Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 of the Conference of the Contracting Parties.

1. Date this sheet was completed/updated:
31st July 2003

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DD MM YY

Designation date | Site Reference Number

2. Country:
UGANDA

3. Name of wetland:
Lake Nabugabo wetland system

4. Geographical coordinates:
0°19' – 0°29'S, 31°50' – 31°58'E

5. Elevation:
Average: 1,136 metres above sea level

6. Area:
Approximately 3,600 ha. (Lake Nabugabo only);
Total area of site approximately 22 000 ha

7. Overview:

Lake Nabugabo is a shallow freshwater lake about 8.2 km long by 5 km wide; three much smaller satellite lakes (Kayanja, Manywa and Kayugi) are located in the same basin 4-6 km to the NW. Nabugabo is separated from Lake Victoria by a sand bar 1.2 to 3 km wide. Maximum lake depth is about 5 metres. The lake is mostly surrounded by very extensive *Loudetia* swamp, especially to the north and south. *Miscanthidium*, *Vossia* and *Sphagnum* bog are also present. Papyrus although present is not dominant in any area. There is a forest along the north-western shore and sandy beaches along the windward, eastern shoreline.

The water is extremely dilute (0.015 g/l; EC < 40 μS/cm); about 20% of the Lake Victoria salinity. Tourism development (existing and on-going) along the western shore; burning of the wetland vegetation and that along the sandbar and over-fishing all threaten the long-term security of the Nabugabo ecosystem.

This group of lakes has been isolated from Lake Victoria for about 3,700 years during which time certain fish fauna has undergone variation. These include the endemic fish species Cichlids *Oreochromis esculentus* and *O. variabilis,* Haplochromines *Haplochromis velifer*, *H. simpsoni*, *H. annectideus*, *H. beadlei*, *H. venator.* Other species similar to those of Lake Victoria cohorts include the lungfish *Protopterus aethiopicus* cat fishes *Clarias gariepinus* and *Synodontis victorinus*, and a Cyprinid *Rastrenoebolus argentea* and swamp species *Ctenopome murei* and *Pseudocrenilabrus multicolor victoriae*.

Nabugabo is an important migratory stop-over/destination for migratory bird species both to the south and palearctics. According to bird counts in the area, at one time of the year, it holds more than 15% of the world's population of the Blue Swallow. The area regularly holds more than an average of about 400,000 White Winged Terns, which is over 20% of the world population. Nabugabo also contains 5 globally threatened bird species: Blue Swallow (Vulnerable); Shoe Bill (Near Threatened); Great Snipe (Near Threatened); Pallied Harrier (Near Threatened) and the Papyrus Gonolek (Near Threatened).

The site is therefore proposed for listing based on its main importance for fish and unique evolutionary history and support significant bird populations according to the Ramsar criteria.

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8. Wetland Type:
O (permanent freshwater >8ha), **Tp (**permanent freshwater marshes and pools <8ha), **T_s** (Seasonal/intermittent freshwater marshes/pools).

Ranking: **O** > **T_p** > **T_s**

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9. Ramsar Criteria:
1; 2; 3, 5; 6 and 7

The most significant criterion applicable is: 2, 3 and 7.

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10. Map of site included? Please tick ***YES*** ❒ √

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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.

Criteria 1: Lake Nabugabo system has an unusual evolutionary history; water quality; and are satellites to Lake Victoria.

The hydrological situation of Lake Nabugabo with particular reference to Lake Victoria and the neighbouring satellite lakes provides special near-natural wetland type found within the region. Scanty geo-hydrological data is available for areas around the lake. Lake Nabugabo was formed between 3000 – 15000 years ago as a result of a sand bar that was formed on the north-western end of the lake Victoria. The winds blowing across the lake have their effect felt more at this end of the lake. As a result a sand dune was formed from the strong winds. Due to the changes occurring in Lake Victoria, a recession in the lake led to the isolation of Lake Nabugabo system. The rainfall pattern indicates that there does not seem to be an absolute dry spell in the region, which was seen to be an important aspect in terms of biodiversity.

