

Wetland Characteristics and Uses

Wetlands cover about 15 percent (31,406 square kilometers) of Uganda's total land area (205,212 square kilometers) and can be found in almost every subcounty. Most individual wetlands are linked to other wetlands through a complex network of permanent and seasonal streams, rivers, and lakes (Map 2), making them an essential part of the entire drainage system in Uganda (UN-WWAP and DWD, 2005).

While such a dispersed geographic coverage provides wetland benefits to a greater number of people, it also increases the likelihood of overexploitation and degradation. Uganda's high level of political and administrative decentralization adds to this risk. Most wetland systems cross administrative boundaries, which, because of compartmentalization of decision-making at the local level, makes it more difficult to manage wetlands in an integrative manner.

With 11 sites designated as Wetlands of International Importance, Uganda is internationally recognized for leading the effort in Africa to conserve wetlands that are regionally and globally important for migratory bird species and biodiversity (Ramsar, 2006). Nonetheless, besides those wetlands that have international or national protection status, the great majority of wetlands lie outside the national protected area system (Map 2). Establishing a solid information base on wetland resources, their use, and condition is therefore essential to identifying successful wetland management approaches for the future.

WETLAND CHARACTERISTICS

To describe and categorize these resources, wetland managers often begin with three basic characteristics of wetlands: the permanence and seasonality of their moisture regime, the main vegetation and land cover types, and the resource pressure from human use. The following section categorizes Uganda's wetlands by these key characteristics.

About 75 percent of Uganda's wetlands are seasonal, meaning they are not flooded for part of the year. In many locations, this dry period extends over most of the year.

As Map 2 shows, seasonal wetlands can be found in almost every corner of Uganda. The great majority of these are narrow and elongated in shape, following valley bottoms and streams. These wetlands form densely branched networks, especially around Lake Kyoga. But they are also

found in other areas such as Ssembabule, Lyantonde, and Kiruhura Districts. Large seasonal wetlands are located in various extensive floodplains, such as Katakwi, Nakapiripirit, and Moroto Districts (northeastern Uganda); at the southern end of Lake Albert; in Kasese District; and in Rakai District, bordering Tanzania.

Permanent wetlands are mostly located near open water bodies such as lakes and rivers. The largest permanent wetlands are directly connected to Lake Kyoga and Lake Victoria. Others follow the banks of the Nile River from Lake Albert to the Sudanese border.

Wetlands in Uganda are covered by a variety of vegetation types and occur in all of Uganda's main land cover classes: tropical high forest, woodland, bushland, grassland, papyrus (including other sedges, reeds, and floating plants), and small and large-scale farmland. As Figure 1 indicates, the most common wetlands in Uganda are seasonally wet grasslands, covering 49 percent (about 15,326 square kilometers) of Uganda's total wetland area. Seasonally wet woodlands are the second most common with 16 percent (5,136 square kilometers). Permanent wetlands consisting of papyrus and other sedges, reeds, and floating plants are the third most common wetland type and represent 15 percent (4,840 square kilometers) of Uganda's wetland area. A significant share of seasonal wetlands is used for crops, with 7 percent (2,322 square kilometers) of Uganda's wetland area covered by small-scale farmland.

