Information Sheet on Ramsar Wetlands

1. Date this sheet was completed/updated: 27 July 2000

2. Country: Nicaragua

3. Name of wetland: Bahía de Bluefields Wetlands

4. Geographical coordinates:

    11° 55' North latitude
    83º 45' West longitude

5. Altitude: 0–20 metres above sea level

6. Area: 86,500.58 hectares

7. Overview:

The Bahía de Bluefields Wetlands is made up by several ecosystems, from salt to freshwater, distributed around the bay, which in reality is a coastal lagoon. The basin is receptor of the system of Río Escondido, with a total area of 12,700 square kilometres. Contributions of seawater arrive through two entrances: Bluff and Hone Sound. The main plant formations are floodplains, swamp woodlands and mangroves, which provide areas for breeding and dispersion for aquatic and terrestrial fauna. The area has a multi-ethnic population (Creoles, Rama Indians and mainly mestizos). The main natural processes found in the system sustain small-scale fisheries (fish, shrimp, lobsters, oysters and crabs), which are the economic and cultural base of the ethnic groups. The system is reviving after having been devastated by Hurricane Juana in 1988. In general, the area has problems of pollution and population growth, which are affecting its functions and characteristics, although several communities have already organized into a group of communal park rangers, protecting the natural resources of part of the wetland system.

8. Wetland type:

Marine coastal

A. Permanent shallow sea waters: There is a marine area adjacent to the system, a strip approximately 50 kilometres long with a width between 3 to 5 kilometres, with depths of no more than six metres at low tide.

D. Rocky seacoasts: In the marine area of the system, there are a series of small rocky islands.

E. Sandy beaches (*guijarros*): Within the system, mainly in the area north of Bahía de Bluefields there are a series of sand banks.

F. Estuaries: All the area north of the bay is an estuarine delta system formed at the mouth of Río Escondido.

I. Intertidal wooded wetlands: Mangroves grow in all the area surrounding the bay and in the delta formed by the mouth of Río Escondido.

J. Brackish or saltwater coastal lagoons: The body of water known as Bahía de Bluefields is in reality a coastal lagoon of brackish or fresh water depending on the levels of precipitation in the basin.

K. Coastal freshwater lagoons: In the most northern part of the system, there is the lagoon called “Big Lagoon”, which is a coastal freshwater lagoon.

Continental wetlands

L. Permanent inland deltas: In the northern part on the Río Kukra Hill, there is a small inland delta.

M. Permanent rivers/streams: All the area is crossed by a large number of rivers and streams.

O. Permanent freshwater lakes of more than eight hectares: In the most western part of the system, there is a lake four kilometres long formed apparently by a former branch of Río Escondido. This body of water is known as Laguna de Poponjoche.

P. Seasonal and intermittent lakes of more than eight hectares: The largest part of the area of the system is formed by large areas of floodplains, which flood seasonally every year.

Tp Freshwater seasonal/intermittent: Marshes/swamps/ponds (of fewer than eight hectares) are dispersed throughout the system.

Ts. Marshes/swamps/ponds seasonal/intermittent freshwater (of more than eight hectare) a large part of all the system is formed by areas that flood seasonally.

Xf. Wooded freshwater wetlands: These are represented in the area by the so-called *yolillales* (woodlands dominated by the palm *Raphia taedigera*), whose main function is to provide habitats of refuge and corridors for larger fauna.

In decreasing order from the most to least dominant: J, Ts, F, M, Xf, A, I, K, E, O, L, P, Tp, D

9. Ramsar criteria:

Criterion 1: Of the criteria that the Ramsar Convention proposes for recognition of a wetland of international importance, the area meets with criteria 1, 2, 3, 4 and 8.

Criteria that best characterize the site:

Criterion 1. As an especially representative example of a wetland that plays a significant hydrological, biological and ecological role in the natural functioning of an extensive water basin or coastal system.

General criteria based on fauna and flora

Criterion 2: For sustaining a sizable group/unit of species or subspecies of rare, vulnerable or endangered fauna or flora, or for a significant number of specimens of one or more of these species.

Criterion 3: For special value for the maintenance of genetic and ecological diversity of a region because of the quality and uniqueness of its flora and fauna.

Criterion 4: For having a special value as a habitat for plants or animals during a critical period in their life cycle.

Specific criteria based on fish

Criterion 8: Because it is an important source of food for fish, a breeding area, an area for growth and a migratory route on which fish populations depend of the same wetland or other places.

Based on this information, although the wetland has processes that clearly meet criteria 2, 3, 4 and 8. The Ramsar criterion most important for the area is criterion 1: A wetland should be considered of international importance with regard to criterion 1 if owing to its important natural, biological, ecological or hydrological functions, it has a significant value for the sustenance of human populations that depend on it. In this context, this support for human populations would include provision of food, fibre or fuel, maintenance of cultural values, support for food chains, water quality, flood control or climatic stability. The main natural process occurring in the system sustains small-scale fisheries (fish, shrimp, lobsters, oysters, crabs, miscellaneous), which are the economic and cultural base of the ethnic groups. The system is regenerating after having been devastated by Hurricane Juana in 1988, which makes it a special natural laboratory.

The Bahía de Bluefields Wetlands is made up of several ecosystems, ranging from saltwater to freshwater, distributed around the bay, which in reality is a coastal lagoon, which converts into a diversity of representative ecosystems.

10. Map of site included? Please tick yes -or- no

11. Name and address of the compiler of this form:

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12. Justification of the criteria selected under point 9, on previous page:

The Bahía de Bluefields Wetlands is made up of the interrelationship of a series of distinct types of wetlands, ranging from those that are determined by their relationship with fresh water to salt water wetlands. The plant formations that characterize these wetlands are determined spatially by different degrees of existing salinity. The most representative in order of importance of area are the floodplains, which in the area has several forms: wooded freshwater wetlands (*yolillales*) and mangroves. All of them, in turn, are interconnected by an extensive network of rivers and canals. The most significant contributions of freshwater that flow into this system are from Río Escondido and El Kukra. At the same time, there is an influence from the ocean through two passages, Hone Sound and Bluff.

This system of wetlands was totally devastated in 1988 by a class 4 hurricane, Hurricane Joan. After this event, a series of fires occurred that weakened the area's capacity for natural regeneration, which now is all a mosaic of areas with distinct degrees of regeneration depending of the level of use or pressure to which they have been submitted.

