

WETLANDS, BIODIVERSITY AND DEVELOPMENT

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DEVELOPMENT PRESSURES ON WATERBIRD HABITAT IN HIGH-ANDEAN WETLANDS

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The wetland system of the Cundinamarca-Boyacá plains, located between 2600 and 2800 m above sea level in central Colombia, includes some of the most important habitats for waterfowl in the Northern Andes, and faces the threats inherent to development: pollution, draining and infilling, water loss, and hunting pressures. Of approximately 50,000 ha of wetlands in the Bogotá region (Sabana de Bogotá) at the beginning of the century, fewer than 1500 ha remain today.

Of the 204 recently reported bird species in the Bogotá region, seven species are endemic and 51 migratory. One endemic species, Colombian Grebe *Podiceps andinus*, has probably become extinct during the past 15 years.

The main problem affecting the wetlands in the region is infilling (e.g. with debris) and draining, especially for construction purposes, although wetlands are considered public property and protected areas.

Since the 1950s, when widespread rural violence began in Colombia, massive migrations to the main cities occurred. Being the capital and centrally located, Bogotá has received a large influx of poor migrants in search of cheap housing. Unscrupulous developers take advantage of this situation and fill the wetlands to take possession of the grounds, which are then divided into plots and sold at low prices.

Law 99 of 1993 laid the foundation for the establishment of the Colombian Ministry of the Environment, which has considered sustainable development of wetlands a top priority.

Although the infilling of Bogotá's wetlands has been reduced by measures taken by the authorities, it is still significant. Furthermore, pollution from various industries is still a strong factor of disturbance.

Recommendations are given as to what are considered urgent actions to save the remaining wetlands of Bogotá.

INTRODUCTION

The Cundinamarca-Boyacá Plains comprise an area of approximately 19,000 km², and are located between 2600 and 2800 m above sea level in the eastern Andes of Colombia. The capital city of Santafé de Bogotá, with an estimated population of 6,314,600 (DANE, pers. comm.) lies on the southwestern border of the plains, and covers an area of approximately 1600 km², (DANE, 1990), referred to as the Sabana de Bogotá (Bogotá Plateau).

It has been estimated that at the beginning of this century wetlands covered about 50,000 ha in the Bogotá Plateau. According to RENGIFO (1992), only 1500 ha (3% of the original area) of these swamps remain, along with 4000 ha of lakes.

A previously characteristic ecosystem, the alder swamp forest (characterized by the occurrence of *Alnus jorullensis*), has disappeared (FJELDSA, 1985), and today the floristic composition of these wetlands is dominated by floating and submerged herbaceous vegetation (*Azolla* spp., *Lemna* spp., *Elodea* spp., *Eichhornia* spp.) and emergent reedbeds (*Typha* spp., *Juncus* spp., *Cyperus* spp., *Scirpus* spp.).

AVIFAUNA

In terms of the rarity of their avifauna, the Cundimarca-Boyacá Plains are perhaps the most important habitat in the entire Andes Range (ADAMS *et al.*, 1986). Most of these plains were originally swamps, interrupted by numerous lakes, which were probably an important habitat for local and migratory birds (FJELDSA, 1985).

Very few research projects have been carried in the zone. Every year a bird census is carried out by A.B.O. (a local ornithological association) for the Bogotá area, which has allowed scientists to determine which bird species depend on wetlands.

The 1995 census recorded 204 species belonging to 44 families. Of these species, seven are endemic, 47 are migrants from the north, and four from the south. This confirms the importance of the remaining wetland area. Table 1 shows families and number of species, Table 2 lists endemic species and Table 3 lists migrants.

Four endemic species, (*Rallus semiplumbeus*, *Cistothorus apollinari*, *Coeligena prunelli* and *Odontophorus strophium*) have been listed in the Red Data Book (COLLAR *et al.*, 1992), but to date no measures have been taken for their conservation.

EVOLUTION OF HUMAN IMPACTS

In the early 1930s, it was estimated that the population of Bogotá would only reach 2,000,000 at the end of the century (UDFJC, 1988). However, 1948 marked the beginning of a period of widespread rural violence which still persists. On April 9 of that year, political leader Jorge Eliécer Gaitán was slain in Bogotá, and his death marked the starting point of a nationwide struggle between supporters of the two main political parties, the Liberals and the Conservatives, which took the lives of thousands up to the early 1960s. As a result of the turmoil, massive migration from rural areas to the relatively safe haven of cities began, and the population of Bogotá almost doubled between 1938 and 1951. Since the last part of this undeclared civil war, leftist terrorist groups have benefited from the chaos, and have taken control of extensive urban areas, displacing the local farmers by means of coercion and violence.

