

Information sheet on Ramsar Wetlands

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1. **Date this sheet was complete/updated:** November, 1997
2. **Country:** Brazil
3. **Name of wetland:** Mamirauá Reserve of Sustainable Development
4. **Geographical coordinates:** 1°25' – 3°07'S; 64°40' - 67°25'W.
5. **Altitude:** Low land, without elevations, at an average 80 meters above sea level
6. **Area:** 1,124,000 hectares
7. **Overview:**
White water “várzea” (flood plain), with several lakes, joined seasonally by natural drainage canals.
8. **Wetland Type:** M, 0, P, R, Tp, Ts, Xf
9. **Ramsar Criteria:** 1a, 2a, 2c, 2d, 3a, 3b, 4a, 4b
10. **Map of site included?** Yes (Annex I)11.
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12. **Justification of the criteria selected under point 9, on previous page:**

Criterion 1a: Mamirauá constitutes the largest Brazilian protected area (1,124,000 ha) and one of the largest in the world encompassing flooded forests (várzeas). Várzeas are present along white-water rivers in the Amazon and correspond to approximately 4% of its total area. Mamirauá presents a high degree of biodiversity and undergoes an annual water level variation between 10 and 12 meters.

Criterion 2a: Mamirauá is home to threatened wildlife such as the black cayman *Melanosuchus niger* and the Amazon turtle *Podocnemis expansa*. The area may have additional importance to species of restricted distribution, such as the mutum-piuri *Crax globulosa* and birds rare in other sites, such as the alencorne *Anhima cornuta*. Locally threatened and protected tree species include samaúma *Ceiba petandra*, jacareúba

Callophylum, cedro *Cedrella*. Included in the IBAMA list of threatened species are seringa-barriguda *Hevea brasiliensis* and ucuúba *Virola*.

Criterion 2b: Varzea habitats function as fish nurseries, especially for pirarucu *Arapaima gigas* and tambaqui *Colossoma macropomum*, two of the greatest economic value species.

Criterion 2d: Wildlife in Mamirauá is characterized by high endemism. The preserve includes the whole distribution area of 2 threatened primates, the white uakari *Cacajao calvus calvus* and the black-headed-squirrel monkey *Saimiri vanzolinii*. Mamirauá also provides shelter to the endemic and threatened Amazonian manatee *Trichechus inunguis* and giant river otter *Pteronura brasiliensis*.

Criterion 3a: Annually, during the dry season, an estimated over 15.000 cormorants use the waters of Mamirauá system alone.

Criterion 3b: There are approximately 340 species of birds in Mamirauá, which corresponds to the total várzea avifauna of the Solimões sector. Species include cormorants *Phalacrocorax brasilianus*, *Anhinga anhinga*, egrets *Ardea*, *Egretta*, horned screamers *Anhima cornuta* and harpy eagle *Harpia harpya*. A new species *Mirmuterulla* was described in Mamirauá.

Criterion 4a: The diversity of fish in the preserve is exceptional, and the ichthyofauna there is more diverse than in adjacent sections of the river. More than 300 species of fish have been described for the area, the highest number yet described for varzea habitat. There is also a specially diverse branch of electrical fish in the reserve.

Criterion 4b: See 2b.

13. **General location:**

State of Amazonas, 30 km. Away the town of Tefé, at the confluence of the Japurá and the Solimões rivers.

14. **Physical features:**

The reserve is in the Amazon sedimentary basin, consisting of white clay with kaolin and quartzous sands. The reserve's soils have been reconstructed along the years by the Solimões and the Japurá rivers and are, in general, classified as Holocene and Pleistocene meadows. The water level varies around 12 meters and between June and October. During the wet season almost the whole reserve is flooded. There are canals which are residual of former river beds, joining the lakes. The climate is tropical and humid, with an average temperature of 21.7 degrees Celsius, and the average annual precipitation is 2,850 mm., with no marked dry season. Nutrients and solid particles dissolved in the water are few, though in higher concentration than in other rivers of the Amazon region, because of the influence of the waters originating in the Andes. Superficial water drainage is between 1,250 and 1,000 mm. a year. Underground waters have good chemical quality. Free aquifers, comprised of non consolidated clastic sediments, with average permeability and average relative hydrological importance.

15. **Hydrological values:**

The area is an extensive flood plain, important as a reproductive habitat for fish which have commercial importance. Deforestation in the region may lead to problems such as erosion and the siltation of the Japurá river delta.

15.1 *Water quality:* The basic limnology is dictated by conditions in the Solimões and Japurá rivers (which constitute the reserve's boundaries), although the lakes located between them vary quite significantly as to their chemical characteristics. The Solimões river is much richer in dissolved inorganic ions, and carries greater amount of sediments. Conductivity is high in the Japurá and low in the Solimões. Surface temperature varies between 27.8 °C and 30.9°C.

