GUATEMALA

INTRODUCTION

based on information provided by Juan Carlos Godoy, Ruben Velasquez and Luis M. Villar Anleu, and information extracted from Cabrera and Willink (1973) and USAC & INGUAT (1981)

Guatemala, with an area of 108,889 km^2 and a population of 7,500,000, has the highest population density of any country in Central America. It is crossed from west to east by three mountain chains which unite in a central massif. There are at least thirty-three volcanoes in the youngest chain; almost ten of these are currently active, and earthquakes and earth tremours are frequent. There are numerous rivers distributed in three watersheds; the Pacific, the Golf of Mexico (Atlantic), and the Caribbean (Atlantic). The country has 240 km of coast on the Pacific and 110 km on the Caribbean.
Guatemala can be divided into four physiographical regions:

a) The Pacific plain, some 50 km wide, characterized by high rainfall during the rainy season (May to October).
b) The Pacific cordillera, made up of the southern slopes of the central massif. The terrain is very rugged with dense, humid tropical vegetation.
c) The inner highlands, with numerous volcanoes and peaks up to 4,211m. The majority of the Guatemalan population lives in this region.
d) The lowlands of Peten-Caribe, a karst limestone region with abundant vegetation. The Peten subregion is a large plain in the north of the country, with maximum heights of 500m and dense tropical vegetation; the Caribbean subregion in the east has some mountain spurs and very humid tropical vegetation.

According to Cabrera and Willink (1973), two biogeographical provinces occur in Guatemala:

a) The Central American Montane Province in the Caribbean Domain, at the southern limit of the Holarctic Realm. This province, corresponding in Guatemala to Udvardy's Madrean-Cordilleran Province (1.21.12), is transitional between the Holarctic and Nearctic Realms; although it includes tree species belonging to Holarctic genera, most of the other forest elements are clearly Neotropical. The province occupies the interior highlands of the country.
b) The Pacific Province in the Amazonian Domain. This province, corresponding in Guatemala to Udvardy's Campechean (8.1.1) and Central American (8.16.4) Provinces, occupies both the Pacific and the Atlantic lowlands. It is characterized by high humidity and high temperatures. The dominant vegetation is humid tropical forest, with mangroves along the coasts.

The wetlands of Guatemala can be grouped into three categories:

a) Rivers, in some forty basins; most have short, rapid courses.
b) The great estuarine, coastal lagoon and canal system extending for some 100 km along the Pacific coast. This incorporates the deltas of several rivers of the Pacific watershed and has extensive mangrove swamps; it comprises a rich habitat for Ardeidae, Anatidae and other waterfowl.
c) Lakes and ponds, of which there are about 350 in the whole country, ranging in size from less than 1 ha to 58,960 ha (Lago de Izabal). The many small seasonal and permanent water bodies in the Department of Peten are particularly worthy of mention. They are known locally as "aguadas" and are characteristic formations of karstic limestone regions. They are of considerable importance to all forms of wildlife in the region.

Institutional Base for Wetland Conservation and Research

Governmental

The Instituto Nacional Forestal (INAFOR) is the body responsible by law for the administration of National Parks and some recreation areas, and also has jurisdiction over the country's wildlife.

The Instituto Guatemalteco de Turismo (INGUAT) actively participates in conservation and collaborates with CECON.

The Direccion General de Antropologia e Historia (DIGAHE) is responsible for the conservation of the national cultural heritage. It works in collaboration with INAFOR, and administers Tikal National Park and the World Heritage sites of Quirigua and Antigua Guatemala.

The Universidad de San Carlos de Guatemala (USAC) is dedicated to education at university level and research. It collaborates on conservation matters with INAFOR, DIGAHE, INGUAT and others.

The Centro de Estudios Conservacionistas (CECON), within the Universidad de San Carlos, is dedicated to environmental research, the conservation of nature and the management of Protected Biotopes. It produces official publications and has a programme of environmental education.

Non-governmental

Asociacion Guatemalteca de Historia Natural
Asociacion de Amigos del Bosque
Asociacion Defensores de la Naturaleza
Asociacion Pro-Defensa del Medio Ambiente

Progress in Wetland Conservation and Research

The first National Parks in Guatemala were established in 1955. The establishment of these National Parks and equivalent areas was the result of isolated symbolic actions, rather than a logical scheme to achieve conservation of natural and cultural resources.

At the present time, those wildlife areas which are being most effectively conserved and managed are the Protected Biotopes, administered by CECON with the collaboration of INGUAT, INAFOR, DIGAHE, Instituto Nacional de Transformacion Agraria (INTA) and Empresa de Desarrollo de el Peten (FYDEP). Of the four Biotopes currently in existence, three play an important role in the conservation of wetlands: Cerro Cahui (which includes areas of Lake Peten-Itza); Chocon-Machacas (which includes mangroves, lagoons and swamps on the Atlantic coast); and Monterrico (which includes part of the mangrove system of the Pacific coast).

Projects and research currently being conducted in relation to wetlands and waterfowl include the following:

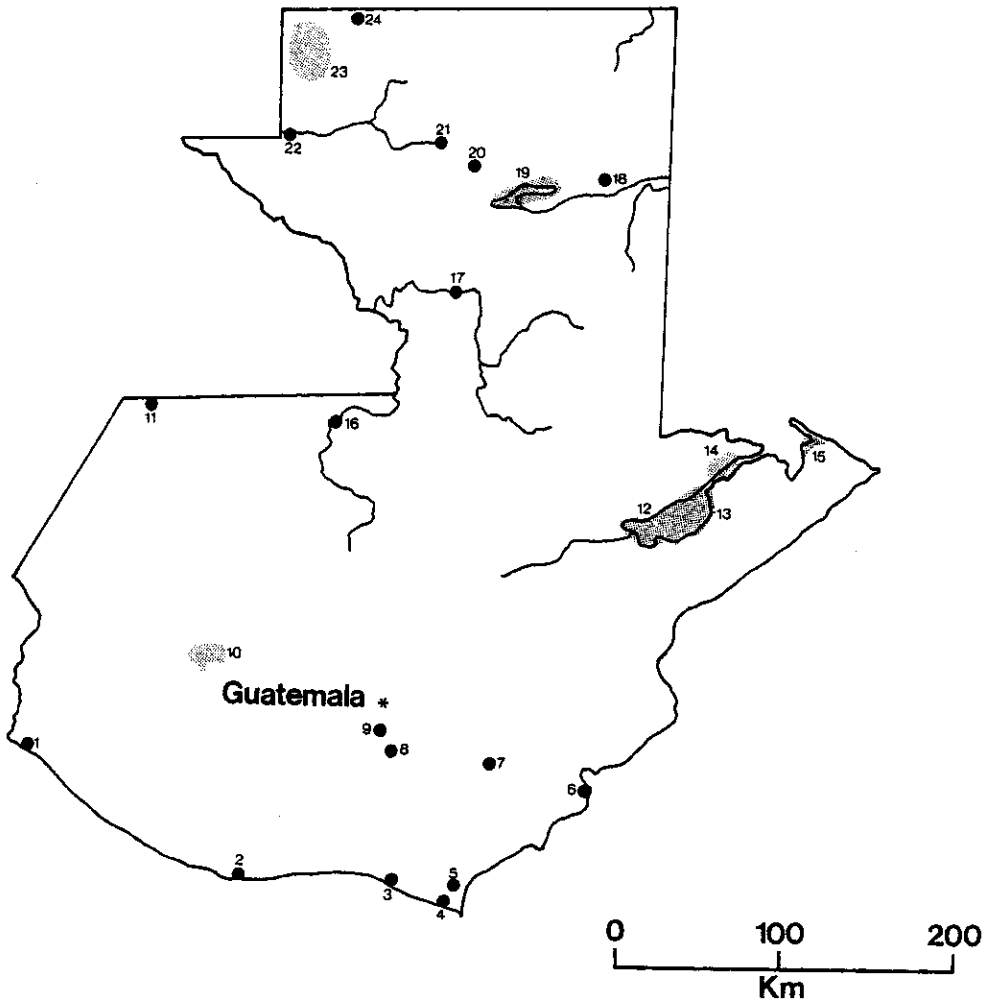
a) A project for the protection and possible captive breeding of *Podilymbus gigas* at Lake Atitlan, by CECON and INAFOR in collaboration with the U.S. Fish and Wildlife Service and World Wildlife Fund - U.S.
b) An inventory project entitled "Tierras Humedas y Vegetacion en Guatemala", directed by Juan Carlos Godoy (CECON).
c) A study of the biology and ecology of Anatidae in Guatemala, directed by Luis M. Villar Anleu (CECON).
d) A study of the biology and ecology of the Podicipediformes of Guatemala, directed by H. A. Kihn (CECON).

Major Threats to Wetlands and Waterfowl

The most imminent threats to wetlands in Guatemala include pollution from fertilizers, pesticides and human waste, and contamination with mineral residues, as is the case at Lago de Izabal. At lakes in the highlands, the most serious problems are increased sedimentation caused by soil erosion in deforested areas and the construction of houses on the lake shores.

Other important factors are the loss of habitat and illegal and uncontrolled hunting. Some lagoons of special importance for migratory waterfowl have been drained for agricultural use. There has recently been an increase in sport hunting, but this has not as yet been rationalized with respect to bag limits or to the type of weapons or methods that can be employed.

GUATEMALA


24
23
22
21
20
19
18
17
11
16
14
15
12
13
10
Guatemala
9
8
1
7
6
2
3
5
4
0
100
200
Km

WETLANDS

Site descriptions based on data sheets provided by Luis M. Villar Anleu, Juan Carlos Godoy and Ruben Velasquez of the Centro de Estudios Conservacionistas (CECON).

Manchon Lagoons (1)

Location: 14°29'N, 92°03'W; on the Pacific coast 40 km west of Mazatenango, San Marcos Department.
Area: 13,850 ha.
Altitude: 0-4m.
Province and type: 8.16.4; 02, 05, 07, 08 & 09.
Site description: A large complex of interconnecting shallow brackish lagoons, up to 5m deep, mangrove swamps and marshes in the estuarine and delta systems of several small rivers; the principal river is the Rio Ococito. The lagoons are subject to tidal inundation near the coast and flooding from the rivers, the water level fluctuating by up to 2m. They are separated from the sea by a sand barrier 100m wide.
Principal vegetation: Mangrove swamps with *Rhizophora mangle*, *Laguncularia racemosa*, *Conocarpus erectus* and *Pachira aquatica*; marshes dominated by Gramineae and Cyperaceae.
Land tenure: Mainly owned by the state and local municipalities, but there are some private holdings.
Protection: The mangroves are protected by law, but this is not enforced. Otherwise the area is unprotected.
Land use: Fishing, pisciculture, shrimp farming, salt extraction, recreation and tourism. The lagoons are used for transportation, and there are housing developments in the area.
Waterfowl: A very important area for both resident and migratory waterfowl; over seventy species have been recorded. Common residents include *Pelecanus occidentalis*, *Phalacrocorax olivaceus*, a variety of Ardeidae, *Mycteria americana*, *Eudocimus albus*, *Dendrocygna autumnalis* (abundant), *Cairina moschata*, *Aramides cajanea*, *Fulica americana* and *Jacana spinosa*; other residents include *Tigrisoma mexicanum*, *Jabiru mycteria*, *Ajaia ajaja*, *Aramus guarauna*, *Heliornis fulica*, *Haematopus palliatus*, *Charadrius wilsonius* and *Himantopus himantopus*. A wide variety of Nearctic Anatidae and shorebirds occur on migration and in winter; the commoner species include *Anas americana*, *A. discors*, *Charadrius vociferus*, *Numenius phaeopus*, *Tringa solitaria*, *Catoptrophorus semipalmatus*, *Actitis macularia* and *Calidris mauri*.
Other fauna: There are important populations of Psittacidae in the area, and the crocodilians *Crocodylus acutus* and *Caiman crocodilus fuscus* occur in the lagoons.
Threats: There is excessive exploitation of all natural resources in the area, and intensive use of pesticides, including D.D.T., in the watersheds of the five main rivers entering the lagoons.
Research and conservation: CECON has conducted faunal and floral surveys, and prepared a proposal for the establishment of appropriate reserves and protected areas.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 2b & 3a.

