critical areas of plateau dry forest).</p> <ul style="list-style-type: none"> <li>• Discuss with municipal authorities, initially in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range), to include the conservation of moist forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for new developments toward the slope moist forests. <b>9</b></li> <li>• Discuss with environmental and municipal authorities to immediately stop issuing (irregular) permits to establish new recreational facilities along the slopes, involving federal legal institutions if necessary (i.e., Ministério Público). <b>9</b></li> <li>• Discuss with APA environmental authorities and stakeholders the situation of the dozen large facilities along the slopes of the Chapada. <b>9</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Study alternatives for fuel and building materials for the communities that live close to the slope, and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.). <b>12</b></li> <li>• Development of 'organic agriculture' methods to avoid using pesticides and other pollutants. <b>15</b></li> <li>• Development of low impact, sustainable agroforestry systems in the slopes of the Chapada that could function as ecological corridors between gallery forest nesting territories. <b>15</b></li> <li>• Development of alternative methods of using stream water without channeling and piping the main water course. <b>10</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Study to identify introduced and opportunistic species in the slope area.</li> <li>• Conduct Research &amp; Monitoring in nesting areas during reproductive period. <b>6</b></li> <li>• Discuss with Protected Area managers and stakeholders the implementation and location of pilot project for moist forest restoration/recovery. <b>8</b></li> <li>• Conduct research on population status and range. <b>7</b></li> <li>• Research &amp; Development of techniques to recover the</li> </ul>	<p>springs.</p> <ul style="list-style-type: none"> <li>• Creating mechanisms in the APA Management Plan to avoid/reduce introduction of non-native species, and management of established ones.</li> <li>• Increase the funding and the scope of the existing Environmental Fire Brigade to include the slope area.</li> <li>• Regulate the activity of honey collecting in the APA through the Management Plan. <b>9</b></li> <li>• Develop and implement the Zoning of the APA, identifying drier areas prone to fires where extraction of fallen wood would be permitted.</li> <li>• Promote the creation of municipal laws for the protection of the moist forest and the Araripe Manakin. <b>6</b></li> <li>• Use the existing facilities of recreational clubs for education, research and monitoring (e.g., Parque Riacho do Meio). <b>5</b></li> <li>• Pilot project to recover moist forest habitats, especially between gallery forest nesting territories. <b>5</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Pilot project of 'organic agriculture' to avoid using pesticides. <b>7</b></li> <li>• Develop alternative methods for honey collecting without the use of fire. <b>13</b></li> <li>• Develop alternatives and methods for sustainable honey harvesting (there are already initiatives, e.g., the CERAPI company, who produces honey in low impact ways in moist forest areas where the Manakin can be found). <b>13</b></li> <li>• Implement pilot projects aimed at the substitution of wood as fuel and building materials. <b>15</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Conduct Research &amp; Monitoring on nesting areas during reproductive period. <b>8</b></li> <li>• Mapping the water resource and gallery forest "Preservation Areas" (according to Federal Law 4,771/65) in the APA and the FLONA, and including them in the Zoning and Management Plans of both Protected Areas. <b>4</b></li> <li>• Monitoring the populations of introduced and opportunistic species in the slope area.</li> </ul>	<ul style="list-style-type: none"> <li>• Implement a long-term program (partly) financed by the recreational clubs aimed at education, research, monitoring and biodiversity recovery. <b>4</b></li> <li>• Involve the recreational clubs in the implementation of the Management of the APA. <b>4</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Pilot project to develop sustainable agroforestry systems in the slopes of the Chapada that that could function as ecological corridors between gallery forest nesting territories. <b>6</b></li> <li>• Develop permanent mechanism to support 'organic agriculture' farmers (techniques, marketing, aggregate value, etc.) and replace pesticide use. <b>6</b></li> <li>• Implement alternative methods for honey collecting without the use of fire. <b>11</b></li> <li>• Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey production in the moist forests. <b>11</b></li> <li>• Develop a permanent program for the substitution of wood as fuel and building material. <b>12</b></li> </ul>
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	<p>gallery forests. <b>8</b></p> <ul style="list-style-type: none"> <li>• Research &amp; Development on moist forest ecology and habitat restoration/recovery. <b>8</b></li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</li> </ul>	
Plateau	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with farmers about dry forest losses (deforestation, fires) and reduced diversity caused by subsistence agriculture. <b>1</b></li> <li>• Informative campaign with ranchers about dry forest losses (deforestation, fires, grazing pressure) by livestock raising. <b>1</b></li> <li>• Informative campaign with communities around the plateau and small towns nearby to halt wildlife trade, and reduce the use of wildlife as a source of food.</li> <li>• Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires. <b>16</b></li> <li>• Improve signs on plateau roads that cross the Araripe National Forest about crossing wildlife. <b>16</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA). <b>2</b></li> <li>• Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA). <b>2</b></li> <li>• Enforcement (wood extraction of living plants is illegal in the FLONA). <b>2</b></li> <li>• Enforcement (wildlife trade and hunting is illegal). <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Discuss with FLONA managers and stakeholders the creation of a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) in the high diversity area of the transition forests along the border of the plateau, where human activities would be limited (e.g., education, ecotourism, research). <b>3</b></li> <li>• Discuss with FLONA managers and stakeholders the regulations for agroforestry in the National Forest. <b>13</b></li> <li>• Discuss with FLONA managers and stakeholders the regulations for livestock raising in the National Forest. <b>13</b></li> <li>• Discuss with FLONA managers and stakeholders ways to increase the funding of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border.</li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with farmers about dry forest losses (deforestation, fires) and reduced diversity caused by subsistence agriculture.</li> <li>• Informative campaign with ranchers about dry forest losses (deforestation, fires, grazing pressure) by livestock raising. <b>1</b></li> <li>• Informative campaign aimed at fire prevention with honey and 'pequi' collectors. <b>1</b></li> <li>• Informative campaign with communities around the plateau and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food.</li> <li>• Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires.</li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA). <b>2</b></li> <li>• Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA). <b>2</b></li> <li>• Enforcement (wood extraction of living plants is illegal in the FLONA). <b>2</b></li> <li>• Enforcement (wildlife trade is illegal). <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Create a Wildlife Refuge Zone, as part of the Zoning and management Plan of the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) in the high diversity area of the transition forests along the border of the plateau, where human activities would be limited (e.g., education, ecotourism, research). <b>3</b></li> <li>• Create regulations for agroforestry in the FLONA. <b>9</b></li> <li>• Create regulations for livestock raising in the FLONA. <b>9</b></li> <li>• Increase the funding of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border.</li> <li>• Regulate the activity of honey and 'pequi' collecting in the FLONA through the Management Plan. <b>9</b></li> <li>• Develop and implement the Zoning of the FLONA, identifying</li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>• Informative campaign with drivers crossing the FLONA, aiming at reducing roadkill and the risk of fires. <b>13</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Enforcement in the Araripe National Forest – FLONA (permanent crops are not allowed in the FLONA). <b>2</b></li> <li>• Enforcement in the Araripe National Forest – FLONA (permanent cattle raising is not allowed in the FLONA). <b>2</b></li> <li>• Enforcement (wood extraction of living plants is illegal in the FLONA). <b>2</b></li> <li>• Enforcement (wildlife trade is illegal). <b>14</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Pilot project for the recovery of the transition moist/dry forest along the border of the plateau. <b>15</b></li> <li>• Develop permanent mechanism to increase the funding and the scope of the existing Environmental Fire Brigade to include a larger portion of the plateau area, especially the transition moist/dry forests of the plateau border.</li> <li>• Use monitoring results to develop management tools. <b>8</b></li> <li>• Implement measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA. <b>13</b></li> <li>• Implement measures to reduce the number of unpaved roads crossing the FLONA. <b>13</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Pilot project for implementing agroforestry techniques in the vicinity of the FLONA.</li> <li>• Implement alternative methods for honey collecting without the use of fire. <b>11</b></li> <li>• Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey and 'pequi' production in the dry forests of the plateau. <b>11</b></li> <li>• Develop a permanent program for the substitution of wood as fuel and building material. <b>12</b></li> </ul>

