COASTAL WETLANDS MANAGEMENT PROTECT

MUNI-POMADZE RAMSAR SITE

THE MANAGEMENT PLAN

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PREAMBLE

In its efforts to balance national development efforts with a rational exploitation of the nation's resource base, Ghana became signatory to some international conventions relating to biodiversity conservation in protected areas and, with World Bank assistance, initiated some projects to implement some of the requirements of these conventions. One of such conventions, the *Convention on Biological Diversitv CCBD),* signed in June 1992 and ratified in 1994, committed the country to start undertaking baseline surveys/inventories of its biological diversity to provide fundamental information on the distribution and abundance of biodiversity to enable long-term management, use and conservation of the country's biodiversity (UNEP, 1992; Stork & Samways. 1995).

Questions about the sustainable exploitation of wetlands worldwide have come to the limelight in recent limes, because of the continuous dwindling in size of wetlands globally as a result of increasing urbanization, with the consequent loss of the flora and fauna of the habitats. In 1988, Ghana became signatory to the *Ramsar Convention (1971),* which, iocussed on the conservation of wetlands of international importance, and stressed the principles of "wise use". Serious wetland conservation efforts in Ghana however started when a management strategy document for Ghana's coastal wetlands was produced (Ntiamoa-Baidu & Gordon, 1991). This document, which focussed on the five key coastal wetlands (Ramsar sites) of Ghana (Keta Lagoon Complex. Songor, Saknmo, Densu Delta, and Muni-Pomadze), essentially outlined the importance of, and threats to. Ghana's wetlands, and also provided recommendations on conservation strategies to maintain the ecological integritv of these wetlands. On the basis of these recommendations, a

(J/iana Coastal Wcilaiuls Management Project (CWMP) was established by the Ghana Wildlife Department (GWD) in 1994, as part of a larger *(iliana I-'nviromnental Resoitn. es Management Project (GERMP),* established in 1992 with funding from the Global Environment Facility (GFP) of the World Bank.

To fulfil the major goals of the CWMP (i.e.to preserve the ecological integritv of coastal wetlands, and enhance the socio-economic benefits of such wetlands to local communities), baseline ecological studies and subsequent long term monitoring of the five coastal Ramsar sites were commissioned to provide the rcijuisitc data needed to formulate sound management plans for each of the sites. It was hoped that this would provide an effective and well-defined management regime for the long-term ecological viability to encourage appropriate economic development consistent with the stated CWMP goals, and to promote public awareness of environmental issues and conservation values (Ryan & Ntiamoa-Baidu, 1998).

After the completion of the baseline ecological studies and monitoring programmes, and submission of the various reports for each of the five coastal Ramsar sites, the CWMP initiated the process to develop the proposed management plans by organizing a one-day consultative workshop to sample the views of various resource persons and stakeholders regarding the formulation of effective medium and long-term management strategies for the sites. The workshop, which was held on the 21st September, 1999 in the Wildlife Department, brought together District Assemblies, traditional authorities, opinion leaders, environmental scientists, and other major stakeholders who are, in one way or the other, affected by wetlands. At the end of the plenary session, five working groups (one for each site) were constituted and tasked with developing the management plans based on the Ramsar Guidelines for Management Plans. This was expected to be done by initially outlining the format for the drafting of the various management plans, and then collating the results emanating from the reports of the various baseline studies and monitoring programmes commissioned by the CWMP, taking into consideration the views expressed at the plenary session.

TERMS OF REFERENCE (FOR)

1. Collate and evaluate available biophysical information for Muni Pomadze Ramsar Site
2. Review existing site management plans for Muni-Pomad/e Ramsar Site with particular reference to
    - staff strength, qualifications and deployment
    - job descriptions
    - implementation of management measures
    - public awareness and education
    - community participation in site management
    - community infrastructure development
    - management-stakeholder collaboration for sustainable wetland resource exploitation
3. Review the current involvement of the Wildlife Department, District Assemblies, NGOs, traditional authorities, major stakeholders and local communities in the management of Muni-Pomadze Ramsar Site, and to formulate strategies for improvement to ensure their long-term participation
4. Formulate long-term objectives for the sustainable management of the site according to the Ramsar wise-use concept
5. Identify factors influencing the attainment of the long-term objectives, and outline measures for addressing them within a five-year implementation period. (Particular attention should be given to reference 2 above)
6. Based on the review, formulated objectives and the management interventions, develop fully-costed five-year integrated management plan for Muni-Pomadze for donor support. In doing this, identify the specific time-bound outputs and indicators which would be used to evaluate the success of the interventions

SOURCES OF INFORMATION:

The major sources of information for the drafting of this document were reports prepared over the years for the Ghana Coastal Wetlands Management Project (CWMP), Ghana Environmental Resource Management Project (GERMP) Ghana Wildlife Department (GWD), and Environmental Protection Agency (EPA) among others (page 69). The Working Group also

relied on personal communications and issues raised at the consultative workshop on management plans development held at the GWD on 21st September, 1999.

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PART ONE DESCRIPTION

1.1 GENERAL DESCRIPTION:

The Muni-Pomadze wetlands was designated a Ramsar site in 1992 under the International Convention on Wetlands (Ramsar, Iran, 1971). It is situated in the Central region of Ghana near Winneba, some 67 kilometres west of Accra. The site encompasses over 90 kin^2 (4,500 ha) of watershed surrounding the Muni Lagoon (5° 19'N 0° 40' W), fed by the 15 km.-long Muni stream and its tributaries, Boaku and Pratu, with a total catchment area of 104 km^2. The lagoon itself, has an area of 4.1 km^2 (Figure 1). The lagoon is shallow (average depth = 0.6 m), and fringed with a scanty cover of mangrove vegetation. It is closed to the sea during the dry season. but the waters break through the sand barrier each year to allow the build-up from the rams to escape. The lagoon is divided into two main areas: (i) Northern Zone, which lies in a south-east and north-westerly direction and is more riverine (ii) Southern Zone, lying somewhat parallel to the coastline, and separated from the sea by a sandbar. Two areas within the boundaries of the site, and making up about 10% of its total land area, have been designated as forest reserves: Yenku Block A Forest Reserve, north-east of the village of Onyadze, and Yertku Block B (Egyasimanku) Forest Reserve about one kilometre from the village of Mankoadze (Figure 1). Other settlements within the site boundaries are Asebu village and the town of Winneba (pop. 35,000) (Gnrnble *et al,* 1998). The remaining villages within the site have a total population of less than 2.000. The eleven communities (settlements) within the site are under the jurisdiction of two districts. Hwutu-Effutu-Senya and Gomoa, but the lagoon area belongs to the Effutu Traditional Council, headed by

the paramount chief of Winneba, while the upper drainage basin is within the jurisdiction of the Gomoa Traditional Council.

1.2 PHYSICAL (ABIOTIC) FEATURES:

1.2.1 Physiography and Drainage:

The lagoon is located about two kilometres west of Wmneba near Akosua Beach, a small fishing village. The Mum Lagoon is shallow and saline, with area of open water varying from 100 hectares (dry season) to 1000 hectares (wet season). It is separated from the sea by a 70-100 m wide sand dune which accommodates the fishing village (Tumbulto & Bannerman. 1994). The site is generally a low-lying undulating plain with two prominent isolated hills: Osi (to the north-east, rising to 53 m) and Egyasimanku (near Mankoadze).

1.2.2 Geology (Amatekpor. 1994)

The geology of the area consists primarily of Upper Birimian rocks, comprising a series of extrusive and hypabasal rocks (greenstones) which are hard, massive and rich in chlorite, feldspar, epidole, magnetite, and ilmcnite. The Birimian is intruded in some areas by masses of biotite-hornblende granites (Winneba granites), and characterized by phenocrysts of grey and pinkish microcline. Soils developed over the greenstones are generally heavy-textured, while those developed from the granites are relatively lighter in texture. The underlying rock consists of Basement Complex granitic rocks to the east, the Birimian Greenstone series to the west, and Tarkwaian Quartz-schists to the north and north-east.

1.2.3 Climate (Ntiamoa-Baidu & Gordon. 1991).

Total annual rainfall averages 845 mm., with two rainy seasons: (i) March-August, with peak in June (accounting for about 75 % of total annual rainfall) (ii) September-November (peak in November). Generally, the highest rainfall occurs in June. Mean annual temperatures range from a minimum of 24 °C (August) to a maximum of 28.9 ^{o}C (March). Maximum and minimum relative humidities (Ril) occur in August (^{C}H).3 %) and January (82.8 %) respectively. Annual evaporation rates estimated from open water surface may be as high as 1600 to 1800 mm.

1.2.4 Soils (Amatekpor, 1994):

The soil is mainly clay, which is impervious to water and therefore liable to sheet erosion during seasonal flooding. Five mam soil series form associations and complexes in the catchment area of the wetland. These are (i) Yenku-Adzintam Association, (ii) Adzintam-Mankoadzc Complex, (iii)

Osibi-Bumbi Association (iv) Oyibi-Muni Association (v) Keta-Goi Association. Three of these associations (Yenku, Bumbi and Muni series) have been identified as "sensitive" areas in terms of their potential or actual contribution to sedimentation of the wetland or their being on aggradational slopes where sediment and pollutants can accumulate. With regard to the relative potential erodahility and sediment yield, the rating of the soils in the catchment area (in increasing order) is Yenku > Adzintam/Mankoadze > Osibi > Bumbi/Muni. It is estimated that moderately to highly erodible soils on slopes of 2 % to 25 %, if left bare, could yield between 0.56 to 16 tons/ha of sediment annually into the wetland.