Rio Acome Estuary (2)

Location: 13°57'N, 91°05'W; on the Pacific coast, 90 km southwest of Guatemala City, Escuintla Department.
Area: 3,100 ha.
Altitude: 0-1m.
Province and type: 8.16.4; 05, 07 & 08.
Site description: The small estuary of the Rio Acome with mangrove swamps, brackish marshes and adjacent coastal sand dunes.
Principal vegetation: Mangrove swamps and sand dune vegetation.
Land tenure: Mainly under private ownership, with some parts state owned.
Protection: No effective protection although the area has been designated as a "Parque Nacional Lineal".

Land use: Cattle ranching, and cultivation of cotton, sugar, some rice and some maize, in the surrounding areas.
Waterfowl: Similar to Manchon Lagoons (site 1), but with more Ardeidae and fewer Anatidae.
Other fauna: No information.
Threats: Contamination with pesticides, and expansion of pasture land and agriculture.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 0.

Monterrico Lagoons (3)

Location: 13°54'N, 90°28'W; 15 km south of Taxisco, Santa Rosa Department.
Area: 4,325 ha.
Altitude: 0.6-1.5m.
Province and type: 8.16.4; 05, 07, 08, 09 & 18.
Site description: A coastal belt of small estuaries, brackish lagoons and marshes about 2 km wide, bordered on the seaward side by sand beaches. The principal river is the Rio Maria Linda. There are large areas of seasonally flooded marshes, shallow seasonal lagoons, and mangrove swamps along the major tidal channels. The salinity in the marshes increases during the dry season (December to May). A narrow interrupted band of swamp forest borders the landward edge of the marshes and extends in a narrow riparian strip as gallery forest along the streams draining into the marshes.
Principal vegetation: Mangrove swamps with *Rhizophora mangle* and *Avicennia germinans*; other plants include *Laurus borbonica, Carapa guianensis, Myroxylum pereirae, Swietenia humilis, Sterculia cartaginensis, Ceiba aesculifolia, Lonchocarpus guatemalensis, Enterolobium cyclocarpum, Pithecolobium lanceolatum, Dalbergia cubilquitzensis, Gliricidia guatemalensis, Tabebuia penthaphylla, Bombax allipticum, Pachira aquatica, Coccoloba caracasana* and *Cynometra retusa*. There is dry tropical scrub forest inland from the marshes.
Land tenure: A mixture of state and private ownership, with some of the state owned lands leased to private individuals.
Protection: Part of the area was designated as a "Protected Biotope" in 1978, and has been well protected since then by CECON.
Land use: Fishing, shrimping, salt extraction, exploitation of mangroves for timber, transportation by boat, and recreation.
Waterfowl: Known to be a very rich area for a wide variety of waterfowl, particularly Ardeidae and Nearctic migrants, but little information available. During field work between 1968 and 1976, Dickerman recorded several species new for Guatemala including *Porzana flaviventer, Calidris bairdii* and *Sterna albifrons*. He also observed small groups of *Limosa haemastica* on spring migration.
Other fauna: The sea turtle *Chelonia mydas* nests of the beaches.
Threats: Human settlement in the area, with extensive utilization of the mangroves for construction and fuel; and the development of salt pans.
Research and conservation: Faunal and floral investigations have been conducted by CECON, and Dickerman carried out ornithological field work in 1968, 1973, 1974 and 1976.
References: Dickerman (1975 & 1977); Godoy (1981); Rodriguez (1981).
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 3a.

Rio Paz Estuary (El Jiote) (4)

Location: 13°49'N, 90°15'W; 30 km southeast of Taxisco, Santa Rosa Department.
Area: 1,300 ha.
Altitude: 0-0.4m.
Province and type: 8.16.4; 02, 05 & 08.
Site description: The estuary of the Rio Paz, with mangrove swamps and adjacent sand beaches.
Principal vegetation: Mangroves and sand dune vegetation.

Land tenure: Owned by the state and local municipality, with some lands leased to private individuals.
Protection: None.
Land use: Fishing, shrimping, exploitation of mangroves for timber, salt extraction, and recreation; plantations and cultivation nearby.
Waterfowl: Similar to sites 1, 2 and 3; particularly important for Ardeidae.
Other fauna: No information.
Threats: None known.
References: Godoy (1980).
Source: Juan Carlos Godoy.
Criteria for inclusion: 0.

Laguna Grande (5)

Location: 13°53'N, 90°11'W; 37 km ESE of Taxisco, Jutiapa Department.
Area: 270 ha.
Altitude: 35m.
Province and type: 8.16.4; 12.
Site description: A permanent shallow freshwater lake and marshes, 13 km inland from the coast near the El Salvador border.
Principal vegetation: No information.
Land tenure: Privately owned.
Protection: None.
Land use: Extensive cattle ranching in the area.
Waterfowl: No information.
Other fauna: No information.
Threats: No information.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 0.

Laguna de Guija (6)

Location: 14°16'N, 88°33'W; 35 km east of Jutiapa, on the El Salvador border, Jutiapa Department.
Area: Total area of lake 4,300 ha; 1,380 ha in Guatemala.
Altitude: 427m.
Province and type: 8.16.4; 12.
Site description: A large permanent freshwater lake with fringing marshes, spanning the Guatemala / El Salvador border. (See El Salvador site 1)
Principal vegetation: No information.
Land tenure: Mainly private.
Protection: None.
Land use: Cattle ranching and agriculture in the area.
Waterfowl: No detailed information available, but known to be an important area for migratory Anatidae.
Other fauna: The fish fauna includes endemic species of Poecilidae, particularly of the genus *Heterandria*.
Threats: No information.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 2b.