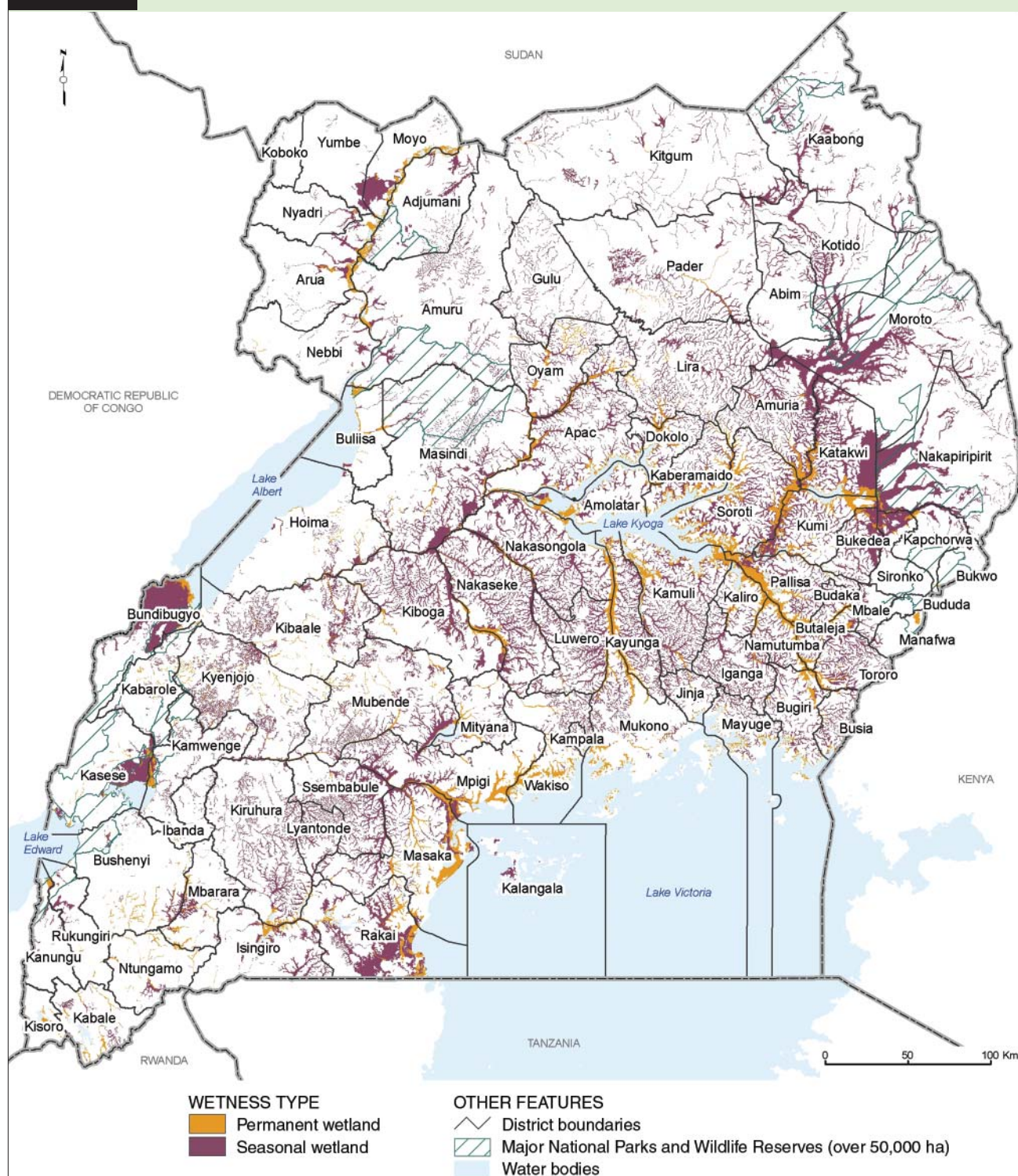
The economic and subsistence uses of wetlands vary with land cover and whether they are seasonal or permanent. The type and level of use in turn determine how vulnerable each wetland is to becoming permanently degraded.

Grasslands, for example, are primarily used for livestock grazing. If they have the right soils and water regime, they are also very desirable for growing crops. In the context of Uganda's heavy dependence on agriculture (UBOS, 2007) and its growing demand for agricultural land, these wetlands are often prime targets for agricultural expansion.