	<ul style="list-style-type: none"> <li>Discuss with FLONA managers and stakeholders the regulation of honey and 'pequi' (the plant <i>Caryocar brasiliensis</i>) collecting activities, including the registration of collectors and issuing of permits. <b>13</b></li> <li>Discuss with FLONA managers and stakeholders the regulation of fallen wood extraction, restricting the collection to drier areas prone to fire, and not allowing the extractivism in the transition moist/dry forests along the border of the plateau. <b>13</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>Research &amp; Development of agroforestry techniques for the dry forests, without using fire. <b>15</b></li> <li>Study the honey and 'pequi' collecting activities (and other significant extractivism activities) and the sustainability of its present methods. <b>11</b></li> <li>Study alternatives for fuel and building materials for the communities that live close to the plateau, and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.). <b>12</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Conduct studies to determine the real impact of roads on wildlife.</li> </ul>	<p>drier areas prone to fires where extraction of fallen wood would be permitted.</p> <ul style="list-style-type: none"> <li>Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA. <b>10</b></li> <li>Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the number of unpaved roads crossing the FLONA. <b>10</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>Develop alternatives to reduce the impact of the large number of 'pequi' collectors in the dry forest (campfires, wood for fuel, temporary livestock, etc.) during the 'pequi' season. <b>14</b></li> <li>Implement pilot projects aimed at the substitution of wood as fuel and building materials. <b>15</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Research &amp; Development of techniques to recover degraded areas of transition moist/dry forests areas along the border of the plateau. <b>16</b></li> <li>Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</li> </ul>	
<p><b>Lowlands</b></p>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with farmers about lowland gallery forests (importance, legislation), the impacts of 'slash and burn', and to disseminate sustainable agricultural practices. <b>1</b></li> <li>Informative campaign with farmers, landowners and other users about gallery forest pollution and biodiversity losses caused by pesticides. <b>1</b></li> <li>Informative campaign with ranchers about gallery forest losses by livestock raising. <b>1</b></li> </ul> <ul style="list-style-type: none"> <li>Informative campaign with communities in the lowland valleys and small towns nearby to halt wildlife trade, and reduce the use of wildlife as a source of food.</li> <li>Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests.</li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Enforcement (suppression of vegetation along water courses). <b>2</b></li> <li>Gallery forest pollution. <b>2</b></li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with farmers about the percentage of rural properties that have to be preserved (i.e., 'Reserva Legal') according to federal laws. <b>1</b></li> <li>Informative campaign with farmers, landowners and other users about gallery forest pollution and biodiversity losses caused by pesticides. <b>1</b></li> <li>Informative campaign with ranchers about gallery forest losses by livestock raising. <b>1</b></li> <li>Informative campaign with communities in the lowland valleys and small towns nearby to halt wildlife trade and reduce the use of wildlife as a source of food.</li> <li>Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests.</li> <li>Informative campaign about the solid wastes and effluents, related to environmental problems and water conservation.</li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Enforcement (suppression of vegetation along water courses). <b>2</b></li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with farmers about lowland gallery forests (importance, legislation), the impacts of 'slash and burn', and to disseminate sustainable agricultural practices. <b>1</b></li> <li>Informative campaign with farmers, landowners and other users about gallery forest pollution and biodiversity losses caused by pesticides. <b>1</b></li> <li>Informative campaign about the importance and legal aspects of gallery forest conservation, in urban areas growing over gallery forests. <b>1</b></li> <li>Informative campaign about the solid wastes and effluents, related to environmental problems and water conservation. <b>1</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Enforcement (suppression of vegetation along water courses). <b>2</b></li> <li>Gallery forest pollution. <b>2</b></li> <li>Gallery forest losses (Enforcement in APA). <b>2</b></li> <li>Enforcement (gallery forest cutting). <b>2</b></li> <li>Enforcement (wildlife trade is illegal). <b>14</b></li> </ul>

<ul style="list-style-type: none"> <li>• Enforcement in the APA (gallery forest cutting). <b>2</b></li> <li>• Enforcement (gallery forest cutting). <b>2</b></li> <li>• Enforcement (wildlife trade is illegal). <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Discuss with APA managers and stakeholders about the legal instruments that establish a percentage of rural properties that have to be preserved (i.e., 'Reserva Legal') and include the results in the Management Plan. <b>14</b></li> <li>• Discuss with APA managers and stakeholders the regulations for livestock raising in the Araripe Protected Area. <b>13</b></li> <li>• Discuss with municipal authorities, initially in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range), to include the conservation of gallery forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for new developments in gallery forests. <b>9</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Research &amp; Development of sustainable agriculture and agroforestry techniques for the lowland areas, especially near gallery forest habitats. <b>15</b></li> <li>• Research &amp; Develop low impact ways to raise livestock. <b>13</b></li> <li>• Study alternatives for fuel and building materials for the communities that live close to the lowland gallery forests, and small businesses in the nearby towns (e.g., bakeries, barbecue restaurants, tile and brick makers, etc.). <b>12</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Research to identify the areas originally covered by gallery forests, and select pilot areas for habitat recovery. <b>8</b></li> <li>• Assessment of existing data on solid waste and effluent production and disposal, especially for the municipalities on the actual range of the Manakin.</li> <li>• Devise a water quality monitoring program for rivers and streams nearby moist forests and major towns.</li> </ul>	<ul style="list-style-type: none"> <li>• Gallery forest pollution. <b>2</b></li> <li>• Gallery forest losses (Enforcement in APA). <b>2</b></li> <li>• Enforcement (gallery forest cutting). <b>2</b></li> <li>• Enforcement (wildlife trade is illegal). <b>17</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Conduct a pilot project to recover selected areas of lowland gallery forest associated to the moist forests along the range of the Manakin. <b>11</b></li> <li>• Create regulations for livestock raising in the APA. <b>9</b></li> <li>• Discuss with APA managers, stakeholders and municipal authorities about the disposal of solid waste and effluents.</li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Conduct a pilot project of agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories. <b>16</b></li> <li>• Research &amp; Development of "organic" agriculture methods to avoid using pesticides and other pollutants. <b>7</b></li> <li>• Develop agroforestry systems for the lowlands that allow sustainable harvesting of wood.</li> <li>• Implement pilot projects aimed at the substitution of wood as fuel and building materials. <b>15</b></li> <li>• Development on alternatives to reduce the impact of solid wastes and effluents.</li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Research to identify the original and existing biodiversity of gallery forests in the lowland valleys. <b>11</b></li> <li>• Monitoring wildlife target species to assess the real impact of the pet trade and hunting (subsistence, sport).</li> <li>• Conduct a water quality monitoring program for rivers and streams nearby moist forests and major towns.</li> </ul>	<p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Develop mechanisms to promote the continuous recovering of lowland gallery forest associated to the moist forests, along the range of the Manakin. <b>10</b></li> <li>• Conduct pilot project to recover selected areas of lowland gallery forest in degraded areas of 'Reserva Legal', in partnership with landowners. <b>10</b></li> <li>• Monitoring of biodiversity in gallery forests, recovered habitats and agroforestry systems in the lowlands. <b>16</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Use monitoring results to develop management tools. <b>8</b></li> <li>• Promote the creation of municipal laws for the protection of the gallery forests.</li> <li>• Create mechanisms in the APA Management Plan to regulate the disposal of solid waste and effluents, at least in the buffer zone along the bottom of the plateau, i.e., the lower limit of the moist forest habitats.</li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Create long term mechanisms to develop agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories. <b>7</b></li> <li>• Develop permanent mechanism to support 'organic agriculture' farmers (techniques, marketing, aggregate value, etc.) and replace pesticide use. <b>6</b></li> <li>• Pilot project for low impact livestock raising.</li> <li>• Develop a permanent program for the substitution of wood as fuel and building material. <b>12</b></li> <li>• Create incentives for the development of agroforestry systems for the lowlands that allow sustainable harvesting of wood. <b>17</b></li> <li>• Pilot projects to reduce the impact of solid wastes and effluents, especially in the buffer zone along the bottom of the plateau, i.e., the lower limit of the moist forest habitats.</li> </ul>
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Table 11 – Priority measures for the Conservation Plan.