Criterion 1: After the hurricane and the fires, a process of regeneration began that is converting the area into a large natural laboratory. Based on studies of this process, a new theory of regeneration of wet forests has been proposed (Vandermeer et al., 1995). Recent studies indicate that in this area, a phenomenon of competition is occurring, with results that contradict some theoretical concepts about the behaviour of the elements of these ecosystems. This is the case of the competition for space identified between mangrove and *yolillo*, which is peculiar given that the literature indicates that *yolillo* does not tolerate high levels of salinity. Nonetheless, in the bay the formation of *yolillo* has displaced formations of mangrove in areas with a strong influence of the sea (Ramos, 1999).

In the area surrounding the system and inside it, there is a multi-ethnic human community that uses the resources and functions provided. Among them the groups best represented in the area is the Rama Indian community, the Creole community and the mestizo community.

In the case of the Rama community, it is now composed of 1120 persons of which 845 live on a small island of 66.4 hectares (Field data from PROCODEFOR, 2000), located in the area south of the bay. The rest of the inhabitants live in dispersed

settlements on the shores of the Dokuno, Kukra and Torzuani rivers, all tributaries of the bay. This community has maintained a relation and ancestral tradition with the environment, plus their own concept of land tenure in a communal regimen, the traditional systems of production of the Ramas combine activities of gathering, hunting, fishing with dispersed farming activities, many of which are integrated into the environment that does not endanger its short-term conservation (Lovelan, 1980 in Bent, 1999).

Practically all productive and cultural activities of this community depend on the fisheries in the bay and the surrounding coastal areas, in addition to the use made of the marsh areas for their activities of hunting, gathering and farming. Here is found the most important settlement of the Creoles in Nicaragua. According to INEC (1997), in the city of Bluefields and the areas surrounding these wetlands live 14,154 Creoles, which means almost 50 per cent of the total number of members of this group existing in Nicaragua. A large part survives from fishing mentioned earlier, and most of the farms in the northern part of the system of wetlands are owned by this community.

The mestizo community is established mostly around the system of wetlands on land slightly higher that normally does not flood. They make use of the resources mainly using them for wood, firewood and meat in the case of hunting. This group is that which probably exerts most pressure on the wetlands through their production practices, because this culture prefers cattle-raising and the production of basic grains, both forms of production implying deforestation of large areas of land and the use of burning to clear the land.

Criterion 2: The other components of the system, primarily the flooded woodlands (*yolillales*) and mangroves, act as biological corridors and refuge habitats, as well as hunting reserves for large game, among them species recognized at the world level as endangered species (*Alouatta palliata, Leopardus pardalis, Panthera onca* and *Tapirus bairdii*).

In the area of water of the bay, the presence of the manatee (*Trichechus manatus*) has been reported, which is recognized as endangered. This species is hunted by the Rama Indian community. The hunting of this animal implies a ritual that reflects a whole series of cultural values of this ethnic group, such as asking for pardon to the animal for having to kill it, to the making of several articles from its skin and bones, among them the making of a whip that earlier was used for whipping those who broke communal laws.

Criterion 3: The diversity of birds in the area is that which is normally expected in a wetland of this type, however, the abundance of these birds is not very high. This phenomenon is thought to be due primarily to the fact that the birds are only recently colonizing these areas. Very probably as a result of the drastic change in the physiognomy of all the area by the hurricane. The flooded woodlands, which formerly dominated the area, were transformed into floodplains, and it is assumed that this change opened new spaces for aquatic birds (Castrillo, 1999).

Criterion 4: Some of these bird species, such as *Mycteria americana,* reproduce in the area, specifically in the Mahogany wetlands (one of the wetlands forming this

system). Colonies of up to 500 nesting pairs have been observed. In addition, the estuaries provide habitat for refuge and growth of shrimp, which is extremely important for the human populations that live from fishing, primarily the Creoles and Rama Indians (Castrillo and Ramos, 1999a).

Criterion 8: Despite the process of regeneration, the system sustains (primarily in the rivers and streams directly associated with the floodplains) large populations of fish during critical periods of their life cycles, chiefly during the growth periods and reproduction. A large number of them remain in these areas from their larval stages until maturity, contributing to maintenance of the regular populations of migratory birds that primarily use the floodplains and estuarine systems (mangroves) as feeding areas. Migrations of fish, which occur during certain periods throughout the system, sustain the small-scale fisheries in the bay and in the neighbouring marine area. Within these fisheries there are also crustaceans and molluscs, which develop in the body of water in the bay. In the case of molluscs, chiefly clams and oysters (Polimesoas and Crassoostreas), and in the case of the crustaceans they are shrimp and two varieties of blue crab (*Callinectes bocourti* and *C. sapidus*). The crabs use the mangroves as an area of refuge and breeding before beginning their migration to the sea.

13. General location:

The Bahía de Bluefields Wetlands is located partly within the Reserva Natural Cerro Silva, located in the Región Autónoma del Atlántico Sur of Nicaragua (RAAS), in the municipio of Bluefields and in the case of part of the Mahogany Wetlands in the municipio of Rama. The RAAS has an area of 4639 square kilometres and borders on the north with the Región Autónoma del Atlántico Norte (RAAN), on the south with the department of Río San Juan, to the west with the departments of Chontales and Matagalpa and to the east with the Caribbean Sea.

The centre of the RAAS is the municipio of Bluefields, the largest city Bluefields, which is located on the western shore of the coastal lagoon called Bahía de Bluefields, with a total of 37,254 inhabitants (National Census, INEC, 1995). This region, like that of the RAAN, has an autonomous government based on Law 28 of the Constitution: Statutes of the Autonomy of the Regions of the Atlantic Coast of Nicaragua, which functions coordinated with the central government.

14. Physical features:

The dynamics of the waters of the wetland system is determined by the flow of fresh water and the action of the tides. The currents and degrees of salinity within the bay are influenced by the dry or rainy seasons and by the level of rainfall.