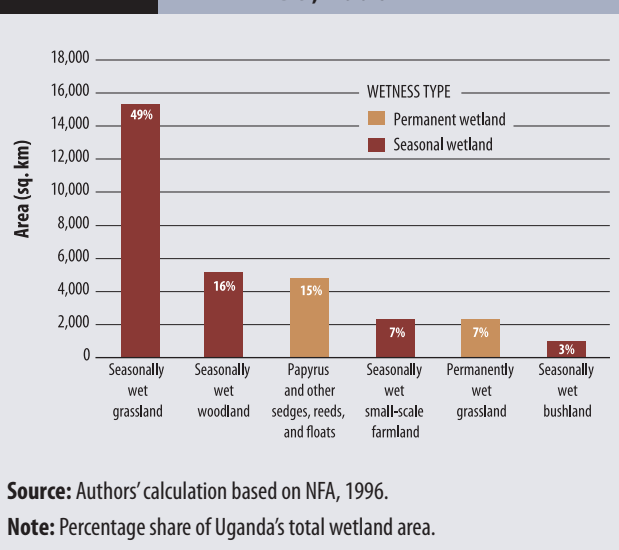
Woodland and papyrus wetlands, on the other hand, provide raw materials, the former for construction and fuel, and the latter for crafts and mats. Both woodland and papyrus wetlands are very vulnerable to over-harvesting of these products, especially if they are close to high demand centers or located along major transport routes.

Map 2

DISTRIBUTION OF PERMANENT AND SEASONAL WETLANDS, 1996



Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), wetness type (NFA, 1996), and major national protected areas (NFA, 2007).

Figure 1**DISTRIBUTION OF MAIN LAND COVER TYPES IN UGANDA'S PERMANENT AND SEASONAL WETLANDS, 1996**

While Map 2 provides a view of the national wetlands distribution and shows their location in every district, local governments and community-based resource user groups need more specific information. First and foremost, local decision-makers need to know what wetland resources they have and the pressure these resources are under.

A simple indicator for a local decision-maker, for example, would measure wetland area per capita, which is the total wetland area of an administrative unit divided by its total population. Such an indicator assumes the following: the more numerous the population in an administrative area, the higher the potential demand on wetland resources, which can lead to a greater number of people fishing, withdrawing water, collecting vegetation, growing crops, extracting clay, constructing houses, or releasing pollutants. Wetland area per capita can therefore be interpreted as a first proxy to measure potential resource usage, and thus pressure on wetlands.

Map 3 displays wetland area per capita by subcounty, represented by the height of the red bar. Wetland area per person varies broadly among the 938 subcounties with data. (The data for the 20 subcounties of Kotido, Kaabong, and Abim Districts are not shown because the census data were deemed unreliable.)

Most subcounties in Uganda have less than 0.2 hectares of wetland area per person (very short red bars). This implies either that wetlands in these areas are sparse (such as in subcounties of Mbale, Arua, and Mbarara Districts) or that they have to be shared among a large number of people (such as in the subcounties of Pallisa, Iganga, and Tororo Districts).

Subcounties with high wetland area per capita (long red bars) are in Kapchorwa, Katakwi, and Moroto Districts (northeastern Uganda). They are also very common in subcounties lying within the triangle formed by Masindi, Kiboga, and Nakasongola Districts, southwest of Lake Kyoga. In general, most subcounties with high wetland area per capita are distinguished by the presence of a specific type of wetland—seasonally wet grasslands—and lower population densities (NFA, 1996; UBOS, 2002b).

Map 3 clearly indicates that the potential demand pressure on wetlands varies across the country but few areas have low pressure (long red bars). Most subcounties have potentially high demand pressure on their wetlands.

A decision-maker in a subcounty with high wetland area per capita can formulate the following hypotheses based on this map:

- Pressure on these wetlands from resource demand is likely to be lower than the rest of the country.
- These wetlands should be able to make a larger per capita contribution both with marketable wetland products and non-marketable wetland ecosystem services.