Priorities		
Short term (1-3 years)	Medium term (4-7 years)	Long term (8-12 years)
<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity. <b>1</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Increasing and integrated enforcement in the APA (especially moist forests, gallery forests and water resources) and the FLONA (mainly in the transition moist/dry forest along the plateau, and during the 'pequi' season). <b>2</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>Discuss with APA and FLONA managers and stakeholders the creation of an integrated Wildlife Refuge Zone, as part of the Zoning and Management Plan of both Protected Areas (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA). <b>3</b></li> <li>Discuss with Araripe Protected Area (APA) managers and stakeholders the existing legal instruments related to gallery forest and water resource protection, establishing the minimum distance from the streams to compose the Preservation Area specified in federal laws (i.e., Forest Code), regulating water uses and concessions. <b>4</b></li> <li>Stimulate landowners to create and register Private Protected Areas (RPPN). <b>5</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Conduct Research &amp; Monitoring in nesting areas during reproductive period. <b>6</b></li> <li>Conduct systematic Research &amp; Monitoring to follow Manakin conservation status (population, range, genetic viability). <b>7</b></li> <li>Research to identify the areas originally covered by gallery forests, select pilot areas for habitat recovery and develop techniques to restore moist and gallery forests. <b>8</b></li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity. <b>1</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Increasing and integrated enforcement in the APA (especially moist forests, gallery forests and water resources) and the FLONA (mainly in the transition moist/dry forest along the plateau, and during the 'pequi' season). <b>2</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>Create a Wildlife Refuge Zone, as part of the Zoning and Management Plan of the APA and the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA). <b>3</b></li> <li>Mapping the water resource and gallery forest "Preservation Areas" (according to Federal Law 4,771/65) in the APA and the FLONA, and including them in the Zoning and Management Plans of both Protected Areas. <b>4</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Develop a long term project to recover gallery forests, and start a pilot project to recover original course of degraded streams and springs in selected areas. <b>5</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>Promote the creation of municipal laws for the protection of the moist forest and the Araripe Manakin. <b>6</b></li> <li>Promote the development of sustainable agricultural practices i.e., (1) agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories;(2) "green" practices to avoid using pesticides; and (3) agroforestry systems for the lowlands that allow sustainable harvesting of wood. <b>7</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Conduct systematic Research &amp; Monitoring to follow Manakin conservation status (population, range, genetic viability), and in nesting areas during reproductive period. <b>8</b></li> </ul>	<p><b>Education and involvement of stakeholders</b></p> <ul style="list-style-type: none"> <li>Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity. <b>1</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>Increasing and integrated enforcement in the APA (especially in the Wildlife Refuge Zone and water resources) and the FLONA. <b>2</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>Develop permanent mechanisms to recover degraded areas of moist forest in the range of the Manakin, including research on forest ecology and biodiversity, and conducting a long term project to recover gallery forests and the original course of streams along slopes. <b>3</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>Implement a long-term program to gradually decrease the impact of the recreational facilities over the moist forests and water resources, involving them in research and education, and in the recovery of slope forests and streams. <b>4</b></li> <li>Pilot project to develop sustainable agroforestry systems in the slopes of the Chapada that that could function as ecological corridors between gallery forest nesting territories. <b>5</b></li> <li>Develop permanent mechanisms to support "organic" agricultural practices and replace pesticide use. <b>6</b></li> <li>Create long term mechanisms to develop agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories. <b>7</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>Provide subsidies for updating APA, FLONA and Private Reserves Management Plans, with the results of research, development and monitoring activities. <b>8</b></li> </ul>

Table 11 – Priority measures for the Conservation Plan (cont.)

<b>Priorities</b>		
<b>Short term (1-3 years)</b>	<b>Medium term (4-7 years)</b>	<b>Long term (8-12 years)</b>
<p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Discuss with municipal authorities in the cities of Crato, Barbalha and Missão Velha (the Manakin’s actual range), to include the conservation of moist forests in the ‘Plano Diretor’ (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for new developments in moist and gallery forests. <b>9</b></li> <li>• Development of alternative methods of using stream water without channeling and piping the main water course. <b>10</b></li> <li>• Diagnose the honey and ‘pequi’ collecting activities (and other significant extractivism activities) and the sustainability of its present methods. <b>11</b></li> <li>• Develop alternatives to reduce wood consumptions as fuel and building materials. <b>12</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Discuss with FLONA and APA managers and stakeholders the regulations for agriculture, agroforestry, livestock raising, and extractivism (honey, ‘pequi’, wood) in both Protected Areas. <b>13</b></li> <li>• Discuss with APA managers and stakeholders about the legal instruments that establish a percentage of rural properties that have to be preserved (i.e., ‘Reserva Legal’) and include the results in the Management Plan. <b>14</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Development of low impact, sustainable agroforestry systems, especially designed for the slopes of the Chapada, to function as ecological corridors between gallery forest nesting territories. <b>15</b></li> </ul>	<p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Provide subsidies for updating the Zoning and the Management Plan of the APA, FLONA and Private Reserves, including regulations for agriculture, agroforestry, livestock raising, extractivism (honey, ‘pequi’, wood), and the results from the research and monitoring campaigns. <b>9</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA, and the possibility of reducing the number of unpaved roads crossing the FLONA. <b>10</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Pilot project to recover moist forest habitats, especially between gallery forest nesting territories. <b>11</b></li> <li>• Use the existing facilities of recreational clubs for education, research, monitoring and support to habitat restoration programs (e.g., Parque Riacho do Meio). <b>12</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Develop alternative methods for honey collecting without the use of fire, in partnership with existing initiatives (e.g., the CERAPI company, who produces honey in low impact ways in moist forest areas where the Manakin can be found). <b>13</b></li> <li>• Develop alternatives to reduce the impact of the large number of ‘pequi’ collectors in the dry forest (campfires, wood for fuel, temporary livestock, etc.) during the ‘pequi’ season. <b>14</b></li> <li>• Implement pilot projects aimed at the substitution of wood as fuel and building materials. <b>15</b></li> </ul>	<p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Conduct a pilot project to recover selected areas of lowland gallery forest associated to the moist forests along the range of the Manakin. <b>9</b></li> </ul> <p><b>Protected area management</b></p> <ul style="list-style-type: none"> <li>• Develop mechanisms to promote the continuous recovering of lowland gallery forest associated to the moist forests, along the range of the Manakin; and the recovery of selected areas of lowland gallery forest in degraded areas of ‘Reserva Legal’, in partnership with landowners. <b>10</b></li> </ul> <p><b>Sustainability of human activities</b></p> <ul style="list-style-type: none"> <li>• Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey and ‘pequi’ production in the dry forests of the plateau; <b>11</b></li> <li>• Develop a permanent program for the substitution of wood as fuel and building material. <b>12</b></li> <li>• Implement measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA, and to reduce the number of unpaved roads across the FLONA. <b>13</b></li> </ul> <p><b>Enforcement of environmental laws</b></p> <ul style="list-style-type: none"> <li>• Enforcement against wildlife trade. <b>14</b></li> </ul> <p><b>Manakin Research, Monitoring and Habitat Recovery</b></p> <ul style="list-style-type: none"> <li>• Pilot project for the recovery of the biodiversity of moist forests and transition moist/dry forest along the border of the plateau. <b>15</b></li> </ul>

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## **Chapter 4**

### **Preliminary Conservation Plan**

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The Preliminary Conservation Plan, as stated in the Introduction, should provide subsidies for the consolidation of the Araripe Manakin Conservation Plan, and also produce a practical Action Plan for immediate action (2006-2007).