Table 1 Families of Birds in the Bogotá Region, Colombia (After HILTY and BROWN, 1986).

Family	Species
PODICIPEDIDAE (Grebes)	2
ARDEIDAE (Herons, Egrets, Bitterns)	9
ANATIDAE (Ducks, Geese)	4
CATHARTIDAE (Vultures)	2
PANDIONIDAE (Ospreys)	1
FALCONIDAE (Falcons)	3
ACCIPITRIDAE (Hawks, Kites)	7
CRACIDAE (Guans)	1
PHASIANIDAE (Bobwhites)	1
RALLIDAE (Rails, Gallinules, Coots)	7
SCOLOPACIDAE (Sandpipers)	7
JACANIDAE (Jacanas)	1
LARIIDAE (Gulls)	2
COLUMBIDAE (Doves & Pigeons)	2
PSITTACIDAE (Parrots)	1
CUCULIDAE (Cuckoos)	5
TYTONIDAE (Barn Owls)	1
STRIGIDAE (Typical Owls)	5
STEATORNITHIDAE (Oilbirds)	1
CAPRIMULGIDAE (Nighthawks)	2
APODIDAE (Swifts)	3
TROCHILIDAE (Hummingbirds)	18
ALCEDINIDAE (Kingfishers)	1
RAMPHASTIDAE (Toucans)	1
PICIDAE (Woodpeckers)	3
FURNARIIDAE (Spinetails)	4
FORMICARIIDAE (Antbirds)	3
RHINOCRYPTIDAE (Tapaculos)	2
COTINGIDAE (Cotingas)	2
TYRANNIDAE (Flycatchers)	26
ALAUDIDAE (Larks)	1
HIRUNDINIDAE (Swallows & Martins)	6
TROGLODYTIDAE (Wrens)	5
MIMIDAE (Mockingbirds)	1
TURDIDAE (Thrushes)	2
VIREONIDAE (Vireos)	1
ICTERIDAE (Blackbirds, Orioles)	8
PARULIDAE (Wood warblers)	12
COEREBOIDAE (Honeycreepers)	8
THRAUPIDAE (Tanagers)	16
CATAMBLYRHYNCHIDAE (Plush-Capped Finches)	1
FRINGILLIDAE (New World Finches & Siskins)	16

Table 2 and LO

Species

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Table 2 Endemic Species in the Bogotá Region, Colombia (After HILTY and BROWN, 1986 and WEGE and LONG, 1995)

Species

Rallus semiplumbeus*

Synallaxis pudica

Cistothorus apollinari*

Conirostrum rufum

Coeligena prunelli*

Pseudacnis hartlaubi

Odontophorus strophium*

* Species in the ICBP/IUCN Red Data Book

Migrants are mostly poor farmers who leave behind their means of income. Upon arrival in Bogotá, they first find a place to settle. Urban "belts" have developed in unclaimed land in the city margins, frequently close to a wetland. When the demand for land surpassed its availability, migrants responded by infilling wetland areas with debris such as used tyres and plastic cans. During the 1960s, developers saw an opportunity in the need for cheap housing and the lack of government interest in wetland conservation. Even today, large urban projects are responsible for wetland infilling, and developers fill and "claim" wetland areas to sell them as parcels.

Although under Colombian law wetlands are considered public property and their destruction is illegal, they have only recently received the attention they deserve, after a shift in public attitude (discussed below).

COLOMBIAN ENVIRONMENTAL LAW AND INSTITUTIONS

Colombia is the second richest country in the world in terms of biodiversity. Although extending over less than 1% of the world's total land area, it possesses about 10% of all the world's species. In terms of birds, it is considered the richest in the world, with about 1700 species, of which about 170 are migrants (HILTY and BROWN, 1986), and at least 66 are endemic (WEGE and LONG, 1995).

Although environmental legislation in Colombia has been considered to be some of the most comprehensive, its implementation has always proven difficult, due to political pressures, lack of effective enforcement authorities, and lack of public awareness about environmental issues (e.g. about the importance of wetlands).