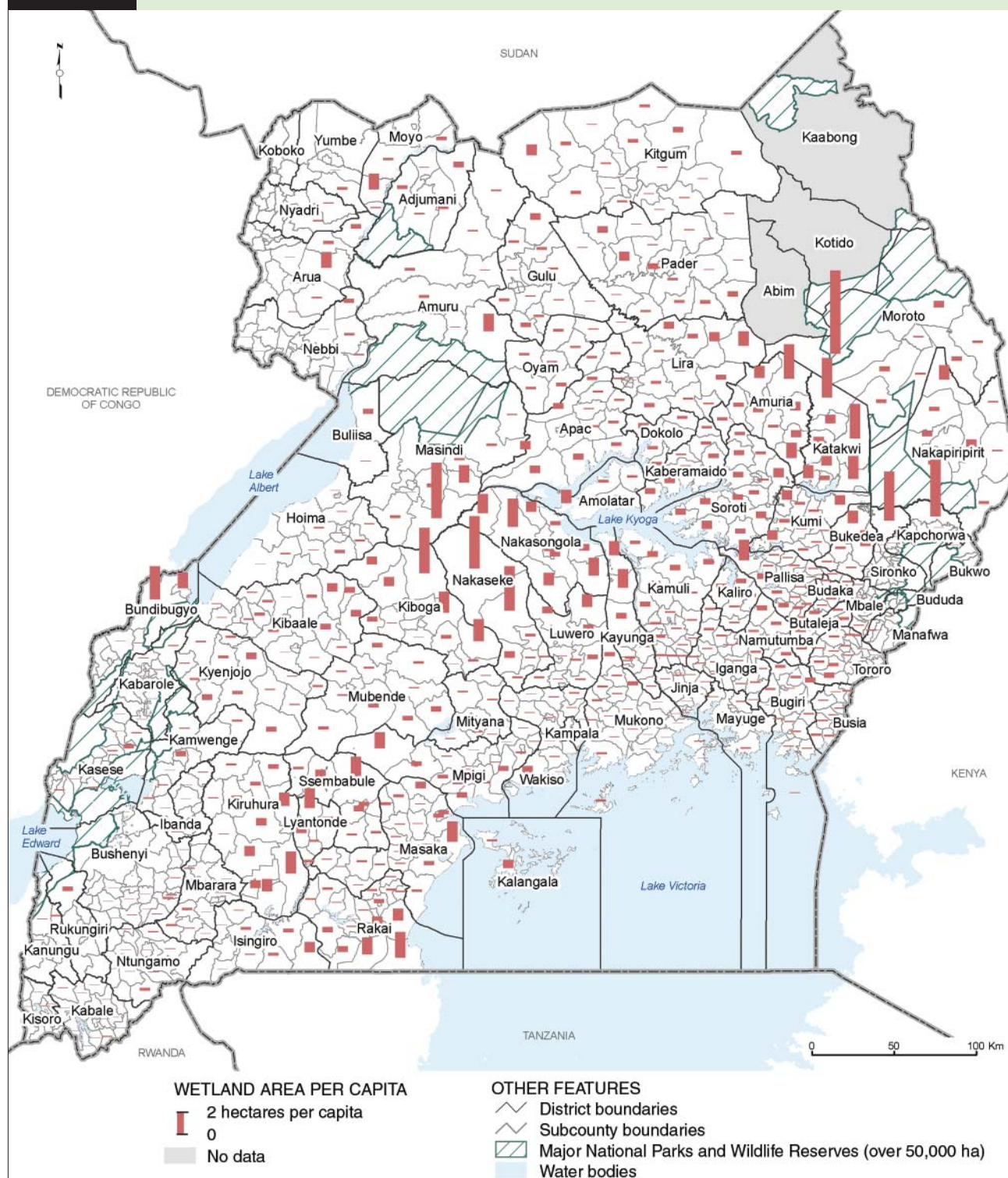
On the other hand, a decision-maker responsible for a subcounty with low wetland area per capita—resulting from a very large number of people sharing a relatively small wetland area—can gain the following insights from this map:

- Competition between different wetland uses has to be carefully managed.
- Special attention has to be paid so as not to undermine the capacity of the wetland to provide its products and services.
- There is a more urgent need to establish well-functioning management plans and zoning of land uses because of the potential for high demand pressure.
- These wetlands will need to be more closely monitored for their resource use.
- Economic returns from resource extraction of marketable products potentially have to be shared among a larger number of people, resulting in low average per capita values.
- While the wetland area per person may be low, these wetlands may still be of great importance locally, for example as a dry season grazing refuge, or nationally, for example to provide habitat for rare species.