1.2.5 Water Quality (Binev, 1995):

The Muni Lagoon may be generally considered as a very saline environment, and therefore characterized by high concentrations of dissolved substances. Salinity levels of 63 ‰ have been recorded just prior to the rains, and fish-kills have been known to occur. Even in the wet season, with increased river inflow, land run-off and consequent decrease in salinity, the lagoon water is still saline, with salinity ranging from *5 ‰* to 13 ‰. The contributary factors to the high ionic concentrations of the lagoon waters include (i) long periods of closure from the sea resulting in minimal water exchange, (ii) low freshwater inflow, and (hi) shallow and flat nature of the lagoon, which encourages evaporation in the high prevailing temperature conditions.

The waters of the Muni Lagoon are generally well-oxygenated, with concentrations ranging between 4.2 mg./'l to 10.8 mg./l in the dry season and 6.2 mg./l to 9.8 mg./l in the wet season. This is considered normal for a shallow well-oxygenated lagoon with low organic contamination. The mean BOD values of 5.1 mg./l and 4.5 mg./l for the dry and wet seasons respectively, indicate that compared to the natural background levels, the lagoon waters were only slightly contaminated. For both the dry and wet seasons, the Northern Zone received lower pollution loads, and had lower nutrient concentrations than the Southern Zone. The occurrence of col i form bacteria in the lagoon waters was generally low, in direct relationship to the low

organic contamination. On the basis of W*orld Health Organization (WHO) limits* (WHO, 1982), the waters were suitable for both primary (swimming) and secondary (fishing) contacts.

1.3 BIOLOGICAL (BIOTtC) FEATURES

1.3.1 Floral Composition:

The wetland lies within the coastal savanna vegetation /one, which represents four distinct habitat types: (i) open water, (ii) floodplain grassland (dominant vegetation consisting of *Sesitvutin portulacastrwn, Paspalum vaginatiim, Imperata cvlindria,, Cyperus articuiatus*', *Dactyloptenium aegyptium* and *Panicum maximum)* (iii) degraded forest, scrub and farmland (vegetation dominated by a mixture of coarse grasses and sedges- *Vetiveria fulvinarbi, Fimbristylis dichotoma., Sporoholus pyramidalis, Setana pallide-fusca, Cassia occidentalis. Crium, Borreliai, Ahiililon niaiirilianuni,* and *Livmiieiiui sylvestre)* and (iv) sand dune (vegetation mainly *Cocos nucijera*- coconut, *Sporobolux virginicus, Renmirea maitima* and Euphorbia) (Ntiamoa-Baidu & Gordon, 1991). The dominant mangrove species is *Avicennia afncana* (olive mangrove), which occurs in clusters among a few scattered trees of *Conocarpus erectus* (button mangrove). Unlike the other Ramsar sites where there is virtually no natural forest cover except for the occasional sacred grove or mangrove stand, the Muni-Pomadze site contains two forest reserves (Yenku A and Yenku B) interconnected by a *Eucalyptus* plantation (Ryan & Ntiamoa-Baidu, 1998).

1.3.2 Faunal Composition:

The lagoon has several fin fish families represented, important ones being Cichlidae *(Tilapia guineensis, T. zillii, Hemichromis fasciatus, Sarotherodon melanotheron),* Mugilidae *(Mugil spp., Liza falcipinnis),* and Gobiidae *(Porogobius schlegeli, Gerres melanopterus)* even though it is generally low in fish biodiversity (Ameyaw-Akumfi *et a!.,* 1998). Shellfish represented are *Callinectes latimanus, Cardiosoma armamtiim, Tympanotonits fiiscatus, Macorna cumana, Crdssostrcd tulipti. Anadara senilis.* and *Turitella meta.* The ocypodc, *lieu tangen,* is also dominant. Over 60% of known wetland bird species are represented, with the site being particularly important for terns, including the "rare" (IUCN) Roseate Tern *(Sterna dougalli).* The area supports internationally-significant numbers of black-winged stilt, and an estimated population of 23,000 waterfowl, including 27 species of waders, eight species of terns, and seven species of herons and egrets. Majority of the avifauna are palaearetic migrants (Ntiamoa-Baidu & Gordon. 1991; Ntiamoa-Baidu & Owusu, 1998). The adjoining wetland is especially important for its populations of

the following economically important terrestrial vertebrate fauna: *Tragelaphus scriptus* (bushbuck), *Cephalophus niger* (black duiker), *C. maxwelli* (Maxwell's duiker), *Neotragus pygmaeus* (royal antelope), *Thryonomya swmderianus* (grasscutter). *Python regius* (royal python), *Varanus mloticus* (Nile monitor), *V. exunihematicus* (Bosc's monitor). Other important fauna are *Cricetoinvs guuilnunns* (giant rat). *Lemniscomvs atriaius* (zebra mouse- key ecological indicator species), the rare (' *'aluluinn reinhardtii* (Calabar ground python), *Naja mgncolis* (spitting cobra), *Dendroaspis viridis* (green mamba), *Kinixys bellidiia* (hinged tortoise), and several anuran (Amphibia) species (Ryan & Attuquayefio, 1998; Raxworthy & Attuquayefio, 1998).

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1 The WHO proposes a waste volume of 7.3 m3 'person/year, and a BOD of 6.9 kg/person/year for areas not connected to sewer (Biney, 1995)

1.4 SOCIO-ECONOMIC FEATURES (Ntiamoa-Baidu & Gordon. 1991

1.4.1 Ethnic Composition:

The dominant ethnic group is Fanli, but the iagoon is owned by the Effutu, while the adjoining land belongs to the Gomoa. There are also settlements of migrant Ewe fishermen along the coast, some migrant Fulani herdsmen, and relatively more dispersed settlements of Gas and Northerners.

1.4.2 Economic Activities:

Outside of Winneba, the principal economic activities of the area are fishing and farming, with the main cultivated crops being maize and cassava. There is limited cattle grazing north of the Accra-Cape Coast highway, and also some clay mining (used in pottery or brick and tile manufacture) near Onyadze. Hunting for bushmeat is undertaken by men either alone or in groups, especially during the dry season.

1.4.3 Human Settlements. Land Ownership/Use and Social Organization:

1.4.3.1 Land Ownership

The Muni-Pomade Ramsar site is administered by two District Assemblies: (i) Awuiu-Effutu-Senya (ownership of the lagoon area, invested in the paramount chief of Wirmeba), with responsibility for inspection of sand-winning activities, and a special budget line for sanitation (limited to construction of places of convenience) (ii) Gomoa (ownership of the upper drainage

area), with responsibilities for monitoring the sanitation programme, formation of a timber task force, bushfire control and education, and monitoring of poaching activities. The three mam fishing villages inhabited by migrant Ewe fishermen from Keta. Anloga, Woe and Anyanui, owe allegiance to the Effutu stool. There is free access to marine fishing, except on Tuesdays (taboo day). Chief fishermen are responsible for handling issues related to fishing in their respective communities.

1.4.3.2 Human Settlements:

There are nine major human settlements in the area, with a total population of approximately 32,000 (1984 census) (Table 1)

1.4.3.3 Land Use.

There is some tern trapping and wader catching around the various settlements in the catchment area, as well as subsistence fanning (cassava, maize and vegetables) in the upper catchment area, and livestock rearing (chicken, pigs, goats, sheep, cattle). Tree harvesting (for fuelwood, charcoal and housing poles) is also undertaken. The greatest threat to the Muni Lagoon ecosystem is the residential expansion of Winneba, which is encroaching on the eastern parts of the wetland plains. Such human activities as fanning, fuelwood harvesting, bush burning, domestic waste disposal, animal grazing, transportation and recreation pose serious threats to the Ramsar site. There is clay mining concentrated around Onyadze, and a private company has initiated gold prospecting in the upper catchment area, but with no commercial exploitation so far. Compared to the other Ramsar sites (especially Sakunio and Densu Delta), land degradation at Muni-Pomadze has been on a relatively lower scale. The establishment of the two forest reserves on the site has had a positive impact on the health of the environment of the area.

Table 1: MAJOR HUMAN **SETTLEMENTS AT MUNI-POMADZE RAMSAR** SITE

SETTLEMENT	POPULATION (1984 CENSUS)
Winneba	27,105
Asebu	1,01 9
Mankoadze	1004

Ansaful	709
Onyadze	521
Pomadze	45S
Bewadzc	195
Mpota	151
Gomoa-Aruanli	85
TOTAL	31,247

Source: Ntiamou-Baidu & Gordon, 1991)

1.4.3.4 Social Organization:

The basic social unit in the communities is the extended family, with the most senior member of the clan as the land and property administrator. The basic economic unit is generally the core household and immediate family. Single-parent households and "grandparent" families also occur, the former in situations where one partner (usually the male) spends some time away from the household, and the latter where both parents work elsewhere leaving the household in the care of a grandmother. Polygamous households also exist, with several wives running separate households.