Studies carried out reveal that Lake Nabugabo water has low ionic content as depicted by low specific conductivity mean of 27.9 μS/cm (range 18.1 - 28.9μS/cm). The mean dissolved oxygen DO was 3.9 mg/lO2 (30% saturation) but values as low as 0.00mg/l are sometimes observed. Wetland soils are more acidic compared to lake sediment, with pH values as low as 4.0. The shallow Nabugabo lakes (Nabugabo, Kayugi and Birinzi) support an algal biomass giving a range of chlorophyll-a concentrations (11-140mg.m3) and the low lake transparency of 0.8m indicate degradation of the water environment. Total phosphorus concentration range 1 μM to 7uM. Soluble reactive silica varies widely (2uM to 230 μM, average 104.0 μM).

This group of lakes has been isolated from Lake Victoria for about 3,700 years during which time certain fish fauna has undergone variation. These include the endemic fish species Cichlids *Oreochromis esculentus* and *O. variabilis,* Haplochromines *Haplochromis velifer*, *H. simpsoni*, *H. annectideus*, *H. beadlei*, *H. venator.* Other species similar to those of Lake Victoria cohorts include the lungfish *Protopterus aethiopicus* cat fishes *Clarias gariepinus* and *Synodontis victorinus*, and a Cyprinid *Rastrenoebolus argentea* and swamp species *Ctenopome murei* and *Pseudocrenilabrus multicolor victoriae*.

Criteria 2: Contains rare and endangered species of fish.

Natural populations of fish species in the Nabugabo region, like elsewhere, have under gone dramatic changes including severe reduction in sizes, division of original stocks into disjunct subunits, and segregation into several isolated population units either within a single water body or but can be worse into separate waters. In addition, these changes have been either preceded or precipitated by introductions of non-indigenous species that out competed the native forms and in case of closely related species genetically swamped them through hybridization. The latter is especially the case in Nabugabo lakes. Such events lead to fragmentation of populations, which results in reduction in genetic diversity due to genetic drift, inbreeding and reduced or lack of gene flow among independent units. Such phenomena make the continued existence of fisheries stocks in the wild precarious, more so in the face of the competition from exotic species. Species introductions coupled with growing exploitation pressure of the fisheries of these lakes have put the native stocks at risk. Nabugabo lakes harbor cichlid species that are unique to these lakes especially species of the cichlid complex.

Oreochromis esculentus is endemic to Nabugabo and is the most important commercial fish species. However, it became endangered with the introduction of modern fishing technology. Other endemic Cichlids include the tilapines *Oreochromis variabilis and* five species of Haplochromines; *Haplochromis velifer*, *H. simpsoni*, *H. annectideus*, *H. beadlei*, *H. venator.*

Nile perch and several tilapiines were introduced into Lake Nabugabo in the 1960's. This was followed by disappearance of many of the native fish species notably *Oreochromis esculentus, Oreochromis variabilis* and *Bagrus docmac* have disappeared from Lake Nabugabo. The number of haplochromine species has reduced from the eight species originally recorded to only 5 species currently. The fishery is now dominated by the introduced species notably *Lates niloticus* and *Oreochromis niloticus*. These three satellite lakes need to be protected to conserve these species. Swamps around the lakes should be protected to prevent Nile perch from spreading into the three lakes. A Cyprinid species *Rastrineobola argentea,* also occurs in lake *Nabugabo.*

Nabugabo also contains 5 globally threatened bird species: Blue Swallow *Hirrundo atrocaerulea* (Vulnerable); Shoe Bill *Balaeniceps rex* (Near Threatened); Great Snipe *Gallinago media*(Near Threatened); Pallied Harrier *Circus macrourus*(Near Threatened) and the Papyrus Gonolek *Laniarius mufumbiri*(Near Threatened). It is for this reason that Lake Nabugabo system has been designated as one of **the 30 Important Bird Areas in Uganda**.

Criteria 3: Populations of plant and animal species important for maintaining the biological diversity of the region

L. Nabugabo has the highest biodiversity ranking of 93 wetland sites surveyed by the Uganda Wetland Biodiversity Study (1996) based on plants, dragonflies, birds and fish as shown in **Tables 1 to 6**. A comparative analysis of the biodiversity ranking for Nabugabo compared to other wetland sites in Uganda and importance according to different taxa is attached as **Appendix I**.

Fish species diversity in the open water of Lakes Victoria, Kyoga and Nabugabo has been reduced by the introduction of the Nile perch, *Lates niloticus* and about 200 out of more than 300 haplochromine species in Lake Victoria are feared to have become extinct. Some information on species diversity in lakes of the Nabugabo system since the Lates introduction has been published and is summarised in the accompanying tables. It is to be noted that with successive surveys in these lakes more species are added; the data should therefore be regarded as minimum estimates of diversity.