In subcounties with large wetlands but very low per capita wetland area—for example wetlands close to an urban center—it is especially important to evaluate a comprehensive set of ecosystem services provided by these wetlands. For such wetlands, it may make little sense to promote increased harvesting of low-return wetland products, especially if this carries the risk of undermining other ecosystem services. Such increases may not provide

Map 3

WETLAND AREA PER CAPITA BY SUBCOUNTY



Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006a), subcounty administrative boundaries (UBOS, 2002a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), and wetland area per capita (authors' calculation based on NFA, 1996 and UBOS, 2002b).

sufficient additional income to each household to justify the heightened risk of overharvesting.

Maintaining these wetlands so that they can continue to filter pollutants for a large number of people living in close proximity may be a more optimal use for such wetlands. This may require prohibiting extractive uses of wetland resources that undermine filtering functions, such as excavation of clay for bricks. Similarly, such wetlands may be most valuable for their role as a temporary reservoir for flood water. The total value of avoided flood damage to nearby establishments with high property values may be considerably greater than the economic returns from consumptive use of a few wetland products.

WETLAND USES

A more advanced understanding of wetland conditions and benefits requires detailed information on the way people use and impact wetlands. Such information is available in geographically referenced format from the National Wetlands Information System (see Box 2).

Uganda's National Wetlands Information System is tracking 13 main wetland uses. They can be ranked according to their increasing potential to undermine the capacity of a wetland to provide its ecosystem services (Table 2).

The least damaging uses for a wetland imply no or very minor modification of its plants, animals, or hydrology. These include tourism and beekeeping.

Box 2

UGANDA'S NATIONAL WETLANDS INFORMATION SYSTEM

The National Wetlands Information System, maintained by the Wetlands Management Department, contains detailed data on different wetland uses, the level of use, and the impact of these uses on wetland systems. It is based on a standardized inventory of wetlands carried out for approximately 5,000 wetland sample points between 1997 and 2001. Each sample point reflects the uses and impacts observed in the field of vision at that location. Field teams inventoried 37 different wetland products, which they aggregated to 13 different main uses (Table 2).

It is important to point out that most of the products and uses inventoried for the National Wetlands Information System focus on provisioning ecosystem services of wetlands (see Table 1). These provisioning services are easier to measure and observe, and provide useful information to understand subsistence and commercial livelihood strategies.

On the other hand, the important contribution of regulating services such as erosion control, fish breeding, flood water retention, and carbon storage were not assessed comprehensively in this first round of data collection. Regulating services were captured in a limited way. Wetlands' contribution to water purification, for example, was counted only when the wetlands were specifically designated for that purpose as part of a wastewater treatment facility. Or the uses were categorized broadly, for example "water collection and use," which is linked to both provisioning services (the quantity of fresh water) and regulating services (water purification and timing of hydrological flows).