1.4.4 Fisheries fWilloughby & Entsua-Mensah, 1998)

Muni-Pomadze has a species-poor fishery, with about 90 % of catches made up of *Sarotherodon melanotheron* (black-chin tilapia). There is marine commercial fishing by migrant fishermen along the coast from Winncba to Mankoad/e, and subsistence lagoon fishing for tilapia *(Sarotherodon melanotheron),* crabs *(Callinectes latimanus)* and molluscs *(Tympanotus fasciaius).* The cast net is the most important fishing gear used on the lagoon, but other gear like bottles and traps are used to catch crabs and fin fishes. Use of drag and gill nets is prohibited on the lagoon but there is evidence to suggest that drag nets are used illegally, especially at night. An

average of 245 kg. offish is taken from the lagoon daily, and these attract high prices especially during the lean marine fishing season. *S. melanotheron* is considered as an over-exploited species in the lagoon, since the stimulated exploited level (E = 0.65) is greater than the optimally acceptable exploitation level (E ~ 0.5). Fishing effort should therefore be reduced through diversion of labour, formal education and the enforcement of taboos (Tuesday and Wednesday are taboo days for marine and lagoon fishing respectively).

PART 2:

EVALUAITON AND OBJECTIVES

2.1 EVALUATION:

2.1.1 Size and Position:

The Muni Lagoon covers only 3.3% of the management area of the Ramsar site compared to 9.0% for Sakumo. 25% for Keta, 29% for Densu Delta, and 35% for Songor (Source: Ghana Wildlife Department Records). This has management implications, since Muni-Pomadze would be expected to be more prone to the environmental problems typical of terrestrial habitats (e.g. bush fires, over-exploitation of forests, rapid urbanization, etc.), compared to the other sites.

2.1.2 Biological Diversity:

2.1.2.1 Floral Diversity (Otens-Yeboah, 1994):

2.1.2.1.1 TOTAL NUMBER OF SPECIES:

A total of 135 species of Angiosperms have been recorded at the Muni-Pomadze Ramsar site, representing *57* families and 114 genera. The group Dicotyledonae was represented by 48 families, 85 genera and 86 species, while there were 9 families, 29 genera, and 37 species of the Monocotyledonae. Majority of the monocotyledons came from the families Poaceae (Graminae) and Cyperaceac, but the dicotyledons were more evenly distributed (Oteng-Ycboah, 1994) (Appendix I). Shrubs formed the largest life-form group, while herbaceous creepers, succulents and geophyies were fewest. An analysis of distribution of the plant species among the various

habitats indicated that the Thickets had the highest number of species (39), making up 39.4 % of the total. The habitat with the least number of species (3) was the Mangrove Swamp, making up 2.3 % of the total (Table 2)

2.1.2.1.2 DESCRIPTIONS OF GROUND SITUATIONS

There were four ground situations, each with its characteristic forms of vegetation:

- ***Flood Plain (Freshwater/Brackish Swamps and Mangrove)***. The area immediately surrounding the lagoon, and comprising of seasonally-flooded and water-logged depressions. About 44 plant species-associations were recorded.
- ***Sandy Bar***. Southern part of the lagoon (i.e., between lagoon and sea), with a sand substrate. Plant cover is concentrated at the lagoon end, with coconut *(Cocos nucifera)* occupying the highest ground. Typical dune species recorded at the site were *Alternantheru maritima, canavalia roscti, Cvperus rnuritimus, Ipornoeci pes-diprae, Opuutia vitlgaris, Pedalium murex,* and *Rennrca mantima,* as were rnclernls like *Tribulus tcrrcstris* and Boerliavia *coccinia.* Lagoon-shore (i.e. before the actual dune vegetation staus) piants recorded were *Sesuvium portulacastrum, Paspalum virginicum* and *Sporobolus virginicus.*

Table 2: PLANT SPECIES DISTRIBUTION IN MAJOR HABITATS

HABITAT	NUMBER OF SPECIES	PERCENTAGE OF
Thicket	52	39.4
Grassland	36	27.3
Ruderal/Weed	19	14.4
Flood Plain	15	11.4
Dune/Strand	8	5.3
Mangrove Swamp	3	2.3
TOTAL	**133**	

Source: Oteng-Teboah (1994)

- ***Riverine***. Ground situation around the main water course and tributaries of the Muni and Pratu rivers. The dominant vegetation close to the lagoon comprises *Sesuvium portulacasiriim, Paspalum virginicum* and *Sporobolus virginicus,* with *Aviccnnia Africana* (mangrove

shrub) occurring in isolated populations. Further upstream (about *2* km away), typical freshwater species like *Typha australis* and *Litd\vigia erec'a,* were recorded.

- ***Elevated Undulating Ground.*** An area about 10 - 50 metres above sea level, located east, west and farther north of the lagoon, and comprising five forms of plant cover formations:
    - ***Continuous Thicket****:* Located on much higher ground (including hills) west and north-west of the lagoon, with the dominant vegetation being largely-impenetrable 3-metre high shrubs and isolated trees. About 51 plant species were recorded, out of which were 33 shrubs and 7 trees. The major shrubs and trees included *Azadirachta mdica* (neem), *Byrsocarpus coccineus, Clausena anisata, Baphia nitida, B. pubescens, Diospyro abyssiniciis, Ehretia cymosa, Fagara zanthoxyloides, Griffonia simplicifolia, Hoshundia opposita, Jasminium dichotomwn,* etc.
    - ***Discontinuous Thicket (Crdssland/Tliicket):*** 'Thicket clumps surrounded by grassland, located north and nortli-cast of the lagoon. Dominant plants in the thicket clumps were shrub and tree species, including *Klacopliorbia drupifcra, Capparis ervthrocarpos, C. thonningn, C.tomentosu, Canssa edulis, Phoenix reciimita, Paullinia pinnata, Azadiraclila indica, Baphia nitida, Ehretia cvinosa, etc.* The clumps are surrounded by three forms of grassland:
    - Shrubby composite of *Vernonia colorata* mixed with grass
    - Mixture *ofMitmgyna inermis* and grass
    - Predominantly grass with prominent species being Panicum *maximum, Andropogon canescens, Paspalum vaginatum,* and *Sporobolus pyramidalis.*

- ***Grassland****:* Continuous layer of grasses and forbes (herbaceous plants), with shrubs lacking, and located north and north-north-east of the lagoon immediately beyond the flood plains. The following grass *(Setaria pallide-fusca, Sporobolus pyramidalis, S.robustus, Vetivena fulvibarbis, Paspalum orbiculare, Panicum maximum, Andropogon canescens)* and forbe (*Phyllanthus pentandrus, Spigelia anthebma, Physalis angulata, Palisota hirsuta, Scilla sudanica, Scoparia dulcis, Oldenlandia corymbosa,* etc.) species are prominent.
- ***Coconut Plantation:*** Located east and south-east of the lagoon. Tree line of *Cocos nucifera* (coconut) with undergrowth of light clumps of shrubby *(Clausena anisata, Azadirachta indica, Ritchiea reflexa, Bvrsocarpus coccineus, Elaeis guineensis, Mallotus oppositijolius, etc.)*

and herbaceous *(Scoparia dulcis, Cyperus rotundas, Chlons barbata, Talinum triangulare, Killinga squainulata, Haemanthus multiflorus, Cnnum ornatum,* etc.) plants.

- ***Eucalyptus Plantation:*** Two plantation blocks with dominant *Eucalyptus spp.,* and undergrowth of several ruderal species like *Chromolaena odorata, Cypents rotundus,Talinum triangulare, Commclina africana, Dactyloctemium aegyptuin, Eleusine indica, Boerhavia diffuse.,* etc.)
    - ***Yenku Block B (Egyasinunikn):*** Located to the extreme south-western comer of the site, immediately abutting the hilly thickets
    - ***Yenku Block A.*** Located bcvond the Winneba-Mankessim Road to the extreme north-western corner of the site.

2.1.2.1.3 SPECIES COVER-ABUNDANCE AND FREQUENCY

Thickets- 10 x (10 x 10m^{2}Quadrats): Frequency and cover-abundance scores for 8 tree and 38 shrub species were recorded (Table 3). One tree *(A. indica)* and two shrub *(Baphia nitida* and *Byrsocarpus coccmeiis)* species had 100 % frec|uency, with the remaining species having between 10 % to 80 % frequencies. Quadrats 1-3 (thicket clumps) contained the most species, (between 1 and 4), while quadrats 4-7 (coconut plantation) contained the least number of species.

A. indica and *B. nitida* had the highest total cover abundance score of 7 (equivalent to 26-50 %). *Cocos nucifera, Byrsocarpus coccineus, Phoenix redmata, Elaeophorbia drupifera, Gnffoma simplicifolia* and *Hoslundia opposita* also had total cover-abundance of 3-5 (5-12 %). The remaining species were considered rare (but may be abundant within clumps), with cover-abundance scores of 1-2. Examples are *Mitragyna inermis* and *Vernonia colorata.* Species with mean total cover-abundance scores of between 3 and 7 are considered important thicket elements

- ***Flood Plain - 149 x (1 x 1 m^2 Quadrats):*** Eight species (including five grasses) showed highest frequencies of between 5 % and 34 % (i.e., cover abundance scores of 5-9). These were *Sporobolus virginicus, Sesuvium pnrtulacastrum, Paspalum vaginatum, Imperata cylindrica, Cyperus articulatus, Fimbristvlis dichotoma, Chloris barbata,* and *Sporobolus pvramidalis.*

These species are very important to the Flood Plain habitat. A number of species, not known to be ruderals, are prominent, but recorded very low frequencies (e.g. *Andropogon gayanus. Vetivena fulvibarbis, Setaria pallide-fusca, Bothriochloa bladhii, Stachytapherta angnistifolia* and *Indigofera hirsuta).*

- ***Dunes - 3* A- *(5 x 5 m^2 Quadrats):*** The sampling indicated the presence of 12 species, with range of species per quadrat between 6 and 9. The range of cover-abundance was however low probably due to the loose and/or sparse nature of the habitat. The dominant species is *Cyperus maritimus,* with other prominent species being *Boerhavia coccinea, Sanseveria Ubcricd, Cyperus articulatus,* and *Sesuvium portulacustrum.*

2.1.2.2 ***Fannal Diversity:***

2.1.2.2.1 **AQUATIC INVERTEBRATES:**

The lagoon is characterized by lack of good aquatic fauna, with extreme impoverishment during lagoon closure, and a marked improvement with the opening of the lagoon to the sea. Zooplankton is the most diverse aquatic fauna, with large numbers of the marine zooplankton *Sagatria sp]\).* This finds its way into the lagoon with breakage of the sand bar. Ctenophores. medusa, polvchaete larvae, copepod nauplii and crab /.oea are also present. The Aufwuchs community is represented by crustaceans, with a few strands of dead *SesitviitDi spp.* Oligochates dominate the benthos, with densities as high as 8,000 individuals/mr. There is however a rapid fall in abundance both towards the sea and the northern part of the lagoon (Gordon, 1995).