15.2 *Catchment basin:* The Mamirauá varzea is highly influenced by the main rivers in hydrochemical terms. The Aranapu and Auati-Paraná channels, and Solimões (Marañon) and Japurá, therefore influencing its composition.

15.3 *Drainage basin:* The sediments originated from the Andes and carried by the Solimões river are transported for long distances along the Amazon basin, discharging at the mouth of the Amazon in the Atlantic ocean.

16. **Ecological features:**

The forest in the reserve is classified in three main categories:

1. High sand bar forest;
2. Low sand bar forest;
3. and open low vegetation, with thin tree trunks, generally on white sand, known as Amazonian, *campina* (typical Amazonian grassland with woody vegetation of some height). The predominant families in the sand bar are *Annonaceae*, *Euphorbiaceae*, *Leguminaceae*, *Apocynaceae*, *Lecythidaceae* and *Lauraceae*. There are no tall submerging plants in the lakes or canals. The reserve houses several aquatic habitats, ranging from broad open areas to areas with woods around small ponds. Habitats with floating vegetation can be found in the canals that flow to the rivers, however there are no fast running waters.

17. **Noteworthy flora:**

The region's forests contain one of the highest rate of diversity of species per hectare in the meadow habitats of the Amazon. It is believed that Mamirauá may be a speciation center for water plants. (Annex II).

18. **Noteworthy fauna:**

The reserve has a high endemism rate. It is one of the places where one can find endangered primates, such as the *Cacajao calvus calvus*, and the newly discovered squirrel monkey *Saimiri vanzolinii*. The "umbrella bird" *Cephalopterus ornatus*, and the manatee, *Trichechus inunguis*, both endangered, can be found there as well. The major mammals are the *Panthera onca*, the capybara *Hydrochaeris hydrochaeris*, coati *Nasua nasua*; feline species (*Felis spp*); the anteater (*Tamandua sp*); two sloth species *Bradypus sp* and *Choleopus sp*; and two freshwater dolphins - *Inia geoffrensis* and *Sotalia fluviatilis*. There are large numbers of waterfowl, including herons, "maçaricos", "anhuma" *Anhima cornuta*, "mergulão" *Phalacrocorax brasilianus* and the "pato caboclo" *Cairina moschata*.

The water fauna is exceptionally diversified, including several crustaceans, such as ostracods and new amphipods, which exist only in this reserve and have not yet been scientifically identified. The fish have yet to be systematically analyzed. An important population of "pirarucu", *Arapaima gigas*, which is largest freshwater fish in the world, can be found in the reserve. Ornamental fish such as the "acará disco", *Symphysodon spp* are very frequent. (Annex III).

19. **Social and cultural values:**

The area provides the "caboclos" with significant fishing and wood exploration. There are Indian communities, which are traditionally attached to the land, in the reserve. Mamirauá may, furthermore, serve as a model for environmental education and scientific research for the Amazon region and for Brazil.

Research has been an important component in the Project since its inception, both at the biological and social levels. Subjects of study have been the species that represent resources for the local people, and fisheries production has been the subject of specific research. Although research is still being carried out, nowadays there is greater emphasis to extension work, which include agrosilvicultural methods. Environmental education has been applied to curricula in rural schools, and we are now experimenting with ecotourism in Mamirauá. The new category of sustainable development reserve has allowed the original population to

remain within the boundaries of the preserved area, therefore preserving the way of life of the caboclo.

20. Land tenure/ownership of:

(a) site: all varzea area is considered Federal (Navy) property, i.e., there are no land titles, although the local inhabitants may make use of it. Part of the reserve is inhabited by “caboclos” (a Brazilian half-breed of white and Indian) who are entitled to the tenure of this land.

Management of the area is the responsibility of IPAAM (Environmental Protection Institute for the State of Amazonas).

(b) surrounding area: on the Japurá side, most of the land is varzea, and therefore fits in the above category. Some of the communities have their land registered, as a communal property on the Solimões side, where there is terra firme, there are private properties with land title and documented in the land register.

21. Current land use:

(a) site: local inhabitants practice agriculture, mainly manioc, corn and bananas. Due to the annual floods, production is restricted to 6 months of the year. Because of difficulties resulting from the regular flooding, livestock raising is very minor. Local practice itinerant agriculture on a small scale; commercial fishing; wood exploration and ornamental fish harvesting.

(b) surrounding/catchment: in the adjacent area of varzea locals practice seasonal agriculture. In the dry land area (terra firme) there are also permanent crops and cattle raising.

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

(a) at the site: increase of the human population which leads to a growing demand for fishing resources.

(b) around the site: the same.