Recent studies have shown that some fish species, which may have been depleted by the Nile perch in Lakes Victoria and Nabugabo, still survive in Lakes Manywa, Kuyugi and Kayanja. These small satellite lakes therefore have considerable ecological significance, which justifies their inclusion in the proposed Ramsar site.

Nabugabo is an area of remarkable conservation significance at least from a botanical viewpoint. Close to 300 species are recorded. This is a fairly high number of species for its size and some of these are species that require global attention and high protection. According this area a high conservation status is recommended so that Nabugabo may act as a 'museum' of these important species.

Nabugabo wetland system also holds more than 15% of the world's population of the Blue Swallow and also contains 5 globally threatened bird species (Blue Swallow, Shoe Bill, Great Snipe, Pallied Harrier, and the Papyrus Gonolek).

Criteria 5 and 6: Nabugabo is an important migratory stop-over/destination for migratory bird species both to the south and Palaearctic's. According to bird counts in the area, at one time of the year, it holds more than 15% of the world's population of the Blue Swallow. The area regularly holds more than an average of about 400,000 White Winged Terns, which is over 20% of the world population.

Criteria 7: Holds species of indigenous Cichlid fishes including two Tilapines, five species of endemic Haplochromines and other swamp fish species.

These include *Oreochromis esculentus*, *O. variabilis, Haplochromis velifer*, *H. simpsoni*, *H. annectideus*, *H. beadlei*, *H. venator Synodontis victorinus*, *Ctenopome murei*, *Pseudocrenilabrus multicolor victoriae,*

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13. General location:
Nabugabo wetlands are located 15 km due east of **Masaka** with a population of 14,413 according to 1991 population census; and 105 km south-west of **Kampala**

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14. Physical features:

Climate:
The Climate around Lake Nabugabo, and Masaka district at large is tropical in nature, being modified by relief and nearness to Lake Victoria. The rainfall pattern is bimodal having two seasons with dry spells between July and August, and January to March. The months of March, April and May receive very heavy and well distributed rains of up to 1,200mm. The second rainy season is in the months of September to December, with the exception of a few years of declining trend in precipitation. The annual average rainfall received is between 1100mm - 1200mm with 100 - 110 rainy days. The average maximum temperature does not exceed 30°C and the minimum not below 10° C, with almost equal length of day and night throughout the year. The humidity level is generally low throughout the district with the exception of lakeshore areas where it tends to rise.

Hydrology and water characteristics:

Lake Nabugabo is sustained by direct rainfall and run-off from the western side via two or more small streams. Outflow to Lake Victoria is through seepage across the eastern sand bank and there are no surface outflows from either Nabugabo or the satellite lakes.

The hydrology of the satellite lakes is unknown since all are surrounded by seasonal wetlands. However, there is no dependable information on the water balance. These lakes lie at a slightly higher elevation than Nabugabo and are not thought to be connected hydrologically.

The water in Lake Nabugabo is extremely dilute (0.015 g/l; EC < 40 µS/cm); about 20% of the Lake Victoria salinity.

Water depth in Nabugabo fluctuates seasonally by less than 50 cm, with the maximum depth being about 5 metres and the lake is permanent. No detailed data is available on water depth, permanence and fluctuation for the satellite lakes but they remain permanent except for Kayugi, which may dry up in extremely dry seasons.

Geology and geomorphology:
Nabugabo and the satellite lakes are natural and are believed to have been originally a bay connected with Lake Victoria. Approximately 3,500 years ago, the lake level fell and the Nabugabo system became separated from Lake Victoria. Further loss of water separated the three lakes from Lake Victoria and left a thin sandbar in between.

Soils:
The soil texture varies from place to place ranging from red laterite, sandy loam and loam

and is in general not very productive. Soils are generally ferrallitic, characterised by red sandy clay loams, yellowish sandy loams and along the lakeshores, soils are hydromorphic.
(e.g., geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; catchment area; downstream area; climate)

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15. Hydrological values:

The Lake Nabugabo wetland system has a link with the main Lake Victoria which is about 15 meters below Nabugabo. Therefore any sub-surface flows passed from Nabugabo to Victoria and not vice versa.