Table 3: PLANT SPECIES FREQUENCY. COVER-ABUNDANCE AND ENDEMICITY AT MUNI-POMADZE RAMSAR SITE

SPECIES	FREQUENCY						MEAN TOTAL COVER-ABUNDANCE SCALE		ENDEMIC ELEMENTS
	THICKETS		FLOOD PLAIN		DUNE-STRAND		THICKETS	DUNE-STRAND	
	No.	%	No.	%	No.	%			
Andropogon gayanus			1	0.067					
Alternanthera maritimn					3	100		3	x (DS)
Avicennia Africana									x (MS)
Azadirachta indica	10	100					7		x (CT, DT)
Baphia nitida	10	100					7		x (CT)
B. pubecens	8	80					1		x (CT)
Boerhavia coccinia					2	60		1	
Bothriochloa bladhii			2	1.34					
Brachiaria distachyoides			2	1.34					
Byrsocarpus coccineus	10	100					5		
Canavalia rosea					3	100		4	x (DS)
Capparis erythrocarpus	6	60					1		x (CT)
C. thonninghii	3	30					1		x (DT)
C. tomentosa	2	20					1		

Carissa edulis	6	30					1		
Cassia momoboides			1	0.67					
C. seiamia	3	30					1		
Ceiba pentandra	1	10					1		
Chloris barbata			8	5.40					
Chrysobalanus orbicularis	6	60					1		
Clausena anisata	7	70					1		x (DT)
Coco nucifera	2	20					5		x (DS)
Conocarpus erectus	1	10					1		
Croton lobatus			1	0.67					
Cyperus articulates			9	6.00	2	60		1	x (FP, MS)
C. imbricatus			1	0.67					
C. maritime			1	0.67	2	60		2	x (DS)
Dactyloctenium aegyptium			1	0.67					
Dialium guineensis	3	30					1		
Dichrostachys cinerea	4	40					2		x (DT)
Diospyros abyssinica	6	60					2		x (CT)
Drypetes florbunda	5	50					1		
Ehretia cymosa	4	40					2		
Elaies guineensis	5	50					1		
Elaeophorbia drupifera	5	50					3		x (DT)
Eugenia coronate	4	40					1		x (DT)
Fagara zanthoxyloides	5	50					2		x (DT)
Fimbristylis dichotoma			9	6.00					x (FP)
F. ferruginea			6	4.00					
Flacourtia flavescens	5	50					1		x (DT)
Grewia carpinifolia	5	50					1		
Griffonia simplicifolia	8	80					3		x (CT)
Heteropogon contortus			29	19.46					
Hoslundia opposite	8	80					3		
Imperata cylindrical			1	0.67					x (FP)
Indigofera hirsuta			1	0.67					
Ipomoea pes-caprae					2	60		2	x (DS)
Jasminium dichotomum	6	60					1		x (CT)
Kyllinga peruviana			3	2.00					
K. squamulata			1	0.67					

Lonchocarpus cyanescens	1	10					1		
Ludwigia erecta			1	0.67					
Malacantha alnifolia	1	10					1		
Mallotus oppositifolius	5	50					2		
Mangifera indica	1	10					1		
Mariscus squarrosus			1	0.67					
Mitragyna inermis	3	30					1		x (DT)
Opuntia vulgaris					1	30		1	x (DS)
Panicum maximum			2	1.34					
P. repens			1	0.67					
Paspalum orbiculare			3	2.00					
P. vaginatum			31	20.80					x (FP, MS)
Paulinia reclinata	8	80					2		
Pedalium murex					1	30		1	x (DS)
Phoenix reclinata	5	50					3		x (DT)
Pyllanthus pentandrus			1	0.67					
Physalis angulata			2	1.34					
Polygala arenaria			1	0.67					
Portulaca foliosa			2	01.34					
Pycreus polystachyos					2	60		2	x (DS)
Remirea maritime					2	60		1	x (DS)
Richiea reflexa	8	80					2		x (CT, DT)
Sanseveria liberica					1	30		1	
Sarcostemma viminale	1	10					1		
Schwekia Americana			1	0.67					
Scoparia dulcis			1	0.67					
Secamone afzelii	5	50					1		x (DT)
Secureniga virosa	4	40					1		x (DT)
Seforia pallid-fusca			1	0.67					
Sesbania sesban			3	2.00					
Sesuvivum portulacastrum			43	28.86	1	30		1	x (FP, MS)
Sida tiliaceous			1	0.67					
Soreindeia warneckei	1	10					1		
Spigelia anthelmia			1	0.67					
Sporobolus pyramidalis			8	5.40					

S. robustus			6	4.00					
S. virginicus			50	33.56					
Stachytapherta anguistifolia			1	0.67					x (FP, MS)
Thespesia polulnea	1	10					1		
Thevetia neriifolia	1	10					1		
Tiliacora dinklagei	3	30					1		
Triclisia subcordata	6	60					1		
Triumfetta rhomboidea			1	0.67					
Vernonia cinerea			3	2.00					
V. colorata	3	30					1		
Vetiveria fulvibarbis			1	0.67					
Uvaria afzelii	4	40							
Waltheria indica			1	0.67					
Wissadula amplissima			1	0.67					

Source: Oteng-Yeboah (1994)

LEGEND: DS = Dune-Strand; MS = Mangrove Swamp; CT = Continuous Thicket; DT = Discontinuous Thicket; FP = Flood Plain

Twelve species of shell fishes belonging to nine orders, have been recorded at the Muni-Pomadze Ramsar site. Notable species include *Uca tangeri, Ocipode afncanus* (Ocypodidae), which occur on the sandy stretch of beach, *Culhnectes latiinanus* (Poiiunidae), *Cardiosoma armamatitrn*

(Gercarcinidae), occurring at the eastern edge of the lagoon among *Paspalum* grass, *Tvnipanoionus fitscatus* (Potanndae), *Crassostrea tulipa* (Ostreidae), *Maconia ntinana* (Tellmidae). *Anadara semlis* (Arcidae) and *Turitella nieta* (Turitellidac). A small colony of *Sesarma huzardi* is also present (Table 4) (Gordon, 1995).

2.1.2.2.2 INSECTS AND OTHER TERRESTRIAL ARTHROPODS (Cordon & Cobblah. 1998):

Muni-Pomadze has a rich, high-diversity butterfly fauna, with a total of 75 species recorded, representing five families: 43 Nymphalidae (57 %), 17 Piendae (23 %), 6 Lycaenidae (8 %), 5 Papilionidae (7 %) and 4 Hespcridae (5 %) (Appendix 3). Some of the recorded species arc *forest-*

dependent (Charaxes tindates, C'.fiilvescens, Papilla meneitstheiis, (.iraphinin adamastor, G. againedes, and *Euphacdm spp.),* and none are endangered or endemic.

Table 4: LIST OF SHELL FISH SPECIES IN MUNI LAGOON

FAMILY	SPECIES
Crustacea	
Gercarcinidae	*Cordiosoma (innfintntiini*
Ocypodidae	*Ocypode cifricana*
	Uca tangeri
Ostreidae	*Crassostraea lulipa*
Penaeidae	*Penneus nolicilis*
	P. kerathurus
	Parapenaeopsis atlantica
Portunidae	*Callinectes lalimanus*
Mollusca	
Arcidae	*Anadara senilis*
Potamidae	*Tympanotus fuscatus*
Tellinidae	*Macoina ctiinann*
Turitellidae	*Turitella meta*

Sources: Gordon (1995); Willoughby & Entsua-Mensah (1998)

There were 1,751 other insect and arthropod specimens captured by light-traps, out of which 1,034 were beetles (Coleoptera), and 413 were moths (Lepidoptera). Pitfall trapping also yielded *656* insect captures, majority of which were Hymenoptera (443), Coleoptera (114) and Orthoptera (66), and 132 captures of other terrestrial arthropods, notably Araneae (92), Isopoda (26) and Acarina (10). A total of 614 insect samples, belonging to 12 families were also obtained using sweep-nets. Dominant orders were Hymenoptera (170), Homoptera (1 18), Diptera (93), Coleoptera (77), Heteroptera (65). and Isoptera (57) (Gordon & Cobblah, 1998) (Table 5).

2.1.2.2.3 FISHES:

The Muni Lagoon is low in fish biodiversity, with the dominant fin-fishes being *Sarotherodon melanotheron.* Other cichlids present include *Tilapia guineensis. T. zillii,* and *Hemichromis fcisciatus.* Other fin-fish families represented include Mugilidae *(Liza falcipmnis),* Gobndae *(Porogohius schlege/i, Lutjanus fitlgvns),* Clupeidac *(Surdinella nuidrensis)* and Gcrridae *(Gerres inelanopterus)* (Table 6) (VVilloughby & Entsua-Mensah. 1998).