Bahía or Laguna de Bluefields has an approximate area of 176 square kilometres, with an elongated form with a north-south orientation, with an approximate length of 30 kilometres and varying in width from three to eight kilometres. Isla del Venado limits communication of the water with the open sea through two openings: one to the north, of greater socio-economic importance, located in front of the town of El Bluff and the other to the south, known as the Estrecho de Hone Sound, which is practically closed by the existence of a sand bar. Most of the lagoon is shallow

(southern part and main body), with the deepest parts towards the northern part, which coincides with the channel that joins Río Escondido with the area of El Bluff. On the northern and northwestern shores, there is a system of lowlands and lagoons (Big Lagoon, Found Out Lagoon and Smokey Lane Lagoon) (CIMAB, 1996).

A large number of short streams and two important rivers drain toward the lagoon, which have a strong influence on the pattern of circulation of the lagoon. Río Escondido contributes a large amount of fresh water and suspended sediments (11,641 million cubic metres of sediments annually according to MARENA–DARH, mentioned by CIMAB, 1996) and which drains into the northern part. The other river is the Kukra, which empties into the southern part of the lagoon (CIMAB, 1996).

The coastal area that surrounds the lagoon is usually rather low. The soils are mostly washed red, rich in kaolinite and sesquioxides of iron and aluminium.

The region has a wet tropical climate tropical, with a temperature that varies around an average of 24.7° C for December and 29° C for March. Average annual rainfall is 4481 millimetres, the rainy season extends from May until January, which is the month with the heaviest rainfall, July and the driest, March (Plan de Action de Recursos Hídricos en Nicaragua: Area Focal Cuenca del Río Escondido RAAS-Chontales, 1995).

Water dynamics: The tides in the Bluefields Lagoon have a mixed character with two floods and two ebbs in a 24-hour period and a different behaviour in each tidal cycle. The average range of the tide is between 0.22 and 0.24 metres, which determines a average tidal curve of 4.0 x 10 raised to 7 cubic metres that creates heavy currents, because this amount of water must be exchanged in a period of approximately six hours (CIMAB, 1996).

Water circulation: All of the lower basin that empties into the lagoon is characterized by many rivers, streams and branches, which overflow in the rainy season, with the basin of several of them completely flooded: This is the case of Caño Negro de Mahogany, which forms large areas with shallow-water marshes. These streams are affected by sediments that once deposited produce, together with fallen leaves, material in decomposition (DIPAL, 1999). With regard to temperature, reference is the study made (1998) by DIPAL in Río Mahogany (55 kilometres from the mouth of Río Escondido), in which it is reported that average temperature ranges between 25° and 28.6° C under normal conditions. But in July 1998, temperatures were recorded of 33.9° C because of the drought caused by the El Niño phenomenon, which also affected levels of salinity.

The salinity of Río Escondido reached a maximum in May 1998. It ranged between 10 and 15 per thousand, with an average of 12.5 per thousand up to 6 kilometres upriver from Río Mahogany. In the first semester of 1999 between January and May, after the El Niño effect, salinity was 0 per thousand and only in May was 3 per thousand recorded, which indicates the dominant influence of fresh water on the contribution of sea water (Brenes and Castillo, DIPAL, 1999).

The water in Bluefields Lagoon is characterized by high year-round temperatures and an almost homogeneous distribution in the water column, with average temperatures

ranging between 27.7° and 30.5° C, with an average daily variation of 1° to 3° C (CIMAB, 1996). The flow of currents of the lagoon creates a large shallow area that extends from the southern part in front of the town of Bluefields and another rather deeper north of the city (CIMAB, 1996). In the first (southern part), water circulation is reduced with tides and wind playing a determinant role. In the second (northern part), there is greater exchange of water from the lagoon with the open sea, which contributes to the increase in the gravitational circulation in this area (CIMAB, 1996).

In both areas, the tides influence circulation of the water substantially, creating short-term and during part of each phase of tide, a circulation of discharge with net flow out of the lagoon during the ebb tide, and an accumulating circulation with net inward flow towards the lagoon during the flood tide (CIMAB, 1996).

During the dry period, in the central and southern parts of the lagoon, circulation is basically determined by the action of the tides and the wind transmitted to the surface of the column of water that favours mechanisms of mixing, making practically the whole column of water very homogeneous with a dominance of high temperatures and total absence of stratification. Salinity during this period fluctuates between 25 and 35 per thousand (CIMAB, 1996). During the rainy season, large amounts of fresh water from Río Escondido determine a gravitational type of circulation with net transfer towards the south. In this period, the salinity of the lagoon deceases significantly (10‰ to 1‰) chiefly in the main part and southern part, to the point of presenting characteristics similar to those of the river. In the northern part, owing to the greater influence of seawater, the horizontal gradients of density are increased, with a tendency of dominance of a classical estuarine circulation, which differentiates this area from the rest of the lagoon (CIMAB, 1996). In accordance with the morphometric and geomorphologic characteristics described for systems similar to this, Bahía de Bluefields can be considered a typical coastal lagoon (Pritchart, 1952 and Dyer, 1973 in CIMAB, 1996).

15. Hydrological values:

The climate of the town of Bluefields is determined primarily by a high level of rainfall, which is caused by the topographic characteristics of the area.

The Chontales Mountains form the backbone of the southern third of Nicaragua. The trade winds carrying humidity are forced to rise upon reaching these mountains, which produces discharge of excess humidity on the Caribbean Coast, of which the Municipio of Bluefields forms part (Vandermeer et al., 1994). These high levels of precipitation supply the basin of the two main rivers that empty into Bluefields Lagoon: El Escondido, which is formed by the joining of the Siquia and Mico rivers with a length of approximately 70 kilometres and a varying width of 250 and 1000 metres, and the Kukra with a length of approximately of 75 kilometres and an average width of 50 metres.

The topography of the area around the lagoon is relatively flat with the average elevations above sea level range between 0 and 20 metres. In the slightly higher parts, there are human settlements. The highest part of the system is occupied by the city of Bluefields.

During the rainy season, which lasts nine months, excess precipitation causes the rivers to overflow, flooding the lower parts, which function as a sponge absorbing the excess water and preventing flooding of the high parts in the system and even decreasing the possibility of flooding up stream. In addition to the function of flood control, they also collect sediments that come from the upper basins and are washed down by the currents. There are no data on the rate of sediment retention by these wetlands but there is data on the amounts that enter the lagoon. According to studies carried out by the Ministry for Construction and Transportation in the bay in 1995, Río Escondido carried 5 million tons of suspended material, with a daily average of 1.4 to 22.3 kilos/cubic metres. (Report on Dredging in the Bahía in Commission Nacional de los Recursos Hídricos, 1995).