Laguna de Ayarza (7)

Location: 14°25'N, 90°07'W; 45 km ESE of Guatemala City, Santa Rosa Department.
Area: 1,400 ha.
Altitude: 1,407m.
Province and type: 1.21.12 (Nearctic); 14.
Site description: A permanent brackish lake of volcanic origin, up to 230m deep and with a narrow fringe of emergent aquatic vegetation (less than 100m wide). There are slight annual fluctuations in water level, and there has been a 2m variation in water level over a period of eight years.
Principal vegetation: Fringing marshes of *Scirpus* sp. In a region of thorn woodland.
Land tenure: The land surrounding the lake is privately owned.
Protection: None.
Land use: Fishing; recreation, including swimming and boating, particularly at weekends. Cultivation of maize, beans and sugar cane in surrounding areas.
Waterfowl: The lake has a resident population of *Podilymbus podiceps* and *Fulica americana*, and *Cairina moschata* may occur. One of the most important sites in Guatemala for migratory Anatidae, with *Dendrocygna bicolor, D. autumnalis* and *Anas discors* predominating.
Other fauna: No information.
Threats: Excessive disturbance from recreation activities, particularly at weekends.
Source: Ruben Velasquez.
Criteria for inclusion: 3a.

Laguna El Pino (8)

Location: 14°20'N, 90°23'W; 30 km SSE of Guatemala City, Santa Rosa Department.
Area: 72 ha.
Altitude: 1,022m.
Province and type: 1.21.12 (Nearctic); 12.
Site description: A permanent almost freshwater lake, up to 18m deep, with extensive fringing marshes; fed by several small streams. There are slight annual fluctuations in water level, and the level has varied by 1.6m over a 16 year period.
Principal vegetation: Submergent beds of *Elodea canadensis*; floating beds of *Eichhornia crassipes*; and marshes with *Eleocharis elegans* and *Scirpus californicus*. Surrounding areas with *Casuarina* sp, *Cupressus lusitanica, Inga xalapensis* and *Pinus* spp.
Land tenure: 20% of the shoreline is state owned; the remainder is private.
Protection: The lake was declared a National Park, but is managed as a recreation area.
Land use: Subsistence fishing, collection of snails, sport fishing, and recreation, including swimming and camping. There are coffee plantations in surrounding areas.
Waterfowl: Common breeding species include *Podilymbus podiceps, Bubulcus ibis, Gallinula chloropus, Fulica americana* and *Jacana spinosa. Dendrocygna bicolor* may breed.
Other fauna: No information.
Threats: Urban development, intensive recreation, and accelerated eutrophication caused by the inflow of organic waste.
References: Valenzuela (1982).
Source: Ruben Velasquez.
Criteria for inclusion: 3a.

Lago de Amatitlan (9)

Location: 14°28'N, 90°35'W; 15 km south of Guatemala City, Guatemala Department.
Area: 1,525 ha.
Altitude: 1,187m.
Province and type: 1.21.12 (Nearctic); 12.
Site description: A permanent freshwater lake, up to 33m deep, subject to fluctuations in water level of about 1.4m.

Principal vegetation: Beds of *Elodea canadensis* and *Ceratophyllum demesum.*
Land tenure: A mixture of municipal and private ownership.
Protection: No legal protection at present.
Land use: Recreation; production of hydroelectric and thermoelectric energy. The lake is a very popular weekend resort for the inhabitants of Guatemala City.
Waterfowl: Very few waterfowl; *Fulica americana* and Charadriidae occur seasonally.
Other fauna: No information.
Threats: The lake is under pressure from a variety of sources including: pollution from pesticides, hydrocarbons, domestic sewage and fertilizers; increased sedimentation as a result of erosion in surrounding watersheds; the construction of a causeway dividing the lake into two sections; and the construction of a marina and 900 weekend homes near the lake shore.
Research and conservation: The lake has been well studied and well documented. A National Commission for the Improvement and Restoration of Lago de Amatitlan has been created, and this includes representatives of government institutions, non-governmental bodies and the local municipalities. A project for the restoration, conservation, protection and improvement of the lake has been drawn up, but this has not as yet been approved.
References: Weiss *et al* (?); Calzada (1974); Silva (1975); Vasquez (1975); Tabarini de Abreu (1981); Instituto Nacional de Electrificacion (undated).
Source: Ruben Velasquez.
Criteria for inclusion: 3a.

Lago de Atitlan (10)

Location: 14°42'N, 91°12'W; at Santiago Atitlan, 65 km west of Guatemala City, Solola Department.
Area: 12,650 ha.
Altitude: 1,562m.
Province and type: 1.21.12 (Nearctic); 12.
Site description: A large permanent freshwater lake, up to 324m deep, surrounded by mountains and with three volcanic peaks rising to 3,550m on the south side. The lake is fed by a number of small streams; it has no surface outflow, water being lost through evaporation and seepage. The lake is oligotrophic; there are extensive fringing marshes in some areas, particularly along the south shore and in the Bahia de Santiago. Annual fluctuations in water level amount to about 1m, the level reaching its lowest at the end of the dry season (November to May). The level also fluctuates by up to 22m on a 40 year cycle; the lake is currently in the low phase of this long-term cycle. The level dropped by seven metres during an earthquake in 1976, and as a result, much of the marsh vegetation disappeared.
Principal vegetation: Submergent and floating beds of *Chara* sp, *Nitella* sp, *Potamogeton fragillimus, P. pectinatus, Eichhornia crassipes, Azolla filiculoides, Najas guadalupensis, Lemna valdiviana* and *Callitriche* sp; marshes with *Scirpus californicus, Typha domingensis* and *Cyperus odoratus.*
Land tenure: Mainly privately owned, with some parts owned by the state and local municipalities.
Protection: The lake itself was declared a National Park in 1955, but the shores remain unprotected and the park has never been properly administered or managed. All hunting of waterfowl has been prohibited since 1959, and a World Wildlife Fund Sanctuary of 2 ha was established in 1968 near Santiago Atitlan to protect several pairs of the endemic grebe.
Land use: Fishing, reed-cutting for handicrafts (baskets, carpets, furniture, etc.), and recreation. The bass *Micropterus salmoides* and *M. dolomieui* were introduced into the lake in 1958 and 1960 by a Tourist Commission, in an attempt to promote sport fishing. About 50,000 people live in the watershed of 548 kmN, and land surrounding the lake is intensively cultivated for maize, beans and coffee.
Waterfowl: The lake is best known for its endemic flightless grebe, the Atitlan Grebe *Podilymbus gigas.* No accurate censuses were made of the population until 1960. However, it is thought that there were about 400 birds at the turn of the century, and perhaps 100 breeding pairs in 1929. There were 200 birds in 1960, 80 in 1964, 135 in 1969 and 240 in 1975. Since then the population has declined rapidly; there were only 55 in May 1983, and