Table 5: NUMBERS OF INSECTS AND OTHER ARTHROPODS RECORDED AT MUNI-POMADZE RAMSAR SITE

ORDER	NO. OF CAPTURES		
	LIGHT TRAPS	PITFALL TRAPS	SWEEP NETS
Insects			
Coleoptera	1,034	114	773
Lepidoptera	413	1	1
Hlymenoptera	88	443	17
Diptera	83	16	93
Homoptera	71	2	118
Orthoptera	30	66	19
Trichoptera	21	-	-
Heleroptera	10	7	65
Odonata	1	-	4
Thysanura	-	4	-
Phasmida	-	1	3
Dcrmoptcra		i	
Isoptcra	-	-	57
Dictvoptera	-		4
Ncuroptera			3
Other Arthropods			
Aranaea	-	92	-
Isopoda	-	26	-
Acanna	-	10	-
Diplopda	-	*3*	-
Chilopoda	-	1	

Source: **Gordon & Cobblah (1998)**

2.1.2.2.4 **HERPETOAUNA (REPTILES AND AMPHIBIANS) (Raxworthy & Attuquayefio. 1998):**

A total of 33 species of herpetofauna was recorded at Mum-Pomadze, comprising 13 species of amphibians and 20 species of reptiles. Three of the reptile species were the first to he recorded in coastal thicket vegetation in Ghana: *Kinixvs hoinecuui* (Home's hinged tortoise). *(Julabarid reinlnirdtn* (Calabar ground python) and *Bothrophtlnilunis linccitus* (Red-lined Snake). The latter was recordcci only in secondary forest. The most diverse herpetofaunai community was recorded in grassland-thicket habitat, with 29 out of the 32 recorded species (Table 6).

2.1.2.2.5 AVIFAUNA (BTRDS) (Ntiamoa-Baidu & Owusu, 1998):

A total of 114 bird species representing 26 bird families were recorded at Muni-Pomadze using mist-netting and transect counts. The dominant families were Muscicapidae (25 species; 22 %), Ploceidae (12; 10.5 %), and Estrildidae (11; 10 %) (Appendix 4). Twenty-two of the recorded species at Muni-Pomadze are of conservation concern. Seven of the species (comprising six birds of prey and the cattle egret) are *wholly protected* on Ghana's list of protected species (Schedule I, Ghana Wildlife Conservation Regulations, 1995). Fifteen species are *biome-restricted* (14 restricted to the Guinea-Congo forest biome, and one restricted to the Sudan-Guinea Savanna biome) (Table 8).

Table 6: LIST OF FIN FISH SPECIES IN MUNI LAGOON

FAMILY	SPFXIES
Belonidae	*Strongyluro sciiegti/ensis*
Cichlidae	*Meinichroinis fasciatus*
	Sarotherodon melanotheror,
	Tilapia guineensis
	T. zillii
Clupeidac	*Elhinalosa fimbrialu*
	I'd Ion u la Iconcnsis
	Sar'dinella nuiderensis
Gerridae	*Gerres melanoplems*
Gobidae	*Gobioides nnsorgei*
	Porogobius sch/egeli
Lutianidae	*Lutjcmus fulgens*
Mugilidae	*Lizfi fcilcipinnis*

Sources: **Ameyaw-Akumfi *et al.* (1998); Gordon (1998)**

2.1.2.2.6 MAMMALS (Ryan & Attiiquavefio, 1998):

Twenty-one mammal species representing six orders have been recorded at Muni-Pomadze. This comprised six species of Aitiodactyla (antelopes, duikers and the red river hog), two species of Primates (mona and lesser spot-nosed monkeys), ten species of Rodcntia (rats, mice and porcupines), two species of Insectivora (shrews), four species of Carnivora (leopards, hyenas mongooses and civets), and two species of Chiroptera (bats) (Table 9). Three species of Carnivora *(Pcmthera pardus* - leopard, *Crocutti crocuta* -spotted hyena, and *Civcttictis civetla* -African civet) and one species of Artiodactyla *(Potamochoerus porcus* - red *river* hog) have been locally extinct during the last generation. The Mum-Pomad/e Rainsar site has an overall species richness of 21, over half of which are small mammals. Sixty-four individuals of seven of the small mammal species were captured of which almost half (48.5 %) were of the zebra mouse *x slriaiu.s)* (Table .9).

Table 7: LIST OF HERPETOFAUNA RECORDED AT MUNI-POM ADZE RAMSAR SITE

SPECIES	COMMON NAME	HABITATS		
		GRASSLAND/ THICKET	*EUCALYPTUS/ STEAK* SECONDARY FOREST	*EUCALYPTUS* PLANTATIOIN/ WINNEBA JUNCTION
AMPHIBIA				
Bufonidae				
Bafo regularis	Common Toad			*
Bafo maculates		*		
Hypcroliidae				
Afrixalus dorsalis	Leaf-folder	*		
Hyperolius concolor	Reed Frog			
H. nasutus				
Kassina senegalensis	Running Frog			
Microhylidae				
Phrynomerus microps				
Ranidae				
Dicroglossus occipitals	Common Frog	*		*
Hylarana galamensis	Common Frog	*		*
Phrynobatrachus accraensis	Sharp-nosed Frog	*		

P. calcaratus				*
Pychadena longirostris	Ridged Frog	*		
P. oxyrhynchus	Stump-nosed Ridged Frog	*		
REPTILIA				
Chelonian				
Pelomedusidae				
Pelomedusa subrufa	Marsh Terrapin	*		
Testudinidae				
Kinixys homeana	Hinged Tortoise		*	*
Squamata: Lacertilia				
Agamidae				
Agama agama	Agama (Rainbow) Lizard		**	*
Gekkonidae				
Hemidactylus brookei				*
H. mobouia				*
Lyodacylus conraui				*
Scincidae				
Mabuya perrotettii	Orange-flanked Skink	*		
M. affinis		*		*
Panaspis togoensis	Skink	*	*	
Varanidae				
Varanus nilotocus	Nile Monitor	*		*
V. exanthematicus	Bosc's (Savanna) Monitor	*	*	
Squamata: Serpentes				
Boidae				
Python regius	Royal Python	*	*	*
Calabaria reinhardti	Calabar Ground Python		*	*
Colubridae				
Bothrophthalmus lineatus	Red-lined Snake		**	
Philothomnus irregularis	Green Tree Snake		*	
Psammophis sbilans	Hissing Sand Snake			*
Rhamphiophis oxyrhynchus	Beaked Snake			*
Elapidae				
Dendroaspis viridis	Green Mamba	**		
Naja nigricollis	Spitting Cobra	*		*
		20	**8**	**15**

Source: **Raxworthy & Attuquayeilo (1998)** **** Observation onlv**

2.1.3 **Naturalness**:

The Muni-Pomadze Ramsar site is relatively undisturbed, compared to the other coastal sites. The tributaries of the rivers serve as refugia for freshwater organisms, while the northern bank of the lower arm of the lagoon is an important roosting site for shorebirds. Black-winged stilts breed around the northern end of the lagoon, with the eastern edge being used as a feeding area for waders. The Yenku A and B Forest Reserves serve as important habitats for terrestrial birds with the scrublands to the west of the lagoon being important habitats for mice, grasscutters *(Thryonomys swinderianus),* and the bushbuck *(Tragelaphus scriptus)* (Ntiamoa-Baidu & Owusu, 1998; Ryan & Attuquayefio, 1998).

2.1.4 **Rarity (Oteng-Yeboah. 1994)**

Endemic elements recorded at the site have been recommended as being useful for habitat management, since they naturally provide cover for the soils of the area, in addition to providing other useful resources for both human and non-human requirements. Fourteen endemic species were recorded in Discontinuous Thicket, nine on the Dune-Strand vegetation, and nine in the Continuous Thicket. The Flood Plain recorded six species, while the Mangrove Swamp had five endemic species (Oteng-Yeboah, 1994) (Table 3). Freshwater turtles (Trionychidae) and

crocodiles (Crocodilidae), which are often associated with large freshwater water bodies (i.e., major rivers and lakes), have not been recorded at Muni. Some fossorial reptile families like the Amphisbacnidae (worm lizards). Typhlopidae (blind snakes) and Leptotyphlopidae (worm snakes) have also not been recorded (Raxworthy & Attuquayefio, 1998).

2.1.5 **Fragility**:

The area to the north-west of the agoon is liable to damage from bushfires, while the eastern Part of the lagoon is under threat from urban encroachment. The area at the extreme western end of the lagoon has the last remnants of white mangrove, since most of the mangrove has been cut over the years. Both the Yenku Forest reserve and the traditional communal hunting grounds are under heavy pressure from the nearby local communities who over-exploit them for fuelwood and charcoal burning, or use them for illegal hunting and livestock grazing.