In this sense, the final Chapter of this document presents:

- 1) A summary of the **priority actions** resulting from the extensive process conducted during the workshops (Table 12);
- 2) An outline of the **strategies** that should be considered for the consolidation of the Conservation Plan;
- 3) An **Action Plan**, with definition of projects and actions that have to be considered for immediate action (2006-2007).



## 4.1. Priority Actions

Table 12 – Summary of priority actions defined in the workshop.

Priorities		
Short term (1-3 years)	Medium term (4-7 years)	Long term (8-12 years)
<ol style="list-style-type: none"> <li>1. Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity.</li> <li>2. Increasing and integrated enforcement in the APA (especially moist forests, gallery forests and water resources) and the FLONA (mainly in the transition moist/dry forest along the plateau, and during the 'pequi' season).</li> <li>3. Discuss with APA and FLONA managers and stakeholders the creation of an integrated Wildlife Refuge Zone, as part of the Zoning and Management Plan of both Protected Areas (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA).</li> <li>4. Discuss with APA managers and stakeholders the existing legal instruments related to gallery forest and water resource protection, establishing the minimum distance from the streams to compose the Preservation Area specified in federal laws (i.e., Forest Code), regulating water uses and concessions.</li> <li>5. Stimulate landowners to create and register Private Protected Areas (RPPN).</li> <li>6. Conduct Research &amp; Monitoring in nesting areas during reproductive period.</li> <li>7. Conduct systematic Research &amp; Monitoring to follow Manakin conservation status (population, range, genetic viability).</li> </ol>	<ol style="list-style-type: none"> <li>1. Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity.</li> <li>2. Increasing and integrated enforcement in the APA (especially moist forests, gallery forests and water resources) and the FLONA (mainly in the transition moist/dry forest along the plateau, and during the 'pequi' season).</li> <li>3. Create a Wildlife Refuge Zone, as part of the Zoning and Management Plan of the APA and the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA).</li> <li>4. Mapping the water resource and gallery forest "Preservation Areas" (according to Federal Law 4,771/65) in the APA and the FLONA, and including them in the Zoning and Management Plans of both Protected Areas.</li> <li>5. Develop a long term project to recover gallery forests, and start a pilot project to recover original course of degraded streams and springs in selected areas.</li> <li>6. Promote the creation of municipal laws for the protection of the moist forest and the Araripe Manakin.</li> <li>7. Promote the development of sustainable agricultural practices i.e., (1) agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories; (2) "green" practices to avoid using pesticides; and (3) agroforestry systems for the lowlands that allow sustainable harvesting of wood.</li> </ol>	<ol style="list-style-type: none"> <li>1. Informative campaign with resource users and other stakeholders (farmers, landowners, ranchers, 'pequi' collectors, etc.) about the importance, resource use &amp; conservation, and legal aspects regarding the Araripe forest habitats and their associated biodiversity.</li> <li>2. Increasing and integrated enforcement in the APA (especially in the Wildlife Refuge Zone and water resources) and the FLONA.</li> <li>3. Develop permanent mechanisms to recover degraded areas of moist forest in the range of the Manakin, including research on forest ecology and biodiversity, and conducting a long term project to recover gallery forests and the original course of streams along slopes.</li> <li>4. Implement a long-term program to gradually decrease the impact of the recreational facilities over the moist forests and water resources, involving them in research and education, and in the recovery of slope forests and streams.</li> <li>5. Pilot project to develop sustainable agroforestry systems in the slopes of the Chapada that that could function as ecological corridors between gallery forest nesting territories.</li> <li>6. Develop permanent mechanisms to support "organic" agricultural practices and replace pesticide use.</li> <li>7. Create long term mechanisms to develop agroforestry in the contact zone between the slopes and the lowlands, to function as a buffer in the lower limits of the moist forest, and to increase the chances of movement of the Araripe Manakin between moist forest territories.</li> </ol>

Table 12 – Summary of priority actions (cont.).

<b>Priorities</b>		
<b>Short term (1-3 years)</b>	<b>Medium term (4-7 years)</b>	<b>Long term (8-12 years)</b>
<p><b>8.</b> Research to identify the areas originally covered by gallery forests, select pilot areas for habitat recovery and develop techniques to restore moist and gallery forests.</p> <p><b>9.</b> Discuss with municipal authorities in the cities of Crato, Barbalha and Missão Velha (Manakin's actual range), to include the conservation of moist forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning) and to stop issuing permits for developments in moist and gallery forests.</p> <p><b>10.</b> Development of alternative methods of using stream water without channeling and piping the main water course.</p> <p><b>11.</b> Diagnose the honey and '<i>pequi</i>' collecting activities (and other significant extractivism activities) and the sustainability of its present methods.</p> <p><b>12.</b> Develop alternatives to reduce wood consumptions as fuel and building materials.</p> <p><b>13.</b> Discuss with FLONA and APA managers and stakeholders the regulations for agriculture, agroforestry, livestock raising, and extractivism (honey, '<i>pequi</i>', wood) in both Protected Areas.</p> <p><b>14.</b> Discuss with APA managers and stakeholders about the legal instruments that establish a percentage of rural properties that have to be preserved (i.e., '<i>Reserva Legal</i>') and include the results in the Management Plan.</p> <p><b>15.</b> Development of low impact, sustainable agroforestry systems, especially designed for the slopes of the Chapada, to function as ecological corridors between gallery forest nesting territories.</p>	<p><b>8.</b> Conduct systematic Research &amp; Monitoring to follow Manakin conservation status (population, range, genetic viability), and in nesting areas during reproductive period.</p> <p><b>9.</b> Provide subsidies for updating the Zoning and the Management Plan of the APA, FLONA and Private Reserves, including regulations for agriculture, agroforestry, livestock raising, extractivism (honey, '<i>pequi</i>', wood), and the results from the research and monitoring campaigns.</p> <p><b>10.</b> Discuss with FLONA managers, stakeholders, road police and transport authorities possible measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA, and the possibility of reducing the number of unpaved roads crossing the FLONA.</p> <p><b>11.</b> Pilot project to recover moist forest habitats, especially between gallery forest nesting territories.</p> <p><b>12.</b> Use the existing facilities of recreational clubs for education, research, monitoring and support to habitat restoration programs (e.g., Parque Riacho do Meio).</p> <p><b>13.</b> Develop alternative methods for honey collecting without the use of fire, in partnership with existing initiatives (e.g., the CERAPI company, who produces honey in low impact ways in moist forest areas where the Manakin can be found).</p> <p><b>14.</b> Develop alternatives to reduce the impact of the large number of '<i>pequi</i>' collectors in the dry forest (campfires, wood for fuel, temporary livestock, etc.) during the '<i>pequi</i>' season.</p> <p><b>15.</b> Implement pilot projects aimed at the substitution of wood as fuel and building materials.</p>	<p><b>8.</b> Provide subsidies for updating APA, FLONA and Private Reserves Management Plans, with the results of research, development and monitoring activities.</p> <p><b>9.</b> Conduct a pilot project to recover selected areas of lowland gallery forest associated to the moist forests along the range of the Manakin.</p> <p><b>10.</b> Develop mechanisms to promote the continuous recovering of lowland gallery forest associated to the moist forests, along the range of the Manakin; and the recovery of selected areas of lowland gallery forest in degraded areas of '<i>Reserva Legal</i>', in partnership with landowners.</p> <p><b>11.</b> Develop permanent mechanism with the partnership of associations and the private sector to support sustainable honey and '<i>pequi</i>' production in the dry forests of the plateau.</p> <p><b>12.</b> Develop a permanent program for the substitution of wood as fuel and building material.</p> <p><b>13.</b> Implement measures to reduce the impact of paved roads over the wildlife and the pressure on natural resources on the FLONA, and to reduce the number of unpaved roads across the FLONA.</p> <p><b>14.</b> Enforcement against wildlife trade.</p> <p><b>15.</b> Pilot project for the recovery of the biodiversity of moist forests and transition moist/dry forest along the border of the plateau.</p>