Another function played by this system of wetlands is the recharging of aquifers, a very important function for the human inhabitants in the area and very special for the city of Bluefields which does not have a potable water supply system (aqueducts). The source of its water is wells dug by the inhabitants in their patios.

These wetlands are also very important for maintenance of the food chains, both internal as well as external of the system, for example these sites provide water and food to groups of Guatemalan white-tailed deer (*Odocoileus virginianus*) and white-lipped peccary (*chancho de monte*) (*Tayassu pecari*) in the dry season (summer), which are the main food of the jaguar (*Panthera onca*). These species have a very wide range that goes beyond the area of the wetlands. In the case of the aquatic species, the bodies of water maintain significant numbers of fish, for which several rivers provide food for other local or migratory fish (for example *Tarpon atlanticus*), and at the same time sustain groups of aquatic birds.

16. Ecological features:

The main plant formations that form the system of wetlands

Floodplains (herbaceous marshes): These are areas that remain seasonally or permanently flooded, dominated by herbaceous vegetation, chiefly Gramineae and Cyperaceae and in some cases with the dispersed presence of trees or palms. The type of plant association depends on the level of salinity, soil type and degree of flooding, thus there are floodplains associated with *papta* (*Acoeloraphe wrightii*) in places with sandy soils and influenced by salinity, floodplains associated with *yolillo* (*Raphia taedigera*), *sangregrado* (*Pterocarpus officinalis*) and *poponjoche* (*Pachira acuatica*) primarily in areas flooded with fresh water and on clay soils, or floodplains that remain flooded year round and are deeper than the others because vegetation is only herbaceous.

Mangroves: Flooded areas subject to exchange of tides are dominated by species of mangrove. In this area, the plant association is comprised of four species, red mangrove (*Rhizophora mangle*), the most abundant, white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia germinans*) and, in some areas, piñuelo mangrove (*Pelliciera rhizophorae*). But despite that most of the mangroves are located in areas influenced by the tide, in Río Caño Negro, a tributary of the Río Kukra, there is an area of mangrove bordering a small lagoon that forms at the end of the river. This has an association with *icaco* (*Chrisobalanus icaco*).

Marsh woodlands (*yolillales*): These woodlands are mixed and are characterized by the abundant presence of *yolillo* (*Raphia taedigera*), the main association is created with *sangregrado* (*Pterocarpus officinalis*) and there are other tree species such as *cedro macho* (*Carapa guianensis*), which can tolerate high humidity. They are important because they are a transition stage between the marshes and non-marsh areas and function as wildlife refuges and corridors and supply trees of commercial value and firewood for the local inhabitants.

Gallery forests: This is vegetation that grows on the edges of the rivers. Because of the permanent proximity to water and because they are areas that have a slight elevation and do not normally flood, these areas are different, characterized in most places by a plant association made up of three canopy levels: the upper canopy dominated by *guácimo colorado* (*Luehea semannii*), the intermediate canopy dominated by *sotacaballo* (*Zigia longifolia*) and *guabo* (*Inga* sp.) and the lower canopy dominated by herbaceous vegetation. In several areas, the vegetation of the gallery woodlands is dominated by bamboo (*Bambusa* sp.). These gallery woodlands are very important for aquatic birds because they are used by them as areas for resting and, for some, as breeding sites as is the case of the stork (*cigüeñon*) (*Mycteria americana*), which nests along the banks of Río Mahogany.

17. Noteworthy flora:

Currently, Nicaragua does not have a record of how many plant species are endangered. It is acknowledged that the process is occurring in Nicaragua because of the reduction of the nature areas caused by the advance of the agricultural frontier and the levels of degradation to which ecosystems are submitted because of human activity.

The Caribbean Coast (Atlantic) of Nicaragua, because of socio-political events in Nicaragua, still has large natural areas, with Bahía de Bluefields Wetlands being a remnant of these sites. It is now beginning to have problems of degradation from human pressure; for example transformation of wet woodlands, primarily yolillo, into floodplains because of fires started mostly by farming, which have increased in frequency proportionally to the increase of human settlements.

Another phenomenon that has occurred in the area, but is caused by natural factors, is the competition between the mangroves and *yolillo* during the regeneration process. This has gained the most ground. This is significant because the forests of *yolillo*, those that normally establish in areas with a supply of fresh water, have grown in areas influenced by seawater, reserved, according to the literature, for mangrove forests (Ramos, 1999).

In addition, the position of Nicaragua marks this overlapping area of the two blocks of vegetation that move with the American continent. This phenomenon makes the appearance of endemic marine flora very rare in the lowlands. The only case possible, but still not confirmed, is formation of mangrove in the lagoon without the direct influence of tides formed at the headwaters of Río Caño Negro, a tributary of Río Kukra. The main species of flora in the area are those associated with the main plant formations present, which were already mentioned under the previous topic.

18. Outstanding fauna:

Among the birds recorded in the studies carried out is the presence of species that are on the official list of Nicaragua as vulnerable or endangered species according to CITES. Among the most important are the following. In the CITES Appendix I as Endangered: jabiru (*pancho galán*) (*Jabiru mycteria*). In CITES Appendix II as endangered: roadside hawk (*gavilán de las rondas*) (*Buteo magnirostris*), *gavilán gris* (*Buteo nitidus*), *Asturina nitida*, *gavilán de Swainson* (*Buteo swainsonii*), common black hawk (*gavilán cangrejero*) (*Buteogallus anthracinus*), semiplumbeous hawk (*gavilán semiplomizo*) (*Leucopternis semiplumbea*), crested caracara (*caracara crestado*) (*Polyborus plancus*), bat falcon (*halcón murcielaguero*) (*Falco rufigularis*), Aztec parakeet (*perico frente oliva*) (*Aratinga nana*), spectacled owl (*búho de anteojos*) (*Pulsatrix perspicillata*) and rufous-tailed hummingbird (*colibrí rabirrufo*) (*Amazilia tzacatl*). In Appendix III, as protected by other countries: Muscovy duck (*pato real*) (*Cairina moschata*), black-bellied whistling duck (*piche común*) (*Dendrocygna autumnalis*) and great curassow (*pavón grande*) (*Crax rubra*). According to information from the rural communities, the abundance of this species has dropped considerably in these past few years because its meat is very much appreciated for human consumption.