Table 8: BIRD SPECIES OF CONSERVATION CONCERN RECORDED AT MUNI-POMADZE RAMSAR SITE

SPECIES	**COMMON NAME**
Wholly Protectcd (Schedule 1 - Ghana Wildlife Conservation Regulations)	
Ardeidae	
Bubulcus ibis	Cattle Egret
Accipiiriciduc	
Accipiter melanoleucus	Great Sparrow Hawk
Accipiter tousseneli	West African Goshawk
Buteo augularis	Red-tailed Buzzard
Elanus caeruleus	Black-shouldered Kite
Melierax metabates	Chanting Gostiawk
Polyboroides radiatus	Harrier Hawk
Biomc- Restricted Species	
• Guinea-Congo Forest Biome	
Phasianidae	
Francolimus ahantensis	Ahanta Francolin
Cuculidae	
Centropus ahantensis	Black-throated Coucal
Pyconontidae	
Bleda cancapilla	Grey-headed Bnstle-bill
Phyllasirephus scandens	Leaf-love
Musiapidae	
Camaropiera sapercilaris	Yellow-browed Camaroptera

Hylia prasina	Green Hylia
Illadopsis puveli	Puvel's Illadopsis
Macrosphenus flavicans	Kemp's Longbill
Sylviena virens	Green Crombec
Terpsiphone rufiventer	Blue-headed Crested Flycatcher
Trochocercus nitens	Red-bellied Paradise Flycatcher
Nectariniidae	
Nectarinia adelberti	Buff-throated Sunbird
Estrildidae	
Nigrita bicolor	Chestnut-breasted Negro-finch
Spermophaga haematina	Blue-bill
• **Sudan-Guinea Savanna Biome**	
Nectarinidae	
Nectarinia coccinigaster	Splendid Sunbird

Source: Ntiamou-Baidui & Owusu (1998)

Table 9: MAMMAL SPECIES RECORDED AT MUNI-POMADZE RAMSAR SITE (Source: Ryan & Attuquayefio, 1988)

SPECIES	COMMON NAME	COLLECTED AT SITE DIRECTLY OBSERVED	DIRECTLY OBSERVED	FROM INTERVIEWS	HISTORICALLY PRESENT	HUNTED FOR BUSHMEAT
Artiodactyla						
Bovidae						
Cephalophus maxwelli	Maxwell's Duiker				*	*
C. Niger	Black Duiker				*	*
C. dorsalis	Bay Duiker				*	*
Neotragus pygmaeus	Royal Antelope				*	*
Tragelaphus scriptus	Bushbuck				*	*
Suidae						
Potamochoerus porcus	Red River Hog				*	
Carnivore						
Felidae						
Panther pardus	Leopard				*	
Hyaenidae						
Crocuta crocuta	Spotted Hyena					
Herpestidae						
Mungos gambianus	Mongoose		*			
Viverridae						

Civettictis civetta	African Civet				*	
Primates						
Cercopithccidae						
Cercopithecus petaurista	Lesser Spot-nosed Monkey			*		
C. mona lowei	Lowe's Mona Monkey			*		
Rodentia						
Sciuridae						
Euxerus erythropes	Unstrapped Ground Squirrel		*			
Muridae						
Lemniscomys striants	Zebra Mouse	*				
L. barbarous	Zebra Mouse	*				
Tatera kempi	Kemp's Gerbil	*				
Uranomys ruddi	Brush-furred Rat	*				
Mastomys erthroleucus	Multimammmate Rat	*				
Hylomyscus alleni	African Wood Mouse	*	*			
Cricetidae						
Cricetomys gambianus	Gambian Giant Rat	*				*
Thryonomyidae						
Thryonomys swinderianus	Grasscutter (Cutting Grass)			*		*
Hystricidae						
Hystrix cristata	Crested Porcupine			*		
Insectivore						
Crocidura oliveri	White-toothed shrew	*				

2.1.6 **Typicalness**

Compared to the other sites, there is less severe human encroachment at Muni-Pomadze, because human activities are more remote from bird habitats. The aquatic fauna of the site is also generally impoverished, compared to the other Ramsar sites, because of low water levels, high salinity, and lack of new species to colonise the newly-flooded lagoon margins. The site also has the lowest lagoon area to management area ratio, compared to the four other coastal wetlands Muni-Pomadze site is the only coastal Ramsar site with forest reserves (Yenku and Egyasimanku) and traditionally-protected communal forest, but even these are under pressure from over-exploitation by the local communities for fuelwood, livestock grazing and illegal hunting.

2.1.7 **Recorded History (Ntiamoa-Baidu & Gordon, 1991).**

According to the ex-Paramount Chief of the Effutu traditional area, Nana Ayirebi Acquah, IV, the Effutu people migrated from Techiman in the Brong-Ahafo region in search of water and fertile lands, in the process of which they settled near the Muni Lagoon. The hard nature of the lagoon water made the settlers refer to it as *"Boni"* ("it is hard"), which was later corrupted to *"Muni"*

2.1.8 **Aesthetic, Cultural or Religious Value**

The *"Aboakyir"* Festival of the Effutu people has been celebrated annually to commemorate the long journey to the present settlement, and also to remember their ancestors and the ancestral god (*"Apaseluun* ") who protected them throughout the long journey through the wilderness. The ceremonies involve the capture of a live bushbuck *(Tragelaphus scriptus)* from the traditional hunting grounds *of the Effutu* people with the bare hands. The hunting grounds cover approximately 15% of the site, and lie south of the Accra-Cape Coast highway, between the Yenku Block B Forest Reserve and Bewadze village. Two hunting teams *(Asafo* companies). *Tuafo No. 1* and *Denfsifo No. 2*, compete to be the first to capture the live bushbuck and present it to the paramount chief of the area, who would be waiting at the palace grounds wih his subjects. The meat is used to prepare ceremonial dishes, amid general merry-making and fraternization. In the old days, a human being had to be sacrificed to the god before every w\ar to ensure victory, but later negotiations led to the replacement of a human being wu i a bushbuck, which has to be sacrificed annually (Ntiamoa-Baidu & Gordon. 1991). The presence of coconut-fringed sandy beaches against the backdrop of the Egyasimanku Hills, provides a beautiful scenery, as well as the conducive feeding, breeding and roosting grounds for migratory waterbirds, which provides splendid bird-watching opportunities.

Table 10: NUMBER OF INDIVIDUALS OF SMALL MAMMAL SPECIES TRAPPED AT MUM-POM ADZE RAMSAR SITE

SPECIES	COMMON NAME	TOTAL CAPTURES	PERCENT OCCURRENCE
Rodentia			
Lemniscomys striatus	Zebra Mouse	31	48.5
Uranomys ruddi		8	12.5
Mastomys erythroleucus	Multimammate Mouse	7	10.9

Lemniscomys barbarus	Zebra Mouse	6	9.4
Tatera kempi	Kemp's Gerbil	6	9.4
Hylomyscus alleni	Climbing Wood Mouse	1	1.6
Cricetomys gambianus	Giant Pouched Rat	1	1.6
Insectivora			
Crocidura oliveri	White-toothed Shrew	4	6.3
TOTAL		**64**	

Source: Ryan & Attuquayefio (1998)

2.1.9 Social and Economic Value

From a non-human perspective, the vegetation provides roosting, nesting, breeding and feeding sites for birds as well as cover for the eggs and hatchlings of birds. The Flood Plain provides a habitat for crabs and other invertebrates. Ethnobotanical surveys of the area indicate that the local communities recognise the usefulness of the vegetation in the area as sources of food, fuelwood, medicines etc. (Oteng-Yeboah, 1994), and the importance of the thickets (both continuous and discontinuous) as habitats for some important small and large mammals of some economic and socio-cultural importance, notably mice *(Lemniscomys striatus, Uranomys ruddi)* gerbils *(Tciterci kcnipi.).* porcupines *(Atherurus africanus),* grasscutters *(T. swinderianus)* duikers *(Ccphalophm inuxwelli.* C. *niger)* and the bushbuck *(Tragelaphus scnptus)* (Ryan & Attuquayefio. 1998). The adjoining grassland is also important for thatching, matting and Basketry (Appendix 2).

2.1.10 Education and Public Awareness

Currently, public awareness programmes at the Ramsar site are the responsibility of staff of the Ghana Wildlife Society and Ghana Wildlife Department, and some few journalists. To ensure sustainability of this programme, it is proposed to look beyond these traditional agencies, and to include school wildlife clubs, community groups, traditional authorities and the District Assemblies. Such identifiable groups will be given some basic training in wildlife conservation and management to enable them complement the already existing efforts.

2.1.11 Recreation

The site is to a large extent helping to sustain the annual Aboakyir festival, which provides opportunities for tourists who flock to the area every year, and generate foreign exchange in the process. The area is therefore considered to have enormous eco-tourist potential, especially in the areas of bird watching (along the lagoon and beach, using observatory posts), beachfront development (relaxation spots), walking tours, swimming pools, and forest reserve development (along the lagoon shores) (Glover & Kofiga, 1998). However, even though some modest recreational and tourist facilities have recently sprung up along the coast between Winneba township and the eastern margin of the Muni Lagoon, such facilities are generally poorly-developed, and do not sustain any employment opportunities of significance for local communities^Another problem facing the area stems from its proximity to Winneba township, and the attendant threat of rapid urbanisation, since some Winneba suburbs are encroaching on the flood plains.