probably no more than 45 in late 1984. Other breeding species include *Ixobrychus exilis, Butorides virescens, Egretta alba, Gallinula chloropus, Jacana spinosa* and *Himantopus himantopus*. A variety of other waterfowl occur on migration and in winter, including large numbers of *Anas americana, Aythya affinis* and *Fulica americana*, and smaller numbers of *Ardea herodias, Anas clypeata, Oxyura jamaicensis, Porzana carolina, Actitis macularia, Gallinago gallinago* and *Larus atricilla*.

Other fauna: The lake supports a normal zooplankton fauna, but there are very few reptiles and amphibians, and it is doubtful if there were any native limnetic fishes. However, many species of fishes have been introduced, including the bass *Micropterus salmoides* and *M. dolomieui*, and the tilapia *Tilapia mossambica*.

Threats: The principal threats to the lake and its marshes include: the construction of holiday homes, hotels and recreation facilities along the shoreline; contamination with domestic sewage; increased siltation as a result of soil erosion on the surrounding hills; and general disturbance from human activities. There is still some illegal hunting of waterfowl, and reed-cutting, although prohibited for a part of the year, is permitted during the grebe breeding season (April and May). The natural fall in lake level has resulted in a loss of nesting habitat for the grebe, and the introduced bass may be a serious predator on grebe chicks.

Research and conservation: A considerable amount of research has been conducted on the endemic grebe, particularly by LaBastille between 1960 and 1973, and by Velasquez in recent years. Other studies have focussed on the potential of the lake for tourism, its limnology, and the introduced fishery. In early 1984, CECON and INAFOR, with the assistance of the U.S. Fish and Wildlife Service, initiated a captive breeding programme for *P. gigas*. It seems very unlikely that the grebe will survive in the wild for many more years, unless immediate steps are taken to improve the integrity of the National Park, and an appropriate management plan is implemented.

References: Clark (1908); Meek (1908); Atwood (1933); Carnet & Donville (1957); Williams (1960); Bowes & Bowes (1962); Cazali & Prado (1963); Crowe (1967); Dorris & Summerfelt (1967); Instituto Nacional de Electrificacion (1967); Powers & Bowes (1967); Instituto Geografico Nacional (1969 & 1970); Weiss (1971); LaBastille (1972, 1974 & 1983); IUCN (1982).

Source: Ruben Velasquez.

Criteria for inclusion: 123.

Laguna de Yolnabaj (11)

Location: 16°03'N, 91°34'W; on the Mexican border, 80 km north of Huehuetenango, Huehuetenango Department.

Area: 385 ha.

Altitude: 1,142m.

Province and type: 1.21.12 (Nearctic); 12.

Site description: A permanent shallow freshwater lake and marshes in the northern foothills of the Sierra de los Cuchumatanes.

Principal vegetation: No information.

Land tenure: A mixture of private and municipal ownership.

Protection: None.

Land use: Hunting and fishing; wood-cutting and the cultivation of maize in surrounding areas.

Waterfowl: No information.

Other fauna: No information.

Threats: None known.

Source: Luis M. Villar Anleu and Juan Carlos Godoy.

Criteria for inclusion: 0.

Bujajal-Polochic Marshes (12)

Location: 15°23'N, 89°30'W; west of Lago de Izabal, Izabal Department.
Area: 18,500 ha.
Altitude: 2.5-4m.
Province and type: 8.16.4; 09, 11, 13 & 16.
Site description: The extensive largely seasonal marshes and floodplain of the Rio Polochic, with some small permanent fresh and brackish lakes; at the west end of Lago de Izabal.
Principal vegetation: Lakes and marshes with *Chara vulgaris, Ceratopteris pteridoïdes, Acrostichum daneaefolium, Azolla caroliniana, Salvinia auriculata, Nymphaea ampla, Utricularia foliosa, Jussiaea natans, Hymenocallis littoralis, Pistia stratiotes, Vallisneria americana, Pontederia sagittata* and *Typha domingensis*; riverine forest with *Pachira aquatica, Lonchocarpus guatemalensis, Cecropia mexicana, Acacia hindsii* and *Bucida buceras*.
Land tenure: Privately owned.
Protection: None.
Land use: Extensive cattle ranching, some rice growing, and hunting.
Waterfowl: An important area for Ardeidae.
Other fauna: A few *Crocodylus moreletii* and possibly *Tapirus bairdii* occur. *Trichechus manatus* may reach this area from Lago de Izabal.
Threats: None known.
Research and conservation: The vegetation of the region has been described by Poll.
References: Poll (1983).
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 3a.

Lago de Izabal (13)