Generally, a large amount of water flows through streams to lakes and rivers every year. A huge amount of rainwater run-off during heavy to medium rainfall periods. This could be purposefully used for irrigation. The system thus plays an important hydrological role for the waters entering Lake Victoria. The main hydrological function of the system is water storage, flood control, ground water recharge, sediment retention and water purification. During the dry season, the system maintains a steady discharge of water and supplements the water supply to the surrounding areas.

The system also plays a role in trapping sediments carried from the surrounding catchment in times of heavy run-off and hence reduces the level of sediments carried to Lake Victoria, thereby helping to maintain the natural clean water conditions important for the survival of many fish species.

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16. Ecological features:

Lake Nabugabo wetland system supports an unusually high diversity of plant species, including insectivores of the family *Droseraceae*. Thirty-four families and over 92 species have been recorded. This diversity is probably due to the wide variety of habitats in the area. A zone dominated by Sphagnum moss exists in the east and south-eastern area of Nabugabo.

The wetland around Lake **Nabugabo** (Lwamunda Swamp) is dominated by *Miscanthus* and *Loudetia spp*. Along the western side of the sandbar to the northeast there is a natural swamp forest. Further swamp forest exists on the sandbar adjacent to Lake Victoria. The water in the lake is slightly alkaline and has extremely low dissolved solids giving a conductivity of less than 40 μS/cm. The swamp water is more acidic.

Lake **Kayanja** is surrounded by a dense Miscanthidium swamp; there are patches of swamp forest dominated mainly by Alchornea cordifolia and Beilschmiedia ugandensis on raised ground fringing the swamp.

Lake **Kayugi** is surrounded by a pure Papyrus swamp associated with Ficus congensis. It is a free-floating swamp. The open water is devoid of Nymphaea sp., Nymphoides nilotica or Ceratophyllum demersum.

There seems to be a trend towards encroachment into the Lake Nabugabo of wetland vegetation especially in the north and south-east. Many Lake Edge trees have dried recently, possibly because of the high water level, which resulted from El Nino.

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17. Noteworthy flora:

The wetland supports an unusually high diversity of plant species, including insectivores of the family Droseraceae. Thirty-four families and over 92 species have been recorded. This diversity is probably due to the wide variety of habitats in the area. A zone dominated by *Sphagnum* moss was reported in the mid-1960's in the east and south-eastern area of Nabugabo, its current status is not known.

18. Noteworthy fauna:

Nine species of Cichlidae are known to have existed in these lakes, including five endemic species of Haplochromids: *Oreochromis esculentus*, *Ctenopome murei* and *Pseudocrenilabrus multicolor victoriae, Rastuenoebalus argentea, Protopterus aethiopinus, Clarias gariepinus*, *Synodontis victorinus* (See Appendix I).

Nabugabo is an important migratory stop-over/destination for migratory bird species both to the south and palearctics. According to bird counts in the area, at one time of the year, it holds more than 15% of the world's population of the Blue Swallow. The area regularly holds more than an average of about 400,000 White Winged Terns, which is over 20% of the world population. Nabugabo also contains 5 globally threatened bird species: Blue Swallow (Vulnerable); Shoe Bill (Near Threatened); Great Snipe (Near Threatened); Pallied Harrier (Near Threatened) and the Papyrus Gonolek (Near Threatened). It is for this reason that Lake Nabugabo system has been designated as one of the **30 Important Bird Areas in Uganda**.

19. Social and cultural values:

Lake Nabugabo, the satellite lakes and surrounding wetlands have served as a source of fish for both subsistence and commercial use by the surrounding communities. Up to the 1950s most of the seasonal wetland area around Lake Nabugabo was used for livestock grazing especially during the dry season and no cultivation was reported to have been carried out in these wetlands. The wetlands have also traditionally been used as sources of water and handcraft materials. With the increase in population and need for more agricultural land, crop cultivation and diary farming was carried out in wetland areas.

Wetland areas around Lake Nabugabo system have traditionally been recognised as important cultural sites for historical and religious / spiritual values, especially the satellite lakes. This is mainly reflected in the traditional beliefs, totems, which have contributed to the conservation of the wetland areas around Nabugabo and the satellite lakes.

20. Land tenure/ownership of:

The land tenure/ ownership of Lake Nabugabo system is leasehold for some areas that have dairy farms and the five developed resort beaches and the rest is free hold and mailo. However, the wetland and Lake Area are held in trust for the people in accordance to the Uganda Constitution (1995) and Land Act (1998), and can therefore be considered as public land.