2.1.12 **Research (Ntiarnoa-Baidii & Gordon, 1991)**

Based on the realization that a strong scientific data base would be required for effective management of the wetland, a number of studies were initiated in various disciplines at the site, with the main objective of establishing a national wetland database to facilitate accessibility to data. These included:

- Hydrological and limnological studies
- Detailed inventories of the flora and fauna, bearing in mind the current holistic approach to wetland management that considers the biodiversity of the wetland as a whole rather than an assessment based on ornithological values
- Determination of the'status and distribution of marine turtles on the coast
- Assessment of the fisheries potential of the lagoon with the aim of encouraging aquaculture development
- Evaluation of the contribution of the wetland resources in the socio-economic life of the local communities

- Evaluation of the effectiveness of existing traditional beliefs and taboos associated with the lagoon as a conservation tool, with the aim of encouraging, promoting and enforcing those beliefs which are found to be effective

2.2 OBJECTIVES (Ntiamoa-Baidu & Gordon, 1991

2.2.1 Long-term Management Objectives

The management objectives and proposed actions closely follow the previous management plans and the opportunities and constraints in implementing them. The management proposals and actions constitute two broad components:

- general management actions/proposals
- specific project actions

The long-term management strategy advocated for the Muni-Pomadze Rmasar site has four main objectives:

- to sustain, restore, and publicise the biological and other resources of the wetland for future generations.
- to promote bettec understanding and awareness of the local communities, and to encourage local participation and support for conservation programmes within the districts
- to enhance the benefits derived from coastal wetlands and improve the quality of life for the local communities who live in the vicinity of the wetlands and whose activities influence the wetland ecosystem
- to control, monitor and co-ordinate the activities which affect the coastal zone (e.g. human settlements, industrial developments, agriculture, fisheries, recreation etc.) so as to ensure the maintenance of the health of the coastal environment and sustainability of wetlandresource use

The general actions proposed include:

- the demarcation and zonation of the wetlands
- the development of infrastructure such as access roads and guard posts
- the institution of habitat enhancement programmes (e.g. maintenance of bird nesting grounds and c earing of river channels)

Demarcations of land for public development are often long drawn activities, which involve considerable administrative and legal negotiations and compensations. It is undertaken more conveniently by public agencies such as the Wildlife Department, the Town and Country Planning Department and recently in conjunction with the District Assemblies.

2.2.2 **Constraints**:

2.2.2.1 Administrative Bottlenecks:

The major constraint to the effective management of Muni-Pomadze is administrative. Bureaucratic delays often result in the untimely release of funds for biodiversity conservation initiatives. Another problem is the inertia of the Awutu-Efutu-Senya District Assembly in supporting biodiversity conservation initiatives.

2.2.2.2 Threats From Natural Phenomena:.

Some natural phenomena which pose threats to the attainment of the management objectives for the Muni-Pomadze Ramsar site include:

- siltation and sedimentation of the lagoon
- siltation and weediness of the Pratu River course, which is the source of freshwater to the lagoon.
- untimely opening up of the lagoon during the rain season.

2.2.2.3 Threats From Human Activities:

The population density of Ghana's coastal zone is very high, being the site of several towns or cities, and harbouring 25% of the national population, even though only 6.4% of the nations land area is represented. Muni-Pomadze is faced with the problem of rapid urbanization, especially because of its proximity to Winneba. There is currently widespread encroachment of the flood plains by the suburbs of Winneba. This in itself is not necessarily harmful to the ecological integrity of the site, if well-controlled. However, the present rate of uncontrolled expansion and development of residential areas poses a threat to the natural habitat and biodiversity' of the area, and potential source of pollution to both surface and underground water from domestic waste. There is also the threat of environmental degradation from such commercial activities as sand winning, clay mining, brick and tile manufacture, construction,

wood extraction, livestock rearing, mining exploration, stone quarrying, improper farming practices, etc. The lagoon and the surrounding catchment area are under threat of pollution from domestic sewage from Winneba. Over-exploitation of the forest for firewood and charcoal burning, and illegal hunting in the traditional hunting grounds also pose constraints for efficient management of the site.

The lagoon is also under threat from the acivities of the local community of Akosua village emanating from the use of unapproved fishing nets resulting in low fish stocks, and lack of appropriate fishing gear. Wood gathering for household use, fish smoking and construction, has also led to the problem of over-exploitation of the adjoining forest by the local communities. There is therefore the need for intensive education of the community regarding the deleterious effects of such activities on the environment.

2.2.2.4 Factors Arising From Legislation or Tradition

Wednesday is a taboo or sacred day for fishing or farming, and this is associated with the Muni and Pratu river fetishes. Unfortunately this regulation has not been adequate for the conservation of the lagoon habitat and the catchment area. Feasibility studies are currently being undertaken in consultation with the traditional authorities to evolve ways of improving the situation. It is proposed to suggest to the District Assemblies, land owners and resource users to introduce a "close season" regulation for Muni Lagoon to complement the current traditional conservation regulations for the lagoon. Considering the rapid rate of degradation of the traditional hunting grounds due to farming, charcoal burning and fuelwood harvesting, it is proposed to zone the hunting grounds (core and buffer), so that the core zone could be converted into a "sacred grove" to be used only for cultural and research purposes.

2.2.3. **Available Resources:**

2.2.3.1 Personnel

Currently the Ramsar site is being managed by four personnel from the Ghana Wildlife Department, who occupy the following positions: (i) Assistant Wildlife Officer (in charge of the site), (ii) Wildlife Ranger, (Hi) Wildlife Guard (iv) Driver (see Table below). Even though the staff strength is low, the staff at the site have performed creditably, due to the participatory and

integrated management systems put in place at the site. It is suggested that a Technical Assistant be posted to the site to help complement the efforts of the current field staff (Table 11).

2.2.3.2 ***Sanitation Improvement:***

A tipper truck station located at the Gomoa District Assembly provides waste disposal services for the two districts of Gomoa and Awutu-Effutu-Senya. About 19 sanitation units (toilets) have already been completed to help reduce pollution in the lagoon and along the beaches, A refuse collection point to provide a receptacle for temporary waste disposal, has also been constructed at Akosua village, the most sensitive part of the Ramsar site,

2.2.3.3 ***Community Investment Support Fund (CISF) and Village Infrastructure Project (VIP)***

As at 15th September. 1999. twelve community groups have benefitted from the Community Investment Support Fund (CISF) with a total amount of ¢203,016,753 being disbursed to these groups to enable them engage in various income-generating (fishing, farming, etc.) as well as environmentally-friendly activities (e.g. biodiversity conservation initiatives like woodlot establishment, mangrove regeneration, clearing of choked river channels, etc.) Twelve groups from Gomoa District have so far received a total of ¢131,171,250, representing ¢94,181,250 for micro-enterprise, and ¢40,990,000 as biodiversity grant. Four groups from the Awutu-Efutu-Senya District have also received a total of ¢67,845,503 (¢48,545.503 for micro-enterprise, and ¢19,300,000 for biodiversity). A repayment amount of ¢279,396,734 is expected (Source: Wildlife Department records).

For a more effective implementation of the fund, the following suggestions for improvement should be considered

- procedures for processing of applications should be streamlined since the current processing rate is rather slow
- the current policy of considering group rather than individual applications should be maintained

- the current policy of financing conservation initiatives is likely to deplete the resources of the fund over ume; a better alternative is to establish a revolving fund
- employment of a business development advisor for the fund

To facilitate the merger of the CISF and the Village Infrastructure Project (VIP) a temporary account has been opened in each district for repayments, until the DRIF account under the VIP is formalised.

2.2.4 **Operational Objectives:**

2.2.4.1 ***Achievable and Measurable Targets:***

Conservation of the Muni-Pomadze Ramsar site was envisaged as a component of the Ghana Environmental Resources Management Project (GERMP). As a follow-up to the initial management strategy proposed for the site, there is the need to focus on "multiple use" criteria. It is however important not to downplay the primary objective for the establishment of the Muni-Pomadze Ramsar site as a bird sanctuary, and more currently as a biodiversity conservation area. The specific operational objectives may include:

- *the restoration, maintenance, and enhancement of the value of the Muni lagoon and its environs as a biodiversity conservation area for future generations.* This would involve the following:
    - zonation of the site into core and land-use areas, etc. through pillaring, signposts, education and guidance (on-going)
    - provision of refuse receptacles at Akosua village to prevent pollution of the lagoon (on-going)
    - control of fuelwood cutting in the land-use zones, and and banning it altogether in the core zone (on-going)
    - restoration of the ecosystem through landfilling with soil and plating of damaged or erosion-prone areas (result of sand and stone winning) (to be initiated)
    - mangrove restoration, riverbank planting, Pratu River channel cleaning, and enrichment plating of traditional hunting grounds

- encouragement of captive breeding of grasscutters by local hunters to provide alternative sources of protein (to be initiated)
- division of traditional hunting grounds into sacred and buffer zones, and restocking with bushbuck (to be initiated)

Table 11: Ml M-POMADZE WILDLIFE STAFF ESTABLISHMENT

RANK	QUALIFICATION	RESPONSIBILITIES
1. Assistant \\'ildlifc Officer	B.Sc. (Natural Resource Management)	• General management of the Ramsar site • Preparation of work programmes and facilitation of their implementation • Conservation education of resource users. • Facilitation of community development. • Habitat improvement • Monitoring of the environmental health indicators • Community/stakeholder consultations
2. Wildlife Ranger	G.C.E. (Advanced Level)	• Enforcement of wildlife laws and Ramsar site regulations • Reports to wildlife Department and the two District Assemblies responsible for site. • Field assistance • Undertaking regular patrols of the core area of the site • Enforcement of wildlife laws and by-laws. • Project maintenance • Reporting to the officer-in-charge.
3. Technical Assistant (Vacant)	Good pass at G.C.E. (Ordinary Level) SSCE	-do-
4. Wildlife- Guard	M.S.L.C	-do-
5. Driver	M.S.L.C.	• Driving and maintenance of the station vehicle.