## **4.2. Strategies**

During the exercise of grouping the proposed measures to establish priority actions (see Tables 10 and 11), five major themes were identified: **Protected Area Management, Enforcement of Environmental Laws, Education and Involvement of Stakeholders, Sustainability of Human Activities, and Manakin Research, Monitoring & Habitat Recovery.** These themes encompass all proposed measures, and they represent the five strategies that will be described below.

Strategies were designed so that they encompass most of the short and medium term priority actions resulting from the workshop (Table 12). Since this is an emergency plan, and since this is also intended as a strategic planning for the conservation actions to be pursued and supported by the partnerships already established for the conservation of the Araripe Manakin, the group decided to draft project summaries for the actions expected to take start in 2006-2007, taken from Tables 13 through 17.

### **Strategy 1 - Protected Area Management**

This strategy is mainly related to the management of the two largest protected areas in the region, the Araripe National Forest (FLONA) and the Araripe Environmental Protection Area (APA) (see Figure 27 of the Feasibility Study). It should initially focus in the insertion of conservation measures for forest habitats into the Management Plans and other existing tools for both Protected Areas. Three short term priority actions emerged from the exercises conducted (**Table 13**).

### **Strategy 2 - Enforcement of Environmental Laws**

The Feasibility Study clearly recognizes the importance of enforcing environmental laws for the long-term conservation of the Araripe Manakin's habitat (Chapter 5, FS). It also states that, "although Brazilian environmental laws are fairly restrictive and cover a wide range of issues in terms of providing support for the conservation of the Araripe Manakin and its habitat, several problems are experienced in practice, some nationwide, and others in the Araripe region in particular, mainly related to the general lack of enforcement of environmental laws".

The strategies to improve the enforcement in the Araripe region (**Table 14**), must be implemented by the agencies who have the legal authority to enforce environmental laws. In this sense, interested stakeholders must collaborate to raise the concerns of the local society about this issue, and help provide the means for collaborative work between enforcement agencies and the two Protected Areas.

Table 13 – Summary of priority actions for Strategy 1 - Protected Area Management

Conservation actions	Short term			Medium term			
	2006	2007	2008	2009	2010	2011	2012
1) Create a Wildlife Refuge Zone in the Slope Area (moist forest habitats)	Discuss with APA and FLONA managers and stakeholders the creation of an integrated Wildlife Refuge Zone, as part of the Zoning and Management Plan of both Protected Areas (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA).		Create a Wildlife Refuge Zone, as part of the Zoning and Management Plan of the APA and the FLONA (as precluded in the Federal law that created the national regulation for Protected Areas) including the slope area (APA) and the contiguous high diversity area of transition forests along the border of the plateau (FLONA).			Provide subsidies for the management of the Wildlife Refuge Zone.	
2) Mapping and conservation of legally established Preservation Areas	Discuss with APA managers and stakeholders the existing legal instruments related to gallery forest and water resource protection, establishing the minimum distance from the streams to compose the Preservation Area specified in federal laws (i.e., Forest Code), regulating water uses and concessions.		Provide subsidies for the management of the APA and FLONA.				
	Mapping the water resource and gallery forest "Preservation Areas" (according to Federal Law 4,771/65) in the APA and the FLONA, and including them in the Zoning and Management Plans of both Protected Areas.						
3) Create Private Protected Areas (RPPN)	Stimulate landowners to create and register Private Protected Areas (RPPN).		Stimulate landowners to create and register Private Protected Areas (RPPN), and provide subsidies for their management.				
4) Regulate main economic activities in the Protected Areas			Discuss with FLONA and APA managers and stakeholders the regulations for agriculture, agroforestry, livestock raising, and extractivism (honey, 'pequi', wood) in both Protected Areas.		Implement regulations for agriculture, agroforestry, livestock raising, and extractivism (honey, 'pequi', wood) in both Protected Areas		

Table 14 – Summary of priority actions for Strategy 2 - Enforcement of Environmental Laws

Conservation actions	Short term			Medium term			
	2006	2007	2008	2009	2010	2011	2012
1) Booklet on environmental laws and regulations	Produce a booklet on environmental laws and regulations related to moist forest, gallery forest, slope conservation, Areas of Permanent Protection, “Reserva Legal”, water use and concessions, wildlife trade, etc.						
2) Seminar with authorities		Conduct meetings with environmental authorities, water use regulation agencies, police, road police, fire department, to discuss ways to increase enforcement of laws in the Araripe region.		Conduct an integrated effort to promote enforcement in the Araripe, especially in the Araripe national Forest and the Araripe Protected Area.			

### **Strategy 3 - Education and Involvement of Stakeholders**

Education, information and generating awareness about the importance of the conservation of natural resources was the top priority raised by the participants of the workshop. It was a general consensus that many of the impacts identified could be solved or minimized if resource users knew about regulations, the importance of specific resources, and the consequences of some human activities over the sustainability of resource use. Besides this, a general campaign is needed to involve the local urban societies in resource conservation, especially establishing a clear and direct relation between moist forest quality and water availability. Initial efforts have been conducted by the field team to establish the Araripe Manakin as a flagship species for the conservation of moist forests and water resources, which should be continued and improved. The water issue in the Araripe will probably be one of the most determining factors in the conservation of the Araripe Manakin and its habitat, and should be publicized accordingly. Short and medium term actions for strategy 3 are summarized in **Table 15**.

### **Strategy 4 - Sustainability of Human Activities**

As noticed in Table 3, most of the direct and indirect impacts over the Araripe Manakin and its habitat come from human-related activities, i.e., agriculture, livestock raising, extractivism of forest products, and urbanization. This strategy should concentrate in evaluating these activities and proposing measures to: (1) improve the existing legal instruments to regulate these activities, especially related to the creation of municipal laws, and management tools in protected areas; (2) promote sustainable, or “green” practices for agriculture, livestock raising and extractivism; (3) work closely with educational and informational campaigns to disseminate these practices; (4) identify unsustainable practices and critical areas for enforcement. Priority measures for strategy 4 are presented in **Table 16**.

### **Strategy 5 - Manakin Research, Monitoring and Habitat Recovery**

Research and monitoring should concentrate in two important areas for updating the conservation status of the Araripe Manakin and providing subsidies for the Conservation Plan: (1) **reproductive biology research and nest monitoring** during reproductive period, to refine our knowledge on reproductive success, and predicting the reproductive season, and (2) continuing efforts on **population research, Manakin’s range, and genetic analyses**, to refine the total population count and subsidize a minimum viable population study, and to monitor genetic variability and endogamy. Priority projects are summarized in **Table 17**.