21. Current land use:

There are a number of current land uses around the Nabugabo system, which include fishing, water utilisation, agriculture, livestock farming and tourism. These have a very significant socio-economic impact on the lives of local communities in the area.

Around *Lake* ***Nabugabo*** there are four holiday and conference centres. Other activities and businesses along the western shore include fishing activities; boating on the lake; artisanal fishery using canoes and gill nets and Cattle are watered at the lake. Few fish are landed compared to the catches in Lake Victoria. The restaurant buys from traders supplying from Lake Victoria.

Around *Lakes* ***Kayanja, Manywa*** *and* ***Kayugi*** and surroundings, there is agriculture and grazing in the surrounding area, which may have a minimum level of degradation.

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

(a) Site: *Lake* ***Nabugabo*** — existing tourism facilities, their probable expansion in the future; the wastewater effluent from these facilities and increased water related activities; continuing fishing pressure; continued burning of the grassland on the sand bar; as international tourism increases the site could attract budget over-land camping safaris in larger numbers. Water pollution from cattle grazing and watering. Power boats have been seen on the lake recently. The introduction of alien fish species (section 16). There seems to be a trend towards encroachment into the lake of the wetland vegetation especially in the north and south east of the lake. Many lake edge trees have died recently; possibly because of the high water level resulting from El Nino.

(b) Site: *Lakes* ***Kayanja,*** *Manywa and* ***Kayugi***: these lakes could be well protected by local customs and 'spiritual' aspects attributed to them. However, potential developments can overpower the cultural aspects.

(c) Around the site: further residential development in the immediate lake shore region especially along the western side; continuing deforestation in the nearby lake catchment; the lake has been assessed as a possible source of raw water for supply to Masaka township.

23. Conservation measures taken:

Masaka Local Government is planning restrictions to promote the management and conservation as outlined in their Development Plan for the period 2001 – 2005. They also plan to formulate an ordinance for the district, which will go a long way to conserve the system.

The local customs in the area, which limit access to the satellite lakes, contribute to the conservation and management of the system.

24. Conservation measures proposed but not yet implemented:

One key conservation measure is the current proposal to have the area listed under the Ramsar Convention. This proposal has been discussed and given total support by the Masaka District Local Government.

To promote sustainable utilisation of wetland resources in Nabugabo, the Wetland Inspection Division, in collaboration with Masaka District Local Government and sub-counties of Bukakata, Mukungwe and Buwunga have developed a Wetland Management Plan for the Lake Nabugabo wetland system. The plan aims at promoting the sustainable utilisation of Nabugabo wetland resources for improved livelihoods of riparian communities while maintaining its ecological importance of the importance as habitat or flora and fauna especially endemic cichilid fish species.

25. Current scientific research and facilities:

Makerere University Institute of Environment and Natural Resources has carried out research on the Biodiversity of the area. A number of researchers have also carried out scientific research, most of which has been published and is in the attached reference list.
The Fisheries Resources Research Institute (FIRRI) in collaboration with the University of Florida, has also carried out various research projects on different aspects of fish in the area, some of which has also been published. The Lake Victoria Environment Project (LVEMP) also through FIRRI supports research around Nabugabo. Both FIRRI and MUIENR have research work on-going on different taxa and water quality.

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26. Current conservation education:

National Wetlands Programme (NWP) conducted a two-day training course for district councillors in 1998, which initiated proposing the listing of Nabugabo as a Ramsar site. After that, a series of mobilisation and sensitisation meetings have been conducted at different administrative levels up to the lowest village level. These have acted as a tool to conservation education in the area.

The management planning process was also started with a series of mobilisation and sensitisation meeting. The planning process has also served as a good tool for conservation education in the area. Wetland Inspection has also used both the planning and sensitisation activities to popularise wetland wise use guidelines in the area.

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27. Current recreation and tourism:

Lake Nabugabo has a holiday resort and "conference centre" with residential facilities (bandas and camping) plus a small restaurant. Kampala and Masaka residents mainly use the centre at weekends. Some workshops and conferences are held there. Some recreational sailing takes place on the lake; recreational fishing is almost non-existent due to the scarcity of larger fish. Canoes can be hired from the centre. Water skiing also takes place occasionally. Tourists and local people use the lake for swimming and bathing; this is because it has the reputation (probably correct) of being bilharzia free (none of the host snails have been observed there).