Although the number of residents of the station is very high - 2.000, using the environmental resources for subsistence and small scale trade for many years, no significant ecological changes have been detected due to anthropic interference.

23. Conservation measures taken:

The Mamirauá Ecological Station had its status changed to Sustainable Development Reserve in 1996.

This new category is designed to allow the permanence of inhabitants inside the area, which is not permitted in an Ecological Station.

24. Conservation measures proposed, but not yet implemented:

In 1996 was completed the Management plan for Mamirauá, already published in Portuguese and English. The plan has been approved by the local inhabitants during the V General Assembly of the reserve, in Tefé, in October 1997. It still awaits final approval by IBAMA.

The elaboration of the management plan as a process and result has helped in the conservation of the area, mainly because it took into account the opinion and needs of the local inhabitants, who participated in all steps of the process. A fishing control plan is being implemented. There are areas which are designed for sustainable use and for preservation, under a proposed zoning scheme.

According to Brazilian legislation, the exploration of animals and plants without a strict management plan is forbidden. Sustainable use techniques have been proposed with the government’s support.

25. Current scientific research and facilities:

The Mamirauá Project is developing research on:

Studies are currently being carried out with fish (daily landings in the Tefé and fishing at the reserve site, Alvarães markets, pirarucu and electric fish ecology, ornamental fish), reptiles (caiman and turtles), mammals (manatees and dolphins), agriculture, timber and logging and health conditions, social and economic activities of the local human population, avifauna and ecotourism (feasibility).

The facilities include offices and sleeping quarters for the researchers.

Inventories in execution: Health and nutrition; socio-economic monitoring; anthropology; forest extraction; agro-forest systems; subsistence hunting; *Caymans*; fauna, botanical and climatic inventories; fish biology and limnology; fisheries; aquatic mammals.

Planned inventories: Natural regeneration of dynamics, development and the importance of the dispersion of seeds in areas of varzeas (flooded forest); Research ecology of turtles (*Podocnemis expansa*, *P. unifilis* and *P. sextuberculata*); Ecology of small mammals.

26. Current conservation education:

An environmental education project is being developed to convey to the local population the notion of environmental conservation in conjunction with the sustainable use of the natural resources. This includes the participation of local children and teachers.

There has been a programme for local communities participation, since 1982, including them in the discussions for establishment of wise use policies and management planning.

The main results are annual general assemblies of the local-resource users, designation of coordinators from each of the 10 sectors in the reserve and a weekly local radio program called "Connected to Mamirauá".

The environmental education segment is aimed at promoting public awareness of environmental impacts due to anthropic interference and informing about alternative methods of use of resources. This program among other activities, promoted the distribution of environmental education publications, training of public teachers and community leaders in environmental education, drawings and articles competitions on environmental issues and ecological tours.

Two primers (1 for children and 1 for teenagers) have been elaborated, along with a teacher's manual, by members of the Mamirauá Project and local teachers. The team operates in partnership with the local town administration to include environmental education in the curriculum and improve the level of teaching.

There are regular training courses with the local teachers to spread knowledge on health and nutrition.

Research: Recently were concluded master's theses in areas related to folivorous mammals (sloths and howler monkeys), seed dispersal, hunting and small forest mammals. The ecology of electric fish was the subject of a doctoral theses. Master's theses are currently being developed with agricultural systems and ecology of tambaquis; doctoral theses are being developed with ecology of pirarucuc and caiman.

Monitoring: All natural resources (fish, timber, hunting) continue to be monitored.

Law enforcement/vigilance: IBAMA offered courses to voluntary environmental agents, where people from the local communities acquire knowledge and greater authority before poachers. Approximately 20 voluntary agents have graduated.

27. Current recreation and tourism:

Recently we've started a program for the establishment of ecotourism in Mamirauá. In this first moment we offer short (1-2 day) visits, with a night in one of the floating houses, sharing it with the researchers. A local guide is being trained and visit sites have been identified and trails maintained. An interpretation system is being prepared. So far touristic activity has been foreign and sporadic, but there is great interest from the Tefé population.

28. Jurisdiction:

IPAAAM - Instituto de Proteção Ambiental do Estado do Amazonas

Dr. Vincente Nogueira , President
R. Recife, 3280 - 69050-030 - Manaus - AM

29. Management authority:

Sociedade Civil Mamirauã - SCM
P.O. Box 038
69.470-000 - Tefé, AM
Brazil

30. Bibliographical references:

List of Publications of Mimirauá Project Sociedade Civil Mamirauá

A. Articles on specialized scientific journals or magazines

B. Thesis & Unpublished Reports

C. Newspapers and popular articles

D. Films, TV programs and CD-ROM

E. Books and Educational Materials

Annex I Maps of Site (5)

Annex II Flora (21 pages)

AnnexIII Fauna (21 pages)