Table 15 – Summary of priority actions for Strategy 3 - Education and Involvement of Stakeholders

Conservation actions	Short term			Medium term			
	2006	2007	2008	2009	2010	2011	2012
1) Produce a series of printed informative materials	1. Araripe forest habitats diversity and conservation	2. Agriculture and cattle raising in the Araripe: agroforestry, sustainable practices and regulations	3. Forest products Extractivism in the Araripe: sustainable practices and regulations	4. Priority themes identified when updating the Conservation Plan	5. Priority themes identified when updating the Conservation Plan	6. Priority themes identified when updating the Conservation Plan	7. Priority themes identified when updating the Conservation Plan
2) Exhibitions at the Annual Cultural Fair	Produce an annual exhibition for the Cultural fair that takes place every November, one of the most important events in the Araripe region. Initially in the municipality of Crato, and expanding for neighbouring municipalities, promoting the Araripe Manakin as a symbol for the conservation of the region, especially linking it to the water issue.						
3) Produce digital media interactive materials about Araripe biodiversity	Develop an interactive DVD with video images, still pictures and sounds from Araripe diversity. 1. Moist forests	2. Dry forests	3. Lowlands	4. Priority themes identified when updating the Conservation Plan	5. Priority themes identified when updating the Conservation Plan	6. Priority themes identified when updating the Conservation Plan	7. Priority themes identified when updating the Conservation Plan

Table 16 – Summary of priority actions for Strategy 4 - Sustainability of Human Activities

Conservation actions	Short term			Medium term			
	2006	2007	2008	2009	2010	2011	2012
1) Reduce urbanization over moist forest	Discuss with municipal authorities in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range) to stop issuing permits for new developments in moist and gallery forests.			Implement a long-term program to gradually decrease the impact of the recreational facilities over the moist forests and water resources, involving them in research and education, and in the recovery of slope forests and streams			
		Discuss with municipal authorities in the cities of Crato, Barbalha and Missão Velha (the Manakin's actual range), to include the conservation of moist forests in the 'Plano Diretor' (the guiding document for urban planning, regulating urban growth and zoning).		Promote the creation of municipal laws for the protection of the moist forest and the Araripe Manakin.			
2) Water resource use and conservation			Development of alternative methods of using stream water without channeling and piping the main water course.				
3) Reduce the impact of extractivism			Develop alternatives to reduce wood consumptions as fuel and building materials.		Implement pilot projects aimed at the substitution of wood as fuel and building materials.		
			Develop alternative methods for honey collecting without the use of fire, in partnership with existing initiatives (e.g., the CERAPI company, who produces honey in low impact ways in moist forest areas where the Manakin can be found).				
			Develop alternatives to reduce the impact of the large number of 'pequi' collectors in the dry forest (campfires, wood for fuel, temporary livestock, etc.) during the 'pequi' season.				
4) Develop sustainable agricultural practices			Development of low impact, sustainable agroforestry systems, especially designed for the slopes of the Chapada, to function as ecological corridors between gallery forest nesting territories.				



Table 17 – Summary of priority actions for Strategy 5 - Manakin Research, Monitoring and Habitat Recovery

<i>Conservation actions</i>	<i>Short term</i>			<i>Medium term</i>			
	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>
1) Monitoring reproductive period	Conduct Research & Monitoring in nesting areas during reproductive period.			Develop a permanent program for monitoring reproductive period with local universities.			
		Build local capacity to conduct a permanent monitoring program during reproductive season.					
2) Conservation status research and monitoring	Conduct systematic Research & Monitoring on Manakin population status, range, genetic viability.			Develop a permanent program with local universities for monitoring population status and range.			
		Build local capacity to conduct a permanent monitoring program.					
3) Habitat recovery			Research to identify the areas originally covered by gallery forests, select pilot areas for habitat recovery and develop techniques to restore moist and gallery forests.	Develop a long term project to recover gallery forests, and start a pilot project to recover moist forest habitats (especially between gallery forest nesting territories) and to recover original course of degraded streams and springs in selected areas.			

### **4.3. Action Plan 2006-2007**

One of the main expected outcomes of the workshop was the Action Plan for 2006-2007, identifying the activities that should be performed in the short term, and presenting the outlines of projects for each action, as elements for immediate **action, partnership articulation, and fund raising**.

To produce the Action Plan, the group decided to selected, from the 16 conservation actions listed in Tables 13 to 17, those starting in the years 2006 and 2007, resulting in eleven selected actions (highlighted in red colour in the Tables mentioned). The team then discussed the basic topics required to produce a project summary (i.e., objectives, justification and background, methods, timeframe, responsible institution and partners, main inputs, approximate budget, main goals, risk analysis, and potential funding sources), which are presented below for each of the eleven selected priority actions. A summary of the Action Plan is presented in **Table 18**.

#### **Strategy 1 - Protected Area Management**

##### **Action 1.1 - Create a Wildlife Protection Zone in the APA and FLONA.**

**Objectives:** Create a Wildlife Protection Zone in the Slope Area (moist forest habitats).

**Justification:** The Zoning of protected areas designated as sustainable use, like the Araripe National Forest (FLONA) and the Araripe Environmental Protection Area (APA), should have an area designated as wildlife protection zones, or wildlife refuges.

**Methods:** As part of the Scientific Committee of the Management Plan of the Araripe National Forest, the team should lead the discussions for the creation of a Wildlife Protection Zone in the Slope Area (moist forest habitats) and transition areas of the plateau border. This involves the presentation of motives for the Consultive Committees and IBAMA Managers of both protected areas (APA and FLONA) and the production of necessary reports and mappings, with the results of field research.

**Timeframe:** 2006-2007 (discussions), 2008-2010 (create Wildlife Refuge).

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA.

**Inputs:** Preliminary Conservation Plan, Report produced for PA Managers, trips to Brasília.

**Approx. Budget:** US\$ 7,000 (for 2006-2007).

**Goal:** Create a contiguous **Wildlife Protection Zone in the APA and FLONA**, including their limits and uses in the Management Plans of both areas.

**Analysis:** Low cost, but high risk. Many variables involved in the Zoning of a protected area, from stakeholder resistance to institutional bureaucracy.

**Potential funding sources:** Ministry of Environment (IBAMA), AVINA Foundation.

##### **Action 1.2 - Mapping legally established Preservation Areas.**

**Objectives:** Identify the legally designated 'Permanent Preservation Areas' in the Araripe.

**Justification:** There are strong legal instruments that already protect several forest habitats in the Araripe, especially the slope forests (above 45° inclination), gallery forests (30m to each side of the stream), springs (50m radius), and forests on the border of the plateau (100m from the border). These areas, formally designated as 'Permanent Preservation Areas', and one of the main institutions in the Brazilian environmental legal framework, certainly encompass most of the Manakin's known range, and a detailed mapping would constitute an very important tool for the conservation of moist forest habitat, supporting the creation of the Wildlife Refuge.

**Methods:** Based on the Federal Law (4,771/65) that created this designation, as well as other legal instruments (e.g., Resolutions from the National Environmental Council) that defined new criteria for its delimitation and use, produce a detailed mapping identifying the 'Permanent Preservation Areas', centered in the northeastern slope of the *Chapada do Araripe*, the Araripe Manakin's habitat.

**Timeframe:** 2007-2008 (mapping), 2009 (inserting in Management Plan).

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA.

**Inputs:** High-resolution IKONOS satellite images; geoprocessing and mapping services.

**Approx. Budget:** US\$ 50,000.

**Goal:** Produce a detailed mapping of approx. 150km<sup>2</sup> of moist and dry forests, centered on slope forests of the Manakin's range.