Access to Lake Kayanja appears to be difficult and the extensive wetland surrounding all three-satellite lakes may further reduce the likelihood of development in the area.

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28. Jurisdiction:

(a) Functional: Wetland Inspection Division (WID), National Environment Management Authority (NEMA), Forestry Department, District Environmental Officer, District Fisheries Officer.

(b) Territorial: Masaka District Local Government and the lower councils (Buwunga, Mukungwe and Bukakata sub-counties).

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29. Management authority:

According to the Constitution (1995), wetlands are held in trust for the people, therefore functionally, wetlands jurisdiction is in the hands of the Central government. According to the Local Government Act (1997) wetland management is devolved to Local Governments.

Therefore, the management authority is:
Masaka District Local Government
(Buwunga, Mukungwe and Bukakata Sub-counties)
P. O. Box 634
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UGANDA

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30. Bibliography:

Below are some publications for work carried out in Nabugabo. Full details can be found in the Wetland Inspection Division Documentation Centre.

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APPENDIX I: COMPARATIVE ANALYSIS TABLES FOR NABUGABO'S BIODIVERSITY IMPORTANCE WITH REFERENCE TO DIFFERENT TAXA

TABLE 1. Biodiversity status for Nabugabo compared to other key wetland sites**

BIODIVERSITY VALUES OF SITES BASED ON WL & WA DATA ONLY.

TABLE SORTED ON RANK (b) VALUES

Site	Biodiversity Value						Rank	
	Plants	Odonata	Fish	Birds	Mean (a)	Mean (b)	(a)	(b)
Lake Nabugabo	19.15	2.19	0.28	2.89	**6.13**	**6.13**	2	1
Muchoya swamp	18.85	0.19		1.03	**6.69**	**5.57**	1	2
Lutembe Bay	11.10	1.37	2.30	5.98	**5.19**	**5.19**	4	3
Omito (L. Bisina)	5.11		3.81	8.37	**5.76**	**4.68**	3	4
Kyojja swamp	10.55	0.85	0.48	5.05	**4.23**	**4.23**	7	5
Doho Rice Scheme	2.63	6.01		4.68	**4.44**	**3.88**	6	6
Oyu (Albert Nile)	8.25	1.60			**4.93**	**3.81**	5	7
Lake Mutanda	8.77	0.35	0.78	3.45	**3.34**	**3.34**	10	8
River Sezibwa Falls	6.69	5.40	0.28	0.24	**3.15**	**3.15**	11	9
Lake Opeta	5.93	1.00	3.77	1.60	**3.08**	**3.08**	12	10
Kitanga swamp	7.07	3.14	0.38	1.57	**3.04**	**3.04**	13	11
Lake Kochobo	5.17	0.91	1.17	4.43	**2.92**	**2.92**	14	12
Masulula swamp	2.55			4.79	**3.67**	**2.74**	8	13
Rhino Camp (Albert Nile)	0.17	1.13	8.66	0.83	**2.70**	**2.70**	15	14
Lumbuye Dam	3.04	2.33			**2.69**	**2.69**	16	15
Aakide (Lake Bisina)	5.55	2.59	1.35	1.23	**2.68**	**2.68**	17	16
Sezibwa swamp forest	6.98			0.03	**3.51**	**2.65**	9	17
Waseko (Victoria Nile)	1.87	0.07	5.29		**2.41**	**2.61**	22	18
Lake Mburo	2.95	0.05	3.76	3.22	**2.50**	**2.50**	19	19
Lake Munyanyange	1.48	0.02		6.11	**2.54**	**2.45**	18	20
Kazinga Channel	0.58	0.20		6.70	**2.49**	**2.42**	20	21
Kasenyi (Lake George)	3.68	0.02	1.64	4.32	**2.42**	**2.42**	21	22
River Malaba	3.99	3.20	0.76	1.64	**2.40**	**2.40**	23	23
Lake Nyaguo	1.66	0.02		4.24	**1.97**	**2.03**	25	24
Hamukungu (Lake George)	3.67	0.02	2.45	1.94	**2.02**	**2.02**	24	25
Acha swamp	2.52	2.60	0.50	1.84	**1.87**	**1.87**	27	26
Lake Gigati	1.46	0.02	2.44	2.71	**1.66**	**1.66**	26	27
Lake Kachera	0.78	0.07	1.49	0.84	**0.80**	**0.80**	28	28
Mean	5.44	1.41	2.19	3.19	**3.26**	**3.06**		
Min	0.17	0.02	0.28	0.03	**0.80**	**0.80**		
Max	19.15	6.01	8.66	8.37	**6.69**	**6.13**		