Table 2

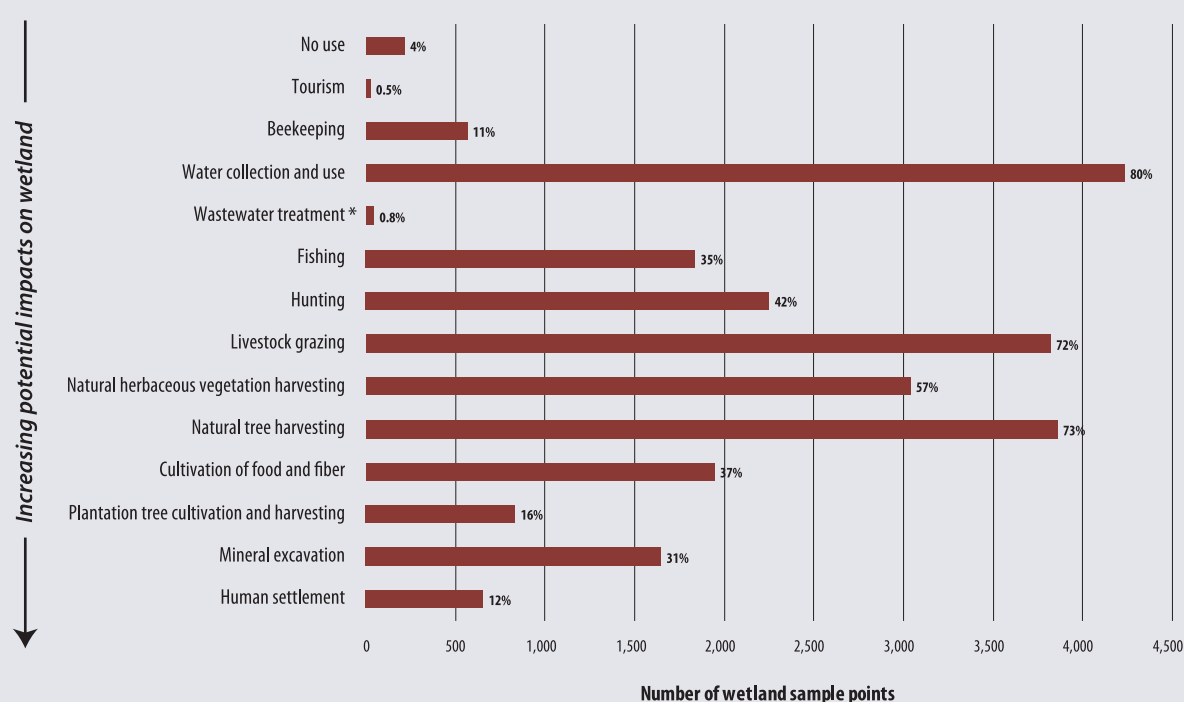
MAIN WETLAND USES INVENTORIED IN UGANDA'S NATIONAL WETLANDS INFORMATION SYSTEM

	Main Wetland Uses	Examples of Products and Services
Increasing potential impacts on wetland	Tourism	Bird watching, nature walks, education
	Beekeeping	Honey and wax; pollination
	Water Collection and Use	Rural domestic water, urban domestic water, water for livestock, industrial water, and irrigation water
	Wastewater Treatment*	Sewage treatment
	Fishing	Food and skins
	Hunting	Meat, skins, and craft materials
	Livestock Grazing	Meat, milk, and other livestock products
	Natural Herbaceous Vegetation Harvesting	Food, fuel, building materials, craft materials, mulch, and medicines
	Natural Tree Harvesting	Food, fuel/firewood, craft materials, building poles or timber, and medicines
	Cultivation of Food and Fiber	Food and fiber
	Plantation Tree Cultivation and Harvesting	Food, fuel/firewood, craft materials, building/fencing materials, and medicines
	Mineral Excavation	Salt, clay, sand, gravel, gold, gemstones, and other minerals
	Human Settlement	Housing and industrial development

Source: WID, 1996

Note: For ranking criteria, see text, p. 12.

* Wastewater treatment only refers to those wetlands that are part of an established human wastewater treatment plant.

Figure 2**FREQUENCY OF MAIN WETLAND USES INVENTORIED IN UGANDA'S NATIONAL WETLANDS INFORMATION SYSTEM, 1997–2001**

Source: Authors' calculation based on WID, 1996.

Note: For ranking criteria, see text, p. 12. Percentage represents share of Uganda's wetlands.

* The percentage related to wastewater treatment only refers to those wetlands that are part of an established human wastewater treatment plant.

The next uses listed in Table 2—water extraction and harvesting of native animals and vegetation (fishing, hunting, livestock grazing, harvesting of natural herbaceous vegetation, and harvesting of trees)—are all activities that could potentially have greater negative wetland impacts at very high use levels. On the other hand, these uses can be sustainable if harvesting does not exceed natural regeneration rates, water withdrawals are adequately replenished, and no other changes occur such as pollution and diseases. Under such a scenario, most other ecosystem services such as water filtration and flood control can be maintained.