Although it is true that there are no data for all the system of wetlands on population sizes or relative abundance, there is in the area species that make this area important just because of their presence. In fact, just the fact of recording them is important information. This is the case of the birds of prey (Accipitridae and Falconidae), which do not live in colonies, making the number of specimens in the area small. Jabiru (*pancho galán*) (*Jabiru mycteria*) is a species that is considered endangered.

It is acknowledged that the area is important for maintenance of biodiversity because these ecosystems have been converted into an area of refuge and dispersion for several groups of animals. In the case of mammals, the most important species, listed on the official repertory for Nicaragua, are listed in CITES Appendix I species endangered: mantled howler (*mono congo*) (*Alouatta palliata*), ocelot (*tigrillo*) (*Leopardus pardalis*), jaguar (*Panthera onca*), American manatee (*Trichechus manatus*) and Baird's tapir (*danto*) (*Tapirus bairdii*). CITES Appendix II endangered species: white-faced capuchin (*mono cara blanca*) (*Cebus capucinus*) and white-lipped peccary (*chancho de monte*) (*Tayassu pecari*). CITES Appendix III protected species by other countries: spotted paca (*guardatinaja*) (*Agouti paca*).

One species that is still not endangered, but which is very important for human consumption is the Guatemalan white-tailed deer (*Odocoileus virginianus*), which is very abundant in the area, but there is a tendency for the population to decrease if steps are not taken to regulate hunting.

Among the reptiles, the most important species is the brown caiman (*cuajipal*) (*Caiman crocodrilus chiapasius*). This species is listed in CITES Appendix II as endangered. The population of the animal has historically been pressured in the area by hunting for trade in its skin. In addition to this, a decrease in habitat limits the natural reproductive capacity of the species (Revista Humedales of RAAS, #2, 2000).

19. Social and cultural values:

A peculiarity of the RAAS with regard to the rest of the country is its ethnic composition. The population is divided into Creoles, Garifunas, Miskitos, Rama, Sumu-Ulwas and mestizos. In general, most of the population is bilingual: speaking Creole English and Spanish. This can help to understand that life in this region is organized based on substantially different cosmic visions with regard to those existing in the rest of the country (Pacífico and Centro). This consideration is important for understanding the relationship of these human groups to the resources (DANIDA, 1996).

In the case of the wetlands related to Bahía de Bluefields, the system maintains life of two important ethnic groups (Creole and Rama). Of these, the most attached to the system both cultural and productively is the Rama indigenous community, because practically all its life is based on the use of local resources.

For the Ramas, there are several types of forests, depending on the ecological area or drainage area in which the forest is located. There is beach forest (intertidal areas), mangroves, palm groves (*yolillales*), flooded woodlands (*yolillales* with associated trees) and the tropical wet forest.

The beach forests and mangroves are used for hunting small animals, including deer and squirrel in addition to gathering coconuts and fishing. In the palms, there is a dozen species of these plants used for construction of roofs for houses, arrows, harpoons, paddles (*canaletes*) and furniture. In addition to medicinal plants with which, according to them, they cure headaches, snakebites and toothaches among other affections. In these forests, during the winter several species of animals are hunted, such as wild boars, deer and jaguar. In the forest, there are areas of secondary forest where the Ramas cultivate rice, beans and maize and exploit wood from several trees for their dwellings (Bent, 1999).

Most of what is gathered or produced in the wetlands of the system is for subsistence, although in the case of fishing, since 1930 most of the catch is sold to firms dealing in seafood (before 1980 international firms and after that by Nicaraguan firms with Nicaraguan capital). In general, the main economic activity in the area is small-scale and industrial fishing in the bay and in the surrounding marine areas. Extraction is oriented to the fishing of lobster, shrimp and other types of fish. However, all these resources are subject to heavy pressure from fishing. For this reason, it is assumed that one of the pillars of the regional economy is seriously threatened (Ryan, J: WANI, no. 16 1995 in DANIDA, 1996).

20. Land tenure/ownership of:

The land in the wetland is mostly the property of the Creole and Rama ethnic groups.

The Rama have developed their own concept of land tenure over time. Given that in the organizational structure of their community, the family is the main basis, and they have maintained a deep-rooted practice of endogamy, the form of land use is collective by the several clans. The Rama community has submitted a claim for

legalization of their land. The claim covers land beyond the wetlands within the system of wetlands, their land covers all the southern part of the bay including Río Kukra, Torsuani, Dockuno and the southern part of Isla del Venado.

In the case of the Creoles, their land is private and has been passed on through inheritance or sale among them. These lands cover the northern part, including the northern part of Isla del Venado and are being extended farther north outside the limits of the system of wetlands. This community also has a claim for legalization of communal land.

For both ethnic groups, colonization by mestizos has had heavy repercussions, chiefly on the land that does not flood. In the case of the wetlands, the parts subject to complete flooding in winter are not under heavy pressure from invasion or use. In contrast, it is on the edges of the rivers where the largest number of settlements have been observed, because these strips of land are not normally flooded and are more fertile in comparison with the rest of the areas. The largest cases of invasion of mestizo communities have occurred on the bank of Río Escondido.

21. Current land use:

Because they are lowlands subject to a regime of periodic flooding, the population is concentrated on the hills that rise in the wetlands, and on the banks of the rivers, which are areas of low elevation and more stable.

The sector with the largest rural population in the system is on the edge of Río Escondido. In this sector are settled the Creoles and mestizos. The main economic activity is production of basic grains for subsistence. In general, yields are very low because these soils are not suitable for farming. The most frequent crops are rice, beans and maize. They also produce bananas and tubers. In some areas, oranges, charcoal and part of the production of basic grains are sold (Study of the communities of the municipio of Bluefields and the sub-municipio of Kukra Hill). Several farms have pastures, but livestock raising is primarily subsistence.

The largest concentration of Creoles is found on the Caño Negro de Bluefields. In this sector, there is slightly more intensive livestock raising than in the rest of the areas, with pastures on the tops of hills that rise above the wetland and in small areas *suampo*[1] around them, which are used during the summer.