Mean (b) & Rank (b) = blank cells filled using the mean biodiversity value for the taxon for all sites.
WL & WA = wetland dependent and wetland associated respectively

** Detailed analyses of the different taxa in Lake Nabugabo are indicated in Table 2-6

TABLE 2. Species richness, rarity and overall biodiversity assessment scores for the Lake Nabugabo and the satellite lakes

Species richness, species rarity and overall biodiversity assessment scores for the Lake Nabugabo system.

		Lake			
Site		Kayanja	Kayugi	Manywa	Nabugabo
Land cover class		SG/W	SGsg	TG	TG
Score for species richness	Plants	0	2	0	0
	Mammals				
	Birds	0	0	0	0
	Amphibians	2	0	0	2
	Butterflies				
	Dragonflies	4	0	0	1
	Fish	3	4	1	5
	Sub-total	*9*	*6*	*1*	*8*
Score for species rarity	Plants	0	3	0	0
	Mammals				4
	Birds	0	0	0	0
	Amphibians	0	0	0	4
	Butterflies				
	Dragonflies	1	0	0	0
	Fish	0	3	0	5
	Sub-total	*1*	*6*	*0*	*13*
	Overall total	**10**	**12**	**1**	**21**

KEY:
SG/W = short grass / water
SG/sg = short grass / sedges
TG = tall grass swamp

0 = no score blank = no data

TABLE 3.

The number of fish species at various sites in the Sango Bay area.

	No. species
L. Nabugabo	***24***
L. Kayanja swamp	***15***
L. Kayugi	***14***
L. Victoria - Diimu	12
L. Victoria - Goma	18
L. Victoria - Nakiga	20

NB. High score for Nabugabo attributed to more intensive sampling; the DI team observe that new species are found with each new survey; so more are likely to be discovered in future.

TABLE 4. Key species of Cichlid fish recorded from L. Nabugabo wetland system

Distribution	Species
Endemic to Lakes Victoria and Kyoga	*Oreochromis esculentus* (Tilapia esculenta) Graham
	Oreochromis (Tilapia) *variabilis* Blgr.
Endemic to Lake Nabugabo system	*Haplochromis velifer* Trewavas, 1933.
	Haplochromis simpsoni sp. nov.
	Haplochromis annectideus Trewavas, 1933.
	Haplochromis beadlei Trewavas, 1933.
	Haplochromis venator sp. nov.
Widely distributed in the Lakes Victoria and Edward drainage basins	*Astatoreochromis alluaudi* Pellegrin, 1903. (1)
	Hemihaplochromis multicolor (Schoeller) 1903.
	Haplochromis nubilus (Blgr.) 1906.
Introduced species	*Lates niloticus* (2)
	Tilapia zillii
	Oreochromis niloticus
	Oreochromis leucostictus

(1) possibly an introduction to Lake Nabugabo.
(2) the Nile perch is not a cichlid species; there are several other non-cichlid fish species in these lakes.

TABLE 5.

NUMBER OF PLANT GENERA AND SPECIES AT LAKE NABUGABO AND ALL SITES COMPARED.

	WL & WA		WL only	
Site	Genus	species	Genus	species
Nabugabo	61	74	13	15
All sites(*)				
Mean	21	26	9	10
Max.	61	74	23	30

Wetland plants of the Sango Bay area

(*) = 93 sites in total.

	No. species	No. unique spp.
L. Kayugi	54	19
L. Kayanja swamp	26	6
L. Victoria - Diimu	50	22
L. Victoria - Goma	76	36
L. Victoria - Nakiga	53	10

TABLE 6.

NUMBER OF BIRD SPECIES AT LAKE NABUGABO AND ALL SITES COMPARED.

	WL+ WA+WLP	WL + WLP	ALL BIRDS
Site	No. species	No. species	No. species
Nabugabo	27	21	35
All sites(*)			
Mean	25	17	30
Min.	1	0	6
Max.	68	51	82

(*) = 93 sites in total.