The next two wetland uses involve replacing natural wetland vegetation with food, fiber, or tree crops. Such conversions generally lower species composition and biodiversity levels in a wetland. The impact of these uses on regulating services such as water regulation or water purification cannot be determined *a priori* and depends on location and specific circumstances. In some cases, these regulating services are only slightly impacted, and tend to stabilize after an initial disturbance phase. In other cases, they can be greatly affected.

The last two uses are the most destructive to wetlands and negatively affect many ecosystem services. They include removal of soil and plants for mineral extraction (in most cases, excavating clay to produce bricks) or the complete destruction of a wetland by human settlements.

As expected, the impact of these activities is also related to the magnitude of the use. Once the magnitude of use outstrips the capacity of the wetland to sustain it, any use can be destructive and permanently damaging.

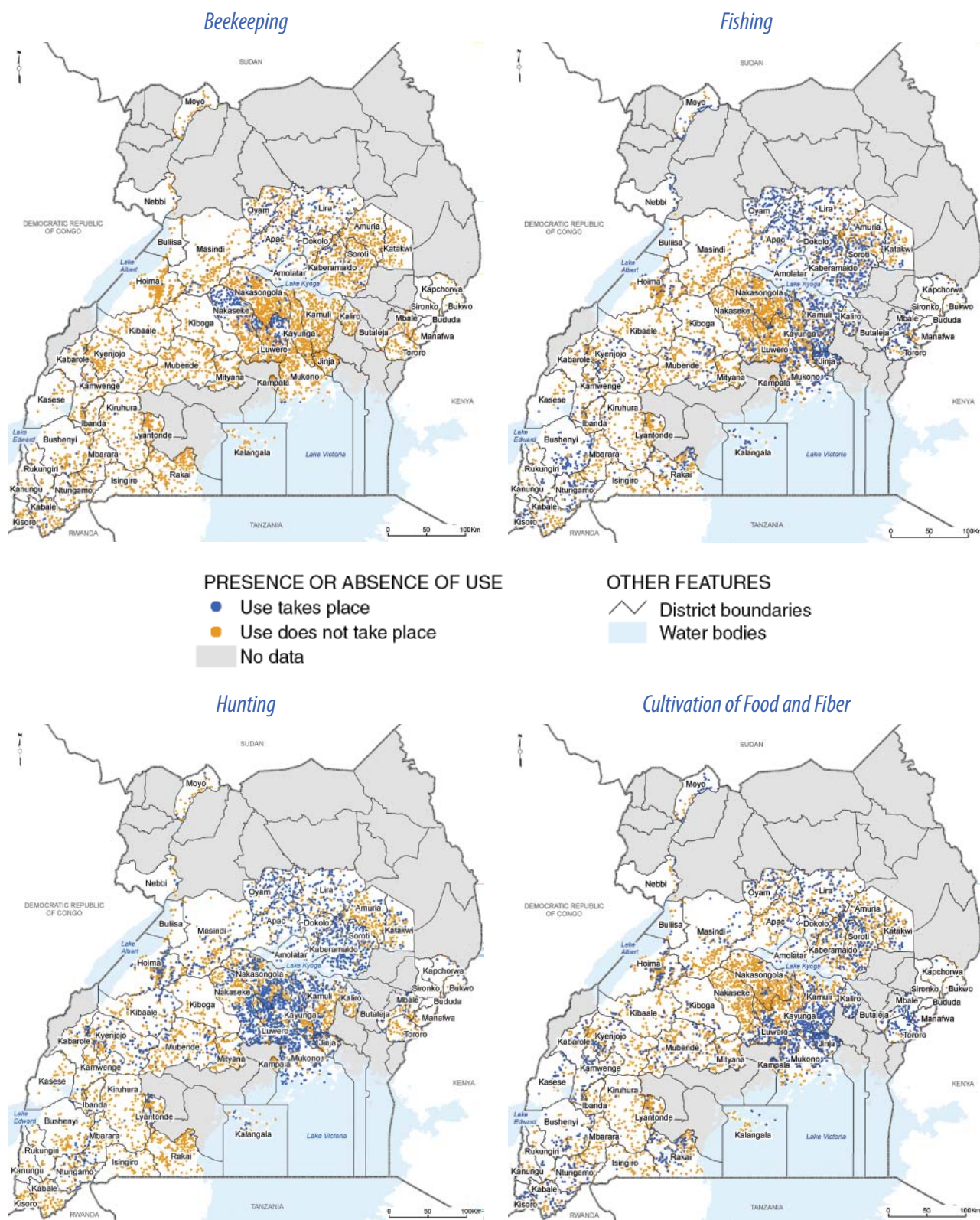
These 13 main wetland uses occur with differing frequency throughout Uganda's wetlands, as shown in Figure 2.