The areas that flood, composed of mangroves, forests of *yolillo* and floodplains are in their natural state and are used for extraction of plant products such as firewood, timber, palms for roofs, and for fishing and hunting (deer, *chancho de monte*, *guardatinaja*, among others). Several sectors are occupied for growing rice, which is transitory and for subsistence.

In the southern part, most of the areas are in a natural state dominated primarily by flooded woodlands of *yolillo* and floodplains. Much of this area is Rama communal land. The indigenous Rama population lives chiefly on Rama Cay, an island opposite the mouth of the Kukra River, and occupy it during the summer to grow subsistence crops. They harvest and then abandon the plot. Forest products are extracted for

[1] Term used locally to refer to areas subject to flooding, such as foodplains and flooded woodlands of *yolillo*.

food, medicines and construction. This is because the main productive activity of the Ramas is fishing, which takes place in the bay.

The greatest concentration of mestizos in the southern part is along the shores of the Kukra River, which is the most heavily settled in this area of the bay, although distribution of the population is concentrated more towards the limits of the wetland in search of higher ground. These populations also grow crops of basic grains primarily for subsistence, bananas and roots and all the productive activities described for the northern part. The natural areas are used primarily for hunting and extraction of firewood and timber.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects:

In 1988, both the wetlands and the surrounding areas suffered from the force of Hurricane Joan. Later that same year, a series of fires occurred that devastated it. In 1990 at the end of the war (1980–1990), repopulation of the area began with former inhabitants and new colonizers (advance of the farming frontier).

In addition to what was mentioned previously, Bahía de Bluefields and its system of wetlands is the final recipient of all the sediments from the Río Escondido basin formed by the Rama, Mico, Siquia, Wapi, Kama, Mahogany and Kukra rivers. This basin has an area of approximately 12,700 square kilometres and is affected by deforestation (erosion), mining (heavy metals and cyanide), tanneries because of the waste from tanning hides (salts and chrome), the dairy industry because of the waste that is dumped into the ground and bodies of water and sewage water from the towns, most of which do not have sewage treatment systems (Commission Nacional de Recursos Hídricos Informe del Area Focal–Cuenca del Río Escondido, 1996).

In the middle and lower parts of the basin, several producers use insecticides (such as Butox, Decis and Nuvan), which affect fishing and as a result all the fauna.

In the sector of the city of Bluefields, according to the database of the Direction General del Ambiente (DGA) since August 1995 there are 15 sources of pollution that have affected the bay: nine food industries, one agro-industry, three refineries, one hospital and a municipal rubbish tip (Comisión Nacional de Recursos Hídricos, Informe del Area Focal–Cuenca del Río Escondido, 1996).

As for the landscape, in the bay the most notable changes are the drastic decrease of areas of mangrove in contrast to the increase in areas of flooded woodland (*yolillal*) and transformation of these into floodplains because of repeated fires (because of natural and human causes), these variations are more evident in the areas with greatest rural population (northern part of the bay), in the case of areas belonging to the Rama indigenous community this type of change is less drastic (southern part).

The current main potential adverse factor is the increase in settlements from the centre of Nicaragua (advance of the agricultural frontier) and with it, more frequent fires, the process of sedimentation and pollution from the Río Escondido basin and sources of pollution located in the bay itself.

23. Conservation measures taken:

In June 1992, by decree 38-92 of the Office of the President declared the area affected by the power of Hurricane Joan southeast of Bluefields in the category of Reserva Forestal Cerro Silva. This was updated on 18 June 1999 by decree 66-99, now with the category of "Reserva Natural Cerro Silva". The Bahía de Bluefields wetland system is partially located in this reserve.

24. Conservation measures proposed but not yet implemented:

In 1996, the Proyecto de Conservación and Desarrollo Forestal (PROCODEFOR) was established in the area with financing from the government of the Netherlands. Among the activities being carried out by the project is preparation of a management plan for the Mahogany Wetlands, the system farthest from the bay toward the west. The methodology used is innovative and seeks to prepare a plan guaranteeing full participation of local inhabitants and users. It is now in the final phase of preparation, which consists in discussion among the authorities with jurisdiction over the area and the communities for agreeing on regulated use and management of the area and reaching a consensus on a form of administration for the area. The same process has permitted formation of a group of voluntary park guards, all members of the local communities in the area. This group now has the support of PROCODEFOR and of the regional office of the Ministry for the Environment and Natural Resources (MARENA).

Action plan for Bahía de Bluefields

A process has begun for preparing an action plan for the system of wetlands associated with the bay, prepared by the following agencies: the City of Bluefields, the Ministry for the Environment and Natural Resources (MARENA), PROCODEFOR, universities in the region and the RAAN-ASDI-RAAS project. Preparation of this plan is part of the institutional strategy for management of coasts and tides presented in 1998 by the Unit for Coastal Areas and Wetlands of MARENA. Until now, work has been carried out on the technical construction of a proposal for zoning and critical areas. It is expected that a draft plan will be presented at the latest by October 2000.

25. Current scientific research and facilities:

There are two universities in the area that recently opened (six years ago): Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense (URACCAN) and the Bluefields Indian and Caribbean University (BICU) which grant degrees in forestry engineering and sociology, in the case of the first, and marine biology and ecology, in the case of the second. Both universities have an initial infrastructure for carrying out research. Currently, URACCAN is carrying out a study on the social dynamics of the human populations settled around the Bahía de Bluefields system of wetlands and is creating the first Geographical Information System (GIS) for the area through an agreement between this university, the regional government and the Centro de Investigaciones de la Costa Atlántica (CIDCA), with

the Proyecto de Conservación and Desarrollo Forestal (PROCODEFOR) acting as facilitator of the process and co-signatory of the agreement.

That university is carrying out work on establishment of mangroves on artificial islands, constructed using waste produced from dredging of a canal in Bahía de Bluefields. The information and analysis from these studies can serve for the preparation of a plan for restoration of mangroves in the system.

In the case of BICU, its orientation is toward research on the aquatic resources. Until now, it has been carrying out studies of fish populations and parasitology in fish, among others, together with the project for the promotion of small-scale fishing (DIPAL). It is building a laboratory to facilitate research on aquatic resources. In studies on aquatic resources and water dynamics, the Proyecto DIPAL has been carrying out a series of studies on the water in the bay and in the Mahogany Wetlands.