**Analysis:** Although expensive, it is of very low risk, and presents some quick results.

**Potential funding sources:** Ministry of Environment (National Fund for the Environment).

### **Action 1.3 – Improve the Private Reserve (RPPN) network**

**Objectives:** Stimulate landowners to create and manage Private Reserves (RPPN).

**Justification:** Legally established Private Reserves are officially recognized as part of the National Protected Area System and should receive government incentives as reduced taxes and incentives for management. There are several landowners along the slopes who are willing to preserve their water resources and moist forest habitats, but have difficulties in producing the required assessments and justifications for the environmental authorities.

**Methods:** Initially, establish a partnership between environmental authorities (IBAMA Regional Office in Crato) and extension groups from the University to establish a service to assist landowners interested in designating Private Reserves. In a second stage, create the local capacity to assist the landowners in the management of their Reserves, translating findings from the Research & Monitoring efforts.

**Timeframe:** 2007-2009 (create RPPNs), 2010-2012 (create and help manage RPPNs).

**Responsible:** Regional University of Cariri, Federal University of Ceará.

**Partners:** Aquasis, IBAMA.

**Inputs:** Office (IBAMA), scholarships and grants (University), printed material, office expenses (supplies, telephone), transportation, consulting services.

**Approx. Budget:** US\$ 8,000 (per year).

**Goal:** Create 10 Private Reserves until 2009, and help manage them.

**Analysis:** Considered of low risk due to the several requests from landowners to create RPPNs, and very efficient in preserving Manakin habitat, since the designation is permanent, and considered in the category of Fully Protected, allowing only research, education and ecotourism.

**Potential funding sources:** Ministry of Environment (IBAMA), University (scholarships and grants).

## **Strategy 2 - Enforcement of Environmental Laws**

### **Action 2.1 – Produce a booklet on environmental laws and regulations**

**Objectives:** Motivate the discussion on pertinent environmental laws to protect Araripe forest habitats and water resources, and promote their dissemination.

**Justification:** Knowing, respecting and following environmental laws is not a common practice in the Araripe culture. This action is part of the initiatives to improve the enforcement of environmental laws, supporting other activities in this strategy (i.e., Seminar).

**Methods:** Research on the main legal instruments related to the conservation of Araripe Manakin habitats, and water resource use. Formatting, printing and distributing the publication.

**Timeframe:** 2006 – 2007.

**Responsible:** Public Ministry.

**Partners:** Aquasis, IBAMA.

**Inputs:** Printing services.

**Approx. Budget:** US\$ 3,000.

**Goal:** Publish and distribute 1 booklet about environmental laws.

**Analysis:** Low risk, important product for supporting and motivating enforcement.

**Potential funding sources:** IBAMA, Public Ministry.

### **Action 2.2 – Seminar with Enforcement Authorities**

**Objectives:** Promote the integration between enforcement agencies, institutions and stakeholders, to improve the enforcement of environmental laws in the Araripe.

**Justification:** Enforcement of environmental laws could be one of the most important factors for Manakin habitat conservation if performed properly. Environmental authorities claim lack of personnel and equipment, and the police does not routinely get involved in enforcement in Protected Areas. The lack of enforcement of environmental laws and Protected Area regulations is so chronic and widespread in the Araripe, that a few symbolic actions could have a large impact on reminding people about some basic rules of sustainability. Solving the present enforcement deficiencies is a difficult task to achieve, with high uncertainties involved, since it

involves government budgets and “unpopular” actions. Direct enforcement actions by other parties are generally not welcome by the enforcement agencies, and we have to understand and promote the proper role each stakeholder has in this integrated effort.

**Methods:** Conduct preparatory meetings and a regional seminar on enforcement of environmental laws in the Araripe. Discuss the creation of regular integrated actions to enforce environmental laws.

**Timeframe:** 2007-2008 (Meetings and preparation); 2009 (Seminar).

**Responsible:** IBAMA, PA managers.

**Partners:** Military police, Road police, Public Ministry, Water Management Agency (COGERH), Universities, Aquasis.

**Inputs:** Seminar, transportation for participants.

**Approx. Budget:** US\$ 16,000.

**Goal:** 1 event for 60 persons, a Cooperation Agreement signed between IBAMA and the police.

**Analysis:** Although it involves a high degree of uncertainty and ancient institutional difficulties, it is of very high priority (see Table 12), and immediate action is required for medium to long term results.

**Potential funding sources:** IBAMA, Public Ministry.

### **Strategy 3 - Education and Involvement of Stakeholders**

#### **Action 3.1 – Informative materials**

**Objectives:** Produce a series of printed informative materials to increase awareness on the importance of forest habitats for the conservation of biodiversity and water resources, and their implications on human welfare.

**Justification:** The Cariri Valley is historically a prosperous region in the mostly semi-arid Ceará State, mainly due to the permanent water resources that originate in the *Chapada do Araripe*. The importance of the forest habitats (i.e., gallery forests, slope moist forests, and plateau dry forests) and their associated biodiversity for the maintenance of these water resources is poorly understood by the local society, and is a vital question for their quality of life, since deforestation is reducing water retention and quality. A reduced outflow is already observed in some of the main springs and streams, making it a real and ‘close to home’ problem and not just some doom prediction by ecologists.

**Methods:** Conduct a research on the most pressing environmental issues regarding water and forest habitat conservation. Produce a planned series of printed materials to be distributed in schools, slope and plateau communities, and urban communities in Crato, Barbalha and Missão Velha municipalities (the actual range of the Araripe Manakin).

**Timeframe:** 2006-2008

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA, Universities, Ceará Trade Organization (SESC and Fecomércio).

**Inputs:** Printing and editing services.

**Approx. Budget:** US\$ 3,500 (per year).

**Goal:** Produce 01 type of informative material yearly

**Analysis:** Little risk involved. Information and awareness about the importance of conservation of natural resources and the consequences for human welfare in the Araripe, were ranked as the highest priority for action.

**Potential funding sources:** Ceará Trade Organization (SESC and Fecomércio).

### **Action 3.2 – Exhibitions at the Annual Cultural Festival**

**Objectives:** Continue the campaign to establish the Araripe Manakin as symbol for the conservation of water and biodiversity resources in the region.

**Justification:** The annual Araripe Cultural Festival that takes place every November, sponsored by the Ceará Trade Organization (SESC and Fecomércio) and State government is one of the most important events in the region, and a good opportunity to reach thousand of people from the Cariri Valley and neighbouring States.

**Methods:** With the partnership of Ceará Trade Organization, we expect, for the third consecutive year, to arrange a booth at Crato main square during the 10-day Festival, disseminating conservation practices, the rich Araripe biodiversity, and the importance of forest habitats and biodiversity for human welfare in the region.

**Timeframe:** 2006-2008.

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA, Universities, Ceará Trade Organization (SESC and Fecomércio), BP Conservation Programme.

**Inputs:** Informative materials (banner, pamphlets), team expenses during Festival, uniforms (T-shirts), transportation, audiovisual equipment.

**Approx. Budget:** US\$ 2,500 (per year).

**Goal:** one exhibition booth produced about the Araripe Manakin conservation project, Araripe biodiversity, and natural resource conservation, during the 10-day Cultural Festival.

**Analysis:** Little risk involved. Information and awareness about the importance of conservation of natural resources and the consequences for human welfare in the Araripe, were ranked as the highest priority for action.

**Potential funding sources:** BP Conservation Programme, Ceará Trade Organization (SESC and Fecomércio).

### **Action 3.3 – Produce a DVD about Araripe diversity**

**Objectives:** Continue the campaign to establish the Araripe Manakin as symbol for the conservation of water and biodiversity resources in the region.

**Justification:** Audiovisual materials are a powerful media to attract the attention of audiences,

especially when showing the poorly known, rich diversity of life found in the Araripe. Digital media is relatively easy to copy and distribute.

**Methods:** Capture images (digital video and photographs) during field activities. Edit them in a DVD interactive format, with menus for video and still images with sounds from wildlife. Copy, screen and distribute the DVD in appropriate occasions (e.g., meetings with stakeholders and PA managers, Cultural Fair, etc.).