Location: 15°30'N, 89°10'W; near the Caribbean coast of eastern Guatemala, Department of Guatemala.
Area: 58,960 ha.
Altitude: 1m.
Province and type: 8.16.4; 09, 12, 16, 17 & 18.
Site description: The largest lake in Guatemala; permanent, slightly brackish, up to 16m deep, and with fringing marshes along about 60% of the shoreline and some swamp forest. The water level fluctuates seasonally by about 0.9m. The lake is often influenced by strong winds from the northeast, particularly in the afternoons.
Principal vegetation: Marshes with species of *Chara, Potamogeton, Scirpus* and *Typha*; and swamp forest. In a zone of humid tropical forest, but most of the forests have been cleared for pastureland.
Land tenure: 30% privately owned in farms, and the remainder in municipal ownership.
Protection: No effective protection, although a part of the lake was included in the Rio Dulce National Park (24,200 ha) established in 1956.
Land use: Traditional fishing, transportation and recreation.
Waterfowl: An important wetland for a wide variety of resident and migratory waterfowl. Resident species include *Podilymbus podiceps, Anhinga anhinga, Tigrisoma mexicanum, Nyctanassa violacea, Cochlearius cochlearius, Butorides virescens, Egretta tricolor, E. thula, E. alba, Mycteria americana, Jabiru mycteria, Ajaia ajaja, Cairina moschata, Aramus guarauna, Aramides cajanea, Laterallus ruber, Porphyrula martinica, Fulica americana, Heliornis fulica, Eurypyga helias, Jacana spinosa* and *Himantopus himantopus*. Common passage migrants and winter visitors include *Charadrius vociferus, Tringa solitaria, Actitis macularia, Larus atricilla* and *Chlidonias nigra*.
Other fauna: The Osprey *Pandion haliaetus* is a fairly common migrant. The manatee *Trichechus manatus* and Morelet's Crocodile *Crocodylus moreletii* occur, but both are very rare. The fish *Cichlasoma maculicauda* is abundant and of great importance in the local economy.
Threats: There is a serious pollution problem from pesticides used in intensive agricultural developments on adjacent land, and there is a potential threat from the possible revival of nickel mining activities in the area.

Research and conservation: Only preliminary investigations of the fauna and flora have been carried out, and further work is urgenty required in view of the serious problem from pollution.
References: Brinson & Nordie (1975); IUCN (1982).
Source: Luis M. Villar Anleu.
Criteria for inclusion: 2b & 3a.

Golfete and the Rio Dulce and Rio Chocon (14)

Location: 15°45'N, 88°50'W; between Lago de Izabal and Bahia de Amatique on the Caribbean coast, Izabal Department.
Area: c.10,000 ha.
Altitude: 0-10m.
Province and type: 8.16.4; 07, 08, 09, 16, 17 & 18.
Site description: A very slow-flowing river between Lago de Izabal and the Caribbean, with a wide lake-like section (Golfete) 16 km long by 7 km at its widest, and up to 13m deep. The water level fluctuates seasonally by about 0.9m. There are mangrove swamps near the coast; swamp forests inland; and extensive marshes, wet meadows and seasonally flooded plains, particularly along the lower Rio Chocon. Winter flooding creates one large lake. In summer, as the water level falls, sea water intrudes into the Rio Dulce, and the water becomes brackish up to Lago de Izabal. Some of the best wetland habitat is in the delta marshes of the Rio Chocon, on the north shore of Golfete.
Principal vegetation: Mangrove swamps dominated by *Rhizophora mangle* and *Pachira aquatica*; lakes and marshes with species of *Typha, Scirpus, Ceratophyllum, Vallisneria* and *Cabomba*; and swamp forest with *Pithecolobium belizense, Pterocarpus officinalis, Spondias mombin, Terminalia amazonia* and the palm *Desmoncus ferox*. In a region of humid tropical forest, although most of the original forest has now been cleared.
Land tenure: State owned.
Protection: A strip one km wide along the shore of the river is included in the Rio Dulce National Park. The northern portion of Golfete, the delta of the Rio Chocon and adjacent land are included in the "Biotopo Chocon-Machacas" reserve (7,600 ha), established for the conservation of the manatee and managed by CECON with the assistance of INGUAT. The southern shore of Golfete is unprotected.
Land use: Traditional fishing, transportation and recreation.
Waterfowl: An important area for a wide variety of waterfowl including several which are rare elsewhere in Guatemala. Residents include *Podilymbus podiceps, Pelecanus occidentalis, Anhinga anhinga, Tigrisoma mexicanum, Nyctanassa violacea, Cochlearius cochlearius, Butorides virescens, Egretta thula, E. alba, Mycteria americana, Jabiru mycteria, Ajaia ajaja, Cairina moschata, Aramus guarauna, Aramides cajanea, Laterallus ruber, Porphyrula martinica, Fulica americana, Heliornis fulica, Eurypyga helias, Jacana spinosa* and *Himantopus himantopus*. A number of Nearctic shorebirds and Laridae have been recorded on migration and in winter, the commoner species including *Charadrius vociferus, Tringa solitaria* and *Actitis macularia*.
Other fauna: The Osprey *Pandion haliaetus* is a common non-breeding visitor. The Central American Otter *Lutra anectens*, Baird's Tapir *Tapirus bairdii* and the manatee *Trichechus manatus* occur in small numbers, and the area supports a rich fish fauna.
Threats: A project for intensive agricultural development in the region threatens to alter much of the wetland habitat. There is some pollution from domestic sewage, and some illegal hunting. Surrounding areas are rapidly being deforested.
Research and conservation: The region is of considerable geological interest in that it lies on the Polochic Fault which cuts across Guatemala from east to west, and delimits the North American and Caribbean tectonic plates. Some preliminary studies have been conducted on the fauna and flora, and a master plan has been prepared for the Biotopo Chocon-Machacas. The area under management includes five small lakes with an average size of 20 ha, and seven small tributaries.
References: USAC & INGUAT (1981); IUCN (1982).
Source: Luis M. Villar Anleu.
Criteria for inclusion: 2a, 2b & 3a.

La Graciosa marshes (15)

Location: 15°50'N, 88°33'W; north of Puerto Barrios, Izabal Department.
Area: 6,000 ha of marshes.
Altitude: 0-0.5m.
Province and type: 8.16.4; 01, 03, 05, 07 & 08.
Site description: A brackish inlet with brackish marshes, mangrove swamps and coastal sand dunes, on the eastern shore of Bahia de Amatique, a shallow sea bay 40 km long by 18 km wide. The tidal rise and fall is about 90 cm.
Principal vegetation: Mangrove swamps. In a region of humid tropical forest, with vegetation similar to site 14.
Land tenure: State owned.
Protection: No habitat protection.
Land use: Fishing, transportation and recreation.
Waterfowl: An important area for waterfowl, with almost the same species as Golfete and the Rio Dulce (site 14). The area is particularly important for *Pelecanus occidentalis*, *Phalacrocorax olivaceus* and migratory Laridae, e.g. *Larus atricilla* and *Sterna maxima*.
Other fauna: The Osprey *Pandion haliaetus* is a common non-breeding visitor, and the manatee *Trichechus manatus* is known to occur.
Threats: None known.
Research and conservation: Some preliminary avifaunal surveys have been conducted in the area. There are plans for the establishment of a reserve (Biotopo Protegido) at Punta de Manabique, at the northern edge of the bay.
Source: Luis M. Villar Anleu.
Criteria for inclusion: 2a & 3a.