For infrastructure, PROCODEFOR has a sub-office with basic conditions for accommodations in the area of the Mahogany Wetlands. Currently, the project is considering the possibility of an agreement with the Universidad Centroamericana (UCA) to establish a biological station in this area. Likewise, the project is preparing the participatory management plan for the Mahogany Wetlands and together with the Universidad Centroamericana has carried out basic studies of the large fauna (mammals) of interest for hunting, aquatic birds and *cuajipales* in Mahogany, also studies throughout the area of jurisdiction of PROCODEFOR on *cuajipales* and birds, which includes the Bahía de Bluefields Wetlands.

Likewise, the Corredor Biológico del Atlántico (CBA) plans, in support for implementation of the management plan for the Reserva Natural Cerro Silva, to create infrastructure and necessary equipment.

26. Current conservation education:

Environmental education activities related to the wetlands in the area do not exist. The only effort in this sense is the work carried out so far by PROCODEFOR for approval by the Ministry for Education of a manual for environmental education for rural schools in the municipio of Bluefields.

27. Current recreation and tourism:

In general, the area receives very little pressure from tourism for lack of access by land (highways). The only means of access to the city of Bluefields is by water or air. Likewise, this is an area that in the 1980s was isolated by the war affecting Nicaragua, which kept it lightly populated and without the development of infrastructure. In 1990 with the change of government and the cease-fire, the area began to open to tourism, both national and international, and development of hotel infrastructure began, which until now has offered only basic accommodations.

28. Jurisdiction:

The Bahía de Bluefields Wetlands is located in the municipio of Bluefields and partly in the municipio of El Rama in the Región Autónoma Atlántico Sur (RAAS) of Nicaragua, within the Reserva Natural Cerro Silva. Management of this area corresponds administratively to the City of Bluefields, City of El Rama and the regional government of the RAAS, based on the law of autonomy of the constitution of Nicaragua (Law No. 28), under the supervision of the authority for management of protected areas, the Ministry for the Environment and Natural Resources through SINAP (Sistema Nacional de Areas Protegidas).

29. Management authority:

City of Bluefields, City of the Rama, MARENA and regional government through RAAS, with coordination among city governments through the Oficina de Medio Ambiente, with advice and technical coordination of the Proyecto de Conservación y Desarrollo Forestal (PROCODEFOR), which are located in the city of Bluefields, in the Municipio of Bluefields, except for the City of El Rama, located in the city of Rama.

30. References:

Annex 1
Plants identified during preparation of a herbarium for the Mahogany Wetlands
(Castrillo, Ramos, PROCODEFOR,1998)

Scientific name	Family
1. Annona glabra	Annonaceae
2. Ageratina pichinchensis	Asteraceae
3. Alibertia edulis	Rubiaceae
4. Allandra cathartica	Apocynaceae
5. Amanoa guianensis	Euphorbiaceae
6. Andropogon bicornis	Poaceae
7. Anthurium bakeri	Araceae
8. Ardisia guianensis	Myrsinaceae
9. Blechnum serrulatum	Blechnaceae
10. Brachiaria mollis	Poaceae
11. Brassavola nodosa	Orchidaceae
12. Casearia sylvestris	Flacourtiaceae
13. Catasetum maculatum	Orchidaceae
14. Ceratopteris peteridoides	Parkeriaceae
15. Cissus biformifolia	Vitaceae
16. Cissus rhombifolia	Vitaceae
17. Citharexylum caudatum	Verbenaceae
18. Coccoloba tuerckheimii	Polygonaceae
19. Conostegia xalapensis	Melastomataceae
20. Costus woodsonii	Costaceae
21. Cyperus odoratus	Cyperaceae
22. Chrysophyllum caimito	Sapotaceae
23. Davilla nitida	Dilleniaceae
24. Desmodium sp.	Fabaceae

25. *Dieffenbachia aurantiaca*	Araceae
26. *Dioscorea sp.*	Dioscoreaceae
27. *Echinochloa polystachya*	Poaceae
28. *Echiornia sp.*	Pontederiaceae
29. *Epiphylum phyllanthus*	Cactaceae
30. *Eugenia acapulcensis*	Myrtaceae
31. *Eugenia salamensis*	Myrtaceae
32. *Ficus obtusifolia*	Moraceae
33. Garcinia intermedia	Clusiaceae
34. Genipa americana	Rubiaceae
35. Geonoma procumbens	Arecaceae
36. Heliconia hirsuta var. Rubiflora	Heliconiaceae
37. *Herrania purpurea*	Sterculiaceae
38. *Heteropteris laurifolia*	Malpighiaceae
39. *Hibiscus furcellatus*	Malvaceae
40. *Hibiscus mutabilis*	Malvaceae
41. *Hibiscus tiliaceus*	Malvaceae
42. *Homalium racemosum*	Flacourtiaceae
43. *Hymenachne amplexicaule*	Poaceae
44. *Inga spuria*	Mimosaceae
45. *Lacistema agregatum*	Flacourtiaceae
46. Laguncularia racemosa	Combretaceae
47. Lasiasis procerrima	Poaceae
48. Lindakeria laurina	Flacourtiaceae
49. Ludwigia decurrens	Onagraceae
50. *Ludwigia* sp.	Onagraceae
51. Luehea semannii	Tiliaceae
52. Lycopodium cernuum	Lycopodiaceae
53. Machaonia martinicensis	Rubiaceae
54. Malouetia guatemalensis	Apocynaceae
55. Maranthes panamensis	Chrysobalanaceae
56. Mavea occidentalis	Euphorbiaceae
57. Maxilliaria uncata	Orchidaceae
58. Miconia longifolia	Melastomataceae
59. Miconia serrulata	Melastomataceae
60. Mikania micrantha	Asteraceae
61. Morinda citrifolia	Rubiaceae
62. Myrica cerifera	Myricaceae
63. Neea acuminatissima	Nyctaginaceae
64. *Neea* sp.	Nyctaginaceae
65. Ocotea cernua	Lauraceae
66. Odontadenia macrantha	Apocynaceae
67. Oryctanthus cordifolius	Loranthaceae
68. Oryza latifolia	Poaceae
69. Pachira aquatica	Bombacaceae
70. Palicourea angustifolia	Rubiaceae
71. Palicourea galeottiana	Rubiaceae