**Timeframe:** 2006-2007.

**Responsible:** Aquasis.

**Partners:** BP Conservation Programme, Birdlife, IBAMA, Ceará Trade Organization (SESC and Fecomércio).

**Inputs:** Capturing and editing digital video and photography; copying and distributing.

**Approx. Budget:** US\$ 4,000.

**Goal:** Produce 01 interactive DVD every two years, with different aspects of forest habitats and associated biodiversity.

**Analysis:** Little risk involved. Information and awareness about the importance of conservation of natural resources and the consequences for human welfare in the Araripe, were ranked as the highest priority for action.

**Potential funding sources:** BP Conservation Programme, Ministry of Environment (National Fund for the Environment).

## **Strategy 4 - Sustainability of Human Activities**

### **Action 4.1 – Reduce urbanization over moist forests**

**Objectives:** Increase the participation of municipal environmental and urban planning authorities in the conservation efforts, in order to produce municipal legal tools for moist forest conservation.

**Justification:** The main cities along the Manakin's distribution are growing towards the slopes of the Chapada do Araripe, especially luxury and vacation houses, and recreational facilities seeking the milder climate and abundant water resources of the moist forest habitats. The recognition of the moist forests as endangered habitats, and responsible for the maintenance of the water supply for the lowlands, could trigger municipal measures such as the development of municipal laws for the protection of moist forests, and the inclusion of conservation strategies in the urban planning.

**Methods:** This action involves meetings with municipal environmental and urban planning authorities, as well as legislators, initially in the three municipalities that comprise the Manakin's range (i.e., Crato, Barbalha, and Missão Velha) to discuss: (1) the creation of specific environmental laws for the protection of moist forests, (2) to devise urban planning mechanisms to avoid urban expansion over the slopes, and (3) to stop issuing permits for recreational facilities in the slopes.

**Timeframe:** 2006-2008.

**Responsible:** Aquasis, IBAMA (Protected Area Managers).

**Partners:** Federal University of Ceará (Urban Planning Dept), Municipalities of Crato, Barbalha and Missão Velha.

**Inputs:** Transportation, legal consulting services.

**Approx. Budget:** US\$ 3,000.

**Goal:** Produce 1 preliminary municipal law to be presented at the Municipal Legislature (Câmara dos Vereadores); awareness of municipal authorities that building permits have to be discussed with PA managers.

**Analysis:** This initiative presents relatively high risks, since it involves institutional arrangements and bureaucratic processes of lawmaking prone to several political variables. However the costs involved are low and the expected results would constitute important tools for municipal involvement and improving the legal framework on moist forest conservation.

**Potential funding sources:** Municipal governments

## **Strategy 5 - Manakin Research, Monitoring and Habitat Recovery**

### **Action 5.1 – Monitoring reproductive period**

**Objectives:** Conduct research to refine the conservation status of the Araripe Manakin and provide subsidies for the Conservation Plan.

**Justification:** A reproductive season was first suggested in 2003, by monitoring vocal activity, and later confirmed in 2004 by finding the first nests. Understand the factors involved in ‘triggering’ reproductive activities (e.g., rains regime), refine reproductive success calculations, collect data for determining the Minimum Viable Population, are important to evaluate the conservation status of the Araripe manakin, refining strategies and future conservation actions.

**Methods:** Fieldwork in nesting areas to look for the beginning of reproductive activities (courtship and increased vocal activity); searching for nests in gallery forests; monitoring selected nests to determine reproductive success and other relevant information for the calculations of minimum viable population and general conservation status.

**Timeframe:** 2006-2009.

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA, Universities.

**Inputs:** Transportation, field expenses and equipment.

**Approx. Budget:** US\$ 9,000 (per year).

**Goal:** Determine (1) reproductive season and factor governing its timing; (2) nesting success and overall reproductive success; and (3) eventual reproductive ‘bottlenecks’ for Araripe Manakin population recovery.

**Analysis:** This is a low risk activity being conducted since 2003, with growing results. It is important to continue intensive nest monitoring for a few more years to have a good series of data to estimate the nesting season ‘window’ and evaluate reproductive success.



**Potential funding sources:** Disney Wildlife Fund (already guaranteed for 2005-2006 season).

## **Action 5.2 – Conservation status research and monitoring**

**Objectives:** Conduct research to refine the conservation status of the Araripe Manakin and provide subsidies for the Conservation Plan.

**Justification:** Some important data for determining and refining the conservation status of the species have to be collected for a few more years, especially regarding population studies (total population count, Minimum Viable Population), the range of the Manakin along the slopes of the *Chapada do Araripe*, and genetic studies to refine the variability and determine the degree of endogamy of this small population.

**Methods:** Yearly population census will be performed during the months of peak vocal activity, and several data important to the calculations of Population Viability Analysis will be collected. A workshop about Minimum Viable Population (with the Manakin as the case study of the course) and specific software use should be conducted in partnership with the Federal University of Pernambuco. Blood sampling for genetic studies will continue, with the development of microsatellite techniques specific for the Araripe Manakin, and detailed intra population analyses that, coupled with the population viability studies mentioned above, will result in a refined strategy for population recovery. Range studies will follow the same systematics of visiting the springs and streams along the slopes of the *Chapada do Araripe*.

**Timeframe:** 2006-2009.

**Responsible:** Aquasis.

**Partners:** Birdlife, IBAMA, Federal University of Pernambuco, Regional University of Cariri, BP Conservation Programme.

**Inputs:** Transportation, field expenses and equipment

**Approx. Budget:** US\$ 18,000 (per year).

**Goal:** Determine (1) total population estimate, and (2) Minimum Viable Population; and refine our knowledge on the actual range of the Manakin, its genetic variability, and bioecological features.

**Analysis:** Low risk activity being conducted since 2001, with growing results. It is important to continue intensive field research for a few more years to have a good series of data to estimate important features of the conservation status (total population, Minimum Viable Population, genetic variability and endogamy, etc.).

**Potential funding sources:** BP Conservation Programme, Ministry of Environment (National Fund for the Environment).

Table 18 – Action Plan 2006-2007. Summary of conservation actions to be conducted in 2006-2007, with existing or potential funding partners inside the cells (the colours represent: green – ongoing project; blue – sent proposals; grey – potential partners).

Conservation Actions	2006												2007													
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
5.2. Conservation status research & monitoring <sup>1</sup>	National Fund for the Environment				BP Conservation Follow Up								National Fund for the Environment / BP (renew)													
5.1. Monitoring reproductive period <sup>1</sup>	Disney Wildlife Fund				BP Conservation Follow Up								Nat. Fund for the Environment / BP (renew)													
Producing an officially recognized Conservation Plan <sup>1</sup>	National Fund for the Environment																									
4.1. Reduce urbanization over moist forests					Municipalities				Municipalities				Municipalities													
3.3. Produce a DVD about Araripe diversity					BP Conservation Follow Up								Ceará Trade Organization													
3.1. Produce a series of printed informative materials					Ceará Trade Organization								Ceará Trade Organization													
1.1. Create a Wildlife Protection Zone in the APA and FLONA					BP Conservation Follow Up								National Fund for the Environment / BP (renew)													
3.2. Exhibitions at the Annual Cultural Festival					BP Conservation Follow Up																					
2.1. Produce a booklet on environmental laws and regulations					Public Ministry																					
2.2. Seminar with enforcement authorities					Public Ministry																					
1.2. Mapping legally established Preservation Areas													National Fund for the Environment (renew)													
1.3. Improve the Private Reserve (RPPN) network													National Fund for the Environment / BP (renew)													

<sup>1</sup> Ongoing activities from 2005.