Laguna de Lachua (16)

Location: 15°55'N, 90°40'W; 85 km west of El Achiotal, Alta Verapaz Department.
Area: 5,600 ha.
Altitude: 173m.
Province and type: 8.1.1; 12 & 18.
Site description: A permanent shallow freshwater lake and marshes surrounded by seasonally inundated forest, in the valley of the Rio Chixoy near the Mexican border.
Principal vegetation: Marshes and swamp forest with *Cabomba aquatica*, *Acrostichum* sp, *Cyperus* sp, *Eleocharis* sp, *Andropogon* sp, *Phragmites* sp, *Lonchocarpus guatemalensis*, *Pachira aquatica*, *Chrisobalanus icaco*, *Bucida burceras*, *Achras zapota* and *Sabal morrisiana*.
Land tenure: State owned.
Protection: None at present.
Land use: Occasional hunting and fishing; the area has not been developed and remains relatively undisturbed.
Waterfowl: Species known or thought to breed include *Podiceps dominicus*, *Aramus guarauna*, *Aramides cajanea*, *Porphyrula martinica* and *Gallinula chloropus*. *Anas americana* and *Aythya affinis* have been recorded on migration.
Other fauna: Five species of kingfisher Alcedinidae occur around the lake.
Threats: Agricultural development in the immediate vicinity.
Research and conservation: Preliminary botanical and avifaunal surveys have been carried out, and it has been suggested that a National Park or Biotope Reserve be established at the lake.
References: Ponciano (1982a & 1982b).
Source: Juan Carlos Godoy and Ruben Velasquez.
Criteria for inclusion: 3a.

Petexbatun and Las Pozas Lakes (17)

Location: 16°27'N, 90°14'W; west and south of Sayaxche, Peten Department.
Area: 5,050 ha.
Altitude: 110m.
Province and type: 8.1.1; 09, 12 & 16.
Site description: A complex of permanent shallow freshwater lakes and marshes, with surrounding areas of seasonally flooded marshes and grassland.
Principal vegetation: Lakes with submergent beds of *Potamogeton, Chara* and *Nitella*; marshes with species of *Cyperus, Eleocharis* and *Acrostichum*; and flood zone with species of *Spilanthes, Panicum, Scleria, Rynchospora* and *Heliconia*. In a region of humid tropical forest.
Land tenure: A mixture of private and municipal ownership.
Protection: No habitat protection, although archeological sites in the area are protected.
Land use: Wood-cutting and cultivation of maize and beans in surrounding areas; some tourism at the archeological sites.
Waterfowl: Similar to Lago Peten-Itza (site 19).
Other fauna: The fish fauna includes the scarce *Lepisosteus tropicus* and economically important species such as *Petenia splendida* and species of *Cichlasoma*.
Threats: None known.
References: Aguilar (1974).
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 3a.

Yaxja and Sachab Lakes (18)

Location: 17°03'N, 89°25'W; 30 km ESE of Tikal, Peten Department.
Area: 1,925 ha.
Altitude: 158m.
Province and type: 8.1.1; 12 & 16.
Site description: A group of permanent, fairly shallow freshwater lakes with surrounding marshes, and seasonally flooded plains to the north.
Principal vegetetation: Aquatic vegetation including species of *Cabomba, Naias, Nitella, Chara, Typha, Eleocharis, Pistia, Cyperus* and *Cladium*, with some *Vigna repens, Cassytha filiformis, Pithecolobium platylobum, Cucurbita radicans* and *Asclepias curassavica*. In a region of humid tropical forest.
Land tenure: A mixture of private and municipal ownership.
Protection: None.
Land use: Fishing and recreation; wood-cutting nearby, and extensive agriculture to the south.
Waterfowl: Similar to Peten-Itza (site 19).
Other fauna: The rich fish fauna includes a variety of Cichlidae and Poecilidae.
Threats: None known.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 3a.

Lago Peten-Itza and Petenchel (19)

Location: 16°59'N, 89°50'W; 30 km southwest of Tikal, Peten Department.
Area: 10,370 ha.
Altitude: 112m.
Province and type: 8.1.1; 12 & 18.
Site description: A group of permanent freshwater lakes with fringing marshes and swamp forest; fed by several small streams and with no surface outflow. Lago Peten-Itza (30 km long by up to 5 km wide, and up to 45m deep) is much the largest of the group, and the largest lake in this region of Guatemala. The lake level fluctuates seasonally by about 38 cm, but there are also long-term fluctuations of about 8m over a 50-60 year cycle. Soils in the region are calcareous.

Principal vegetation: Lakes with beds of *Elodea* sp and *Ceratophyllum sp;* marshes with species of *Typha* and *Scirpus*; and swamp forest. In a region of humid tropical forest.
Land tenure: Municipal ownership.
Protection: A five km stretch of the northeast shore of Lago Peten-Itza is included in the Biotopo Cerro Cahui reserve, managed by CECON with the assistance of INGUAT; the remainder of the area is unprotected.
Land use: Traditional fishing, some hunting of turtles, transportation, and a little recreation. The area is relatively undisturbed.
Waterfowl: Little information is available on the waterfowl of this area and other similar wetlands in northern Guatemala (sites 17 to 24). Species known or thought to be resident include *Podilymbus podiceps, Phalacrocorax olivaceus, Tigrisoma mexicanum, Nycticorax nycticorax, Nyctanassa violacea, Cochlearius cochlearius, Butorides virescens, Egretta caerulea, E. tricolor, E. thula, E. alba, Agamia agami, Mycteria americana, Jabiru mycteria, Cairina moschata, Aramus guarauna, Aramides cajanea, Laterallus ruber, Porphyrula martinica, Fulica americana, Heliornis fulica, Eurypyga helias, Jacana spinosa, Charadrius collaris* and *Himantopus himantopus.* Passage migrants and winter visitors include *Ardea herodias, Dendrocygna autumnalis, Charadrius vociferus, Tringa solitaria, Actitis macularia* and *Larus atricilla.*
Other fauna: Birds of prey include *Pandion haliaetus, Rostrhamus sociabilis, Buteogallus anthracinus* and *Busarellus nigricollis.*
Threats: None known.
Research and conservation: Some preliminary botanical and avifaunal studies have been conducted, but further work is required.
References: USAC & INGUAT (1980).
Source: Luis M. Villar Anleu.
Criteria for inclusion: 3a.