72. Panicum laxum	Poaceae
73. Paragonia pyramidata	Bignoniaceae
74. Paspalum paniculatum	Poaceae
75. Paullina pinnata	Sapindaceae
76. Pelliciera rhizophorae	Pellicieraceae
77. Phoranodendron angustifolium	Viscaceae
78. Phthirusa pyrifolia	Loranthaceae
79. Polygonum hydropiperoides	Polygonaceae
80. Polygonum punctatum	Polygonaceae
81. Polygonum sp.	Polygonaceae
82. Pontederia rotundifolia	Pontederiaceae
83. Posoqueria latifolia	Rubiaceae
84. Prestonia portobalensis	Apocynaceae
85. Psychotria grandis	Rubiaceae
86. Psychotria sp.	Rubiaceae
87. Pterocarpus officinale	Fabaceae
88. Rhizophora mangle	Rhizophoraceae
89. Sabicea villosa	Rubiaceae
90. Simira maxonii	Rubiaceae
91. Smilax domingensis	Smilacaceae
92. Sourobea silgii	Macgraviaceae
93. Stemmadenia donnell-smithii	Apocynaceae
94. *Syngonium* sp.	Araceae
95. *Tabebuia* rosea	Bignoniaceae
96. Tabernaemontana chrysocarpa	Apocynaceae
97. Thrichilia Americana	Meliaceae
98. Thrichilia martiniana	Meliaceae
99. Tillandsia bulbosa	Bromeliaceae
100. Vitex kuylenii	Verbenaceae
101. Vochysia guatemalensis	Vochysiaceae
102. Zigia longifolium	Mimosaceae

Annex 2
Photos of the Bahía de Bluefields Wetlands

Note: See document printed for the Ramsar sheet.

Annex 3

Species recorded in the Mahogany Wetlands (Ramos and Izaba, PROCODEFOR, 1998)

Scientific name	Season	Category	Status
1. Ajaija ajaja	Summer/winter	Resident	
2. Amazilia tzacatl	Summer	Resident	Endangered
3. Anhinga anhinga	Summer/winter	Resident	
4. Aramides cajanea	Summer	Resident	
5. Aratinga nana	Summer/winter	Resident	Endangered
6. Bolborhinchus lineola	Winter	Resident	Endangered
7. Botaurus pinnatus	Summer	Resident	
8. Bulbucus ibis	Summer	Resident	
9. Buteo magnirostris	Summer/winter	Resident	Endangered
10. Buteo nitidus	Winter	Resident	Endangered
11. Buteo swainsoni	Summer	Migratory	Endangered
12. Buteogallus anthracimus	Summer	Resident	Endangered
13. Butorides s. virescens	Winter	Resident	
14. Cairina moschata	Summer/winter	Resident	Protected by other countries
15. Casmerodius albus	Summer/winter	Resident	
16. Cathartes aura	Summer/winter	Resident	
17. Ceryle alcyon	Summer/winter	Resident	
18. Ceryle torquata	Summer/winter	Resident	
19. Chloroceryle aenea	Summer	Resident	
20. Chloroceryle amazona	Summer/winter	Resident	
21. Chloroceryle americana	Summer	Resident	
22. Chloroceryle inda	Summer	Resident	
23. Cochlearius cochlearius	Summer	Resident	
24. Coereba flaveola	Winter	Resident	
25. Columba nigrirostris	Winter	Resident	
26. Coragyps atratus	Summer/winter	Resident	
27. Coryphotricus albovittatus	Winter	Resident	
28. Crax rubra	Summer	Resident	Protected in other countries
29. Crotophaga sulcirostris	Summer/winter	Resident	
30. Cyanocorax morio	Winter	Resident	
31. Dacnis venusta	Summer	Resident	
32. Dendrocinela fuliginosa	Summer	Resident	
33. Dendrocygna autumnalis	Summer/winter	Resident	Protected in other countries
34. Doryfera ludoviciae	Summer	Resident	
35. Egretta caerulea	Summer/winter	Resident	
36. Egretta thula	Summer/winter	Resident	
37. Egretta tricolor	Summer	Resident	
38. Falco rufigularis	Summer	Resident	Endangered

39. Geothypis semiflava	Winter	Resident	
40. Heliornis fulica	Summer/winter	Resident	
41. Icterus g. galbula	Winter	Resident	
42. Icterus mesomela	Summer	Resident	
43. Jabiru mycteria	Summer	Resident	Vulnerable
44. Jacana spinosa	Summer/winter	Resident	
45. Laterallus albigularis	Summer	Resident	
46. Laterallus exilis	Summer	Resident	
47. Leucopternis semiplumbea	Winter	Resident	
48. Megarhinchus pitangua	Winter	Resident	
49. Melanerpes formicivorus	Winter	Resident	
50. Myarchus crinitus	Summer	Resident	
51. Myarchus tuberculifer	Summer/winter	Resident	
52. Mycteria americana	Summer/winter	Resident	
53. Myiozetetes granadensis	Winter	Resident	
54. Notiochelidon cyanoleuca	Summer/winter	Migratory	
55. Nyctanassa violacea	Summer	Resident	
56. Nyctibius griseus	Winter	Resident	
57. Nycticorax nycticorax	Summer	Resident	
58. Ortalis vetula	Winter	Resident	
59. Phalaclocorax brasilianus	Summer/winter	Resident	
60. Piaya cayana	Summer/winter	Resident	
61. Pitangus sulphuratus	Summer/winter	Resident	
62. Polyborus plancus	Winter	Resident	Endangered
63. Porphirula martinica	Winter	Resident	
64. Protonotaria citrea	Winter	Migratory	
65. Pteroglossus frantzii	Winter	Resident	
66. Pulsatrix perspicillata	Summer	Resident	Endangered
67. Ramphocelus passerinii	Summer/winter	Resident	
68. Trigrisoma lineatum	Summer	Resident	
69. Trigrisoma mexicanum	Summer/winter	Resident	
70. Trogon melanocephalus	Summer/winter	Resident	
71. Tyrannus forficatus	Summer	Resident	
72. Tyrannus tyrannus	Winter	Resident	
73. Tyrannus melancholicus	Winter	Resident	