Table 3 Migrant Species of Birds found in the Bogotá Region, Colombia

Northern migrants	Family	Southern migrants	Family	
Hirundo rustica	HIRUNDINIDAE (Swallows & Martins)	Phaeoprogne tapera	HIRUNDINIDAE	
Petrochelidon pyrrhonota		Coccyzus melacoryphus	CUCULIDAE	
Riparia riparia	TURDIDAE (Thrushes)	Tyrannus savana	TYRANNIDAE	
Catharus ustulatus		Empidonomus aurantioatrocristatus		
Vireo olivaceus	VIREONIDAE (Vireos)			
Icterus galbula	ICTERIDAE (Blackbirds, Orioles)			
Dolichonyx oryzivorus	PARULIDAE (Wood warblers)			
Miniotilta varia				
Vermivora peregrina				
Dendroica fusca				
Dendroica striata				
Dendroica petechia				
Wilsonia canadensis				
Seiurus noveboracensis				
Oporornis philladelphia				
Setophaga ruticilla				
Piranga olivaceae	THRAUPIDAE (Tanagers)			
Piranga rubra	ARDEIDAE (Herons, Egrets, Bitterns)			
Butorides virescens		ANATIDAE (Ducks, Geese)		
Anas discors				
Anas clypeata	PANDIONIDAE (Osprey)			
Pandion haliaetus		ACCIPITRIDAE (Hawks, Kites)		
Accipiter striatus				
Ictinia mississippiensis	FALCONIDAE (Falcons)			
Buteo platypterus				
Buteo swainsoni				
Falco columbarius				
Falco peregrinus				
Falco sparverius				
Larus atricilla		LARIIDAE (Gulls)		
Coccyzus erythrophthalmus		CUCULIDAE (Cuckoos)		
Coccyzus americanus				
Chaetura pelagica		APODIDAE (Swifts)		
Porzana carolina	RALLIDAE (Rails, Gallinules, Coots)			
Gallinago gallinago	SCOLOPACIDAE (Sandpipers)			
Tringa solitaria	TYRANNIDAE (Flycatchers)			
Tringa flavipes				
Tringa melanoleuca				
Actitis macularia				
Calidris melanotos				
Contopus virens				
Contopus sordidulus				
Empidonax traillii				
Empidonax virescens				
Tyrannus tyrannus				

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Before 1993, environmental policy and management in Colombia were the responsibility of INDERENA, a government agency with main offices in Bogotá, and regional offices throughout the country. After the 1992 Río Convention, it was decided that efforts would be better directed through a Ministry, and Law 99 of 1993 laid the foundation for the establishment of the National Environmental System, with the Ministry of the Environment as leading authority.

Although the Ministry headquarters are in Bogotá, the Environmental System has 38 regional management authorities, which have autonomy in their ability to implement plans for the sustainable use of the natural resources of each region, based on national policies developed by the Ministry. In addition, cities with a population of over one million have their own Environmental Authority, and the System also includes five research institutes.

Management of wetlands inside the city of Santafé de Bogotá's perimeter is the responsibility of DAMA, the Environmental Administrative Technical Authority. DAMA has recently coordinated an educational campaign to raise public awareness, by issuing booklets and videos, and distributing them to schools.

Because of the efforts of the different parts of the Environmental System, there has been an obvious shift in public attitude toward wetlands, which has manifested itself in demands made by various civic organizations and by the media on the police force to act vigorously to stop further infilling and damage to wetlands, not only in the Bogotá area but at a national level as well.

CONCLUSIONS AND RECOMMENDATIONS

Further efforts must be made by the local environmental authorities in Bogotá and its surroundings to protect and restore the remaining wetland areas. These must include research and enforcement activities. Research is needed on the ecology and biology of the bird species of the Bogotá area, including studies on periods and routes of migration.

Although policies regulating industrial and agricultural wastes, which pollute wetlands, are addressed by Law 99, enforcement is poor and prompt implementation of this legislation is required to avoid additional damage from these factors.

Considering the limited access to funds by both governmental and private Colombian conservation organizations, contact should be established between these organisation and international conservation and funding agencies in order to channel resources for projects in the Bogotá wetlands.

As part of an effort to enhance important sites for local and migratory bird species, resources should be allocated to the creation of artificial wetlands.

There is a need for a national strategy for wetland management in Colombia, and the newly created Ministry of the Environment should begin to develop this action plan.

Educational campaigns should be established at the national level to generate awareness on the importance of conserving and restoring wetlands.

Local Non-Governmental Organisations with an interest in wetland conservation must use the guidelines laid down in the national strategies for the management of natural resources, developed by the Ministry of the Environment, so that management of wetlands is carried out in a sustainable, coordinated manner.

Although the problem of rural violence is complex and unfortunately apparently unresolvable in the near future, the authorities in Bogotá must find ways to provide housing for people displaced from their lands, without further endangering the wetland ecosystem.

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