Based on the 13 categories of wetland use inventoried for the National Wetlands Information System, there are very few wetlands that are not used (4 percent). Wastewater treatment and tourism have been identified as uses in less than 1 percent of Uganda's wetlands. The percentage related to wastewater treatment in the National Wetlands Information System only refers to those wetlands that are part of an established human wastewater treatment facility in urban areas. However, all wetlands in Uganda can provide water purification and waste treatment benefits by retaining, recovering, or removing excess nutrients and other pollutants.

Over 70 percent of all wetlands in Uganda are locally used for three simultaneous purposes: water collection and use (80 percent), livestock grazing (72 percent), and natural tree harvesting (73 percent). The ubiquity of these uses is directly related to the wide geographic spread of wetlands and the distribution of Uganda's main vegetation types: grasslands and woodlands.

Map 4

SPATIAL DISTRIBUTION OF SELECTED WETLAND USES, 1997–2001



Sources: International boundaries (NIMA, 1997), district administrative boundaries (UBOS, 2006a), water bodies (NFA, 1996; NIMA, 1997; Brakenridge et al., 2006), and presence or absence of use (WID, 2006).

Mineral (mostly clay) excavation, with its high negative impact on other wetland functions, occurs in almost a third of Uganda's wetlands (31 percent). Destructive human settlements, even though less widespread (12 percent), usually occur close to urban agglomerations. Demand for land and high property values are typically the drivers for the conversion to human settlement. However, many of these conversions do not take into account the economic contribution that wetlands make in treating wastewater from these population centers.

National maps of each use can be produced, because each sample point in the National Wetlands Information System is geographically referenced. Such maps can inform decision-makers where specific uses take place and help them determine where these uses should be further expanded or stopped. These maps can also be compared to those showing other economic activities (such as oil exploration) or levels of legal protection (such as a forest reserve or a national park). This could improve environmental impact assessments and land-use planning. Map 4 highlights four different uses—beekeeping, fishing, hunting, and cultivation—which occur in less than 50 percent of Uganda's wetlands.

Beekeeping (which occurs in 11 percent of all wetlands) is a localized activity. It is concentrated in Nakaseke and Luwero Districts and in parts of Apac and Lira Districts. For the past seven years, beekeeping has spread more widely than shown in this map (which summarizes data from 1997–2001), mainly because of its commercial success (WMD, 2007).

Fishing (occurs in 35 percent of all wetlands) and cultivation of food and fiber (occurs in 37 percent of all wetlands) have very similar spatial patterns. They cluster within the triangle formed by the districts of Jinja, Kayunga, and Kamuli. Both uses are extensive activities in wetlands in Bushenyi and Ntungamo Districts in southwestern Uganda and in communities northeast of Lake Kyoga.

Hunting is more widespread (occurs in 42 percent of all wetlands) and spatially less concentrated than the other three uses. It occurs simultaneously with agriculture and fishing (such as in Jinja, Kayunga, and Kamuli Districts), but is also highly concentrated in the seasonal wetlands around Lake Kyoga.