Laguna Perdida (20)

Location: 17°04'N, 90°13'W; 65 km WSW of Tikal, Peten Department.
Area: 1,825 ha.
Altitude: 68m.
Province and type: 8.1.1; 12.
Site description: A permanent freshwater lake and surrounding marshes on calcareous soils; fed by several small streams and with no surface outflow.
Principal vegetation: The dominant species include *Eleocharis intersticta, Phragmites communis, Nymphaea ampla, Spilanthes americana, Viguiera dentata, Passiflora foetida, Cucurbita radicans, Cereus undatus* and *Pachira aquatica.*
Land tenure: A mixture of private and municipal ownership.
Protection: None.
Land use: Wood-cutting and some intensive agriculture in surrounding areas.
Waterfowl: Similar to Lago Peten-Itza (site 19).
Other fauna: No information.
Threats: None known.
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 3a.

Los Medanos lakes and marshes (21)

Location: 17°16'N, 90°29'W; 90 km west of Tikal, Peten Department.
Area: 9,600 ha.
Altitude: 67m.
Province and type: 8.1.1; 09, 11, 12 & 18.
Site description: A complex of small permanent freshwater lakes, marshes and swamp forest near the Rio San Pedro, and the riverine marshes along that river; in a low-lying karst region.

Principal vegetation: The dominant species include *Rynchospora aristata, Scleria hirella, Wedelia parviceps, Cyperus luzulae* and species of *Trachypogon, Andropogon, Paspalum, Axonopus* and *Leptocorypium.*
Land tenure: A mixture of state and municipal ownership.
Protection: None.
Land use: Some wood-cutting and agriculture in surrounding areas; there is an archeological site (El Peru) nearby.
Waterfowl: Similar to Lago Peten-Itza (site 19).
Other fauna: No information.
Threats: None known.
References: Lundell (1937); Godoy (1984).
Source: Juan Carlos Godoy.
Criteria for inclusion: 3a.

Rio Escondido and marshes (22)

Location: 17°17'N, 90°51'W; west of El Naranjo, near the Mexican border, Peten Department.
Area: 17,900 ha.
Altitude: 45m.
Province and type: 8.1.1; 10, 11, 13 & 18.
Site description: A fast-flowing river and extensive shallow freshwater marshes and swamp forest, with some small freshwater lakes.
Principal vegetation: Swamp forests with *Conostegia xalapensis, Erytroxylon areolatum, Eugenia capuli, Mimosa albida, Simaruba glauca, Acrocomia mexicana, Curatella americana, Acacia spadicigera* and species of *Brosimum, Bucida, Casia, Enterolobium, Licania, Guarea, Pouteria, Luehea, Spondias* and *Cochlospermum.* In a region of humid tropical forest.
Land tenure: Unknown.
Protection: None.
Land use: Hunting, fishing, wood-cutting, and capture of animals for the zoo and pet trade, for sale in Guatemala and for exportation.
Waterfowl: Similar to Lago Peten-Itza (site 19).
Other fauna: *Crocodylus moreletii* occurs.
Threats: None known.
References: Godoy (1984).
Source: Juan Carlos Godoy.
Criteria for inclusion: 3a.

El Tigre lakes (23)

Location: 17°37'N, 90°56'W; 40 km north of El Naranjo, in extreme northwestern Guatemala near the Mexican border, Peten Department.
Area: 16,700 ha.
Altitude: 50m.
Province and type: 8.1.1; 12, 16 & 18.
Site description: A group of small permanent freshwater lakes and marshes with surrounding irregularly flooded grassland and swamp forest; in a low-lying karst region.
Principal vegetation: Marshes and swamp forest with *Eleocharis retroflexa, Fuirena simplex, Pachira aquatica, Haematoxylum campechianum, Talisia floresii, Diospyros bumelioides, Cupania belizense, Achras zapota, Cestrum panamensis*, and species of *Croton, Phyllanthus, Caesalpinia, Cryosophila, Sabal* and *Swietenia.*
Land tenure: Within state and private concessions for the exploitation of timber and oil resources.
Protection: None.
Land use: Very little at present; some hunting of large mammals, and some exploitation of *Achras zapota* (the chewing-gum tree).
Waterfowl: Similar to Lago Peten-Itza (site 19).

Other fauna: *Crocodylus moreletii* occurs.
Threats: Development of the petroleum industry.
References: Lundell (1937).
Source: Juan Carlos Godoy.
Criteria for inclusion: 0.

Rio Candelaria and marshes (24)

Location: 17°45'N, 90°42'W; 60 km NNE of El Naranjo, on the Mexican border, Peten Department.
Area: 17,500 ha.
Altitude: 60m.
Province and type: 8.1.1; 10, 11, 13, 16 & 18.
Site description: A complex of small permanent shallow freshwater lakes, marshes, seasonally flooded grassland and swamp forest.
Principal vegetation: Natural grassland subject to seasonal flooding; in a region of humid tropical forest with trees less than 6m high.
Land tenure: State owned.
Protection: None.
Land use: Very little; some cattle ranching nearby, and some illegal capture of wildlife for exportation by Mexican poachers.
Waterfowl: Similar to Lago Peten-Itza (site 19).
Other fauna: *Crocodylus moreletii* occurs.
Threats: Development of the petroleum industry.
References: Lundell (1937); Godoy (1984).
Source: Luis M. Villar Anleu and Juan Carlos Godoy.
Criteria for inclusion: 0.