Source: Ghana Wildlife Department records

- *promotion of a better understanding and awareness of the local people of environmental issues, and encouragement of local participation and support for conservation programmes within the districts.* The following are the specific activities envisaged:
  - increased anti-bushfire educational campaigns during the dry season (on-going)
  - encouragement of wetland resource users to form co-operatives or unions to ensure support and effective monitoring of their activities
  - intensification of public awareness campaigns on environmental issues, to ensure local participation in biodiversity conservation initiatives (on-going)

- promotion of publications focussing on the Muni-Pomadze wetland, and encouragement of organised groups, religious bodies, District Assemblies, and traditional authorities to disseminate environmental information to the remotest parts of the various districts

- *ensuring the sustainable utilisation of resources of the wetland, and an improved quality of life of the local communities* through:
  - banning of sand and stone winning activities at sensitive areas of the site
  - control of farming and grazing activities, and restricting them to land-use zones of the site
  - introduction of a "close season" on fishing activities on the Muni Lagoon to protect the lagoon habitat and prevent over-exploitation
  - establishment of woodlots as alternative sources of fuelwood (on-going)
  - encouraging research into community trends of resource exploitation and advising on improvements whenever necessary
  - conduction of a bushbuck population census (to be initiated)
  - identification of viable environmentally-friendly economic activities as an alternative source of livelihood for the local communities, and facilitation of financial support for such activities through poverty alleviation initiatives
  - encouragement of human activities that do not excessively encroach on the lagoon fauna (e.g. vegetable, cassava and maize farming, fish smoking and salting, etc.)
- *maintenance and promotion of local traditions and cultures associated with the lagoon, which foster the improvement of the environment and sustainable use of its biological and other resources* through:
  - reduction of fish exploitation rate through education of local fishermen, introduction of "taboo" days, and regulation of fishing gear
- *provision of appropriate facilities for the development of a national wetland research programme involving Muni-Pomadze and other coastal Ramsar sites in Ghana, and encouraging /participation of scientists and students in Ghanaian research institutions and universities.*

The specific projects may vary from community to community, and according to the natural environment of the wetland and the socio-economic background and characteristics of the people. Generally, preliminary investigations will include the determination of the:

- relevance and acceptability of previous projects to the community
- technical and financial feasibility of specific projects
- environmental impacts
- proposals for mitigatory measures as well as management options.

2.2.4.2 Relationship to Long-Term Objectives:

Specific wetland management projects are well within the capabilities and mandates of government, NGOs, communities, cooperatives, development companies, and individuals. It is proposed that these opportunities should provide a role for institutions in the Central region of Ghana in the general effort to manage the Muni wetlands,which offers reasonable opportunities for such participation in wetland management.

The proposed immediate participation for selected institutions in the conservation management of the Muni wetlands in Ghana is made on the basis of the following observations that:

- most institutions are desirous and anxious to:
    - develop workable guidelines for the conservation and exploitation of wetland resources on sustainable basis.
    - involve local communities in wetland rehabilitation, and
    - establish a research and institutional base for the carrying out of management and campaign activities.
- considerable public and private initiative and effort have already gone into this aspect of national planning and development with particular reference to the coastal wetlands in general, but also to the Muni-Pomadze wetland in particular, which has attracted little attention.
- plans for the rehabilitation and development of the Muni wetland have a great potential for providing opportunities for integrative and participatory development.

- it is possible to define immediate actions for the development of the Muni area for selected institutions.
- experience gained in other areas such as the Songor area can be applied in the development of Muni wetlands even though specific natural and socio-economic conditions differ.
- the dual approach of governmental initiative in *general planning and infrastructural provision* complemented by *specific project planning and implementation* by other institutions and organisations seems to be a reasonable arrangement in the Ghanaian socio-economic, political and cultural context.

PART 3:

ACTION PLAN/PRESCRIPTIONS

3.1 ZONING:

A zonation scheme has been advocated for the Muni-Pomadze Ramsar site, in order to ensure effective management, as well as the protection of the biodiversity of the area, and the economic well-being of the local communities. Five management zones have been recognized:

3.1.1 Core Area

Comprising the northern sections of the open lagoon and immediate surroundings covering an area of about 2 km^2. The area is most important for feeding, roosting and nesting shorebirds, and least important for fishing. To ensure minimal disturbance of the birds populations, other human activities in the area are to be restricted during the peak season for palaearctic migrants (August to December) and the breeding season for the resident species (May to June).

3.1.2 Traditional Hunting Grounds:

Comprising degraded forest adjoining the Yenku B (Egyasimanku) Forest Reserve, which is especially restricted and managed both to sustain the annual *Aboakyir* festival, and to provide a

source of bushmeat. There is strict control of habitat-degrading human activities like farming, hunting, fuelwood collection, livestock grazing, and bushfires. Management of the area is expected to be incorporated into current management plans for the adjoining forest reserve through collaboration of between local communities (especially Asafo companies), traditional authorities and District Assemblies on the one hand, and the Wildlife and Forestry Departments and environmental NGOs on the other.

3.1.3 Controlled Zone:

Area adjoining the Core Area, located at the southern half of the open lagoon, sand dunes, and the adjoining flood plain. Since the area is considered ecologically-sensitive, there is strict control and monitoring of current traditional activities at the site (e.g. fishing, shellfish collection, subsistence farming, etc.), lagoon productivity, agrochemical use, and bushfires. Management of the area is to focus on agroforestry for increased fuelwood production, as well as restriction of housing development to immediate vicinities of existing settlements.

3.1.4 Land Use Management Zone:

Outer sections of the drainage basin, comprising scrublands, farms and small settlements. Management measures will focus on the mapping of land use patterns, control of bushfires, and encouragement of tree planting. There will also be controls to minimize the adverse effects of deforestation, soil erosion, and agro-chemical run-off, on the wetland ecosystem.

3.1.5 Settlements:

Comprising the Winneba township and villages within the drainage basin. Management efforts would be geared towards minimising pollution by ensuring proper waste disposal practices.

3.2 MANAGEMENT STRATEGIES (2000-2005):

3.2.1 Habitat/Species Management:

3.2.1.1 Habitat Management:

3.2.1.1.1 CORE AREA:

Additional roosting sites for birds are to be provided, through the creation of habitat "islands" and provision of wooden platforms in the open water.

3.2.1.1.2 TRADITIONAL HUNTING GROUNDS:

The management plan envisages the establishment of a five-metre wide fire break to prevent bushfires, and also demarcate the zone boundaries. A habitat enhancement programme involving the planting of desired plant species (e.g. based on diet preferences of key antelope species) or removal of undesirable species will be required, in order to provide basic data for the proper management of the zone. This requires the collaborative effort of both the Asafo Companies, Ghana Wildlife Department staff and the expertise of the Ghana Forestry Department in the area of seedling supplies and sound forestry practices.

3.2.1.1.3 CONTROLLED ZONE/LAND USE MANAGEMENT AREA:

There is the need to control the use of bushfires and agrochemicals for farming in this area through intensive education of the fanners on the need to initiate agroforestry and woodlot projects, to improve vegetation cover, with the ultimate aim of increasing the supply of fuelwood. There is also the need to encourage establishment of plantations of coconut trees *(Cocos nucifera),* with measures put in place to control the spread of diseases such as St. Paul virus, since the trees serve as tree cover for the sand dunes. The cultivation of another useful tree cover, *Thespe.sia populnea,* is also to be encouraged.

3.2.1.1.4 SETTLEMENT AREAS:

The management plan provides for the supply of appropriate waste disposal systems (e.g. KVIP toilets, garbage trucks, etc.) to improve sanitation in the area, especially by discouraging littering of domestic waste, and discouraging the use of the beaches as toilets. Currently, a tipper truck station located at the Gomoa District Assembly provides waste disposal services for the two districts of Gomoa and Awutu-Effutu-Senya. About 19 sanitation units (toilets) have already been completed to help reduce pollution in the lagoon and along the beaches. A refuse collection point to provide a receptacle for temporary waste disposal, has also been constructed at Akosua village, the most sensitive part of the Ramsar site.

3.2.1.1.5 COMMUNITY PARTICIPATION IN HABITAT MANAGEMENT:

In developing this plan the central theme has been the involvement of the local communities in the management and development of the wetlands. This participatory approach has been adopted in recognition of the fact that the support and co-operation of local people are critical for the continued survival of protected areas throughout the world. The plan, if implemented, should ensure the participation of local people and also integrate the development of wetlands into the overall development of the local traditional communities. In order to facilitate the implementation of the plan, an integral series of plan modules have been identified which are central to the management plan but which could be developed as projects to attract donor funding. These include sanitation and water supply development, creation of environmental awareness, introduction of agroforestry and tree planting, etc. The communities must be helped to undertake communal projects like construction of toilets, and health posts, and provision of good drinking water which are essential for the healthy development of the people.

A Site Management Committee (SMC) is in place at the Vhini-Pomadze site, with membership comprising the local representative of the wetland resource users (e.g. lagoon fishermen, crab catchers, fuelwood harvesters, farmers and hunters), traditional authorities, the District Assembly, District Chief Executive, representative of community rangers, site warden, District Forestry Officer, District Environmental and Sanitation Officer; and the Chief Town and Country Planning Officer. Management decisions are taken at the site management committee meetings before implementation. As an example of community participation in site management, the local wetland resource users are involved in mangrove

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Plans are also underway to group the community rangers and wetland resource users in the vanous commun.t.es into catchment and water-watch committees. Catchment committee members would be give the requisite basic training in soil conservation to enable them

supervise such activities in their areas of operation. Water-watch committee members would also be trained m aquatic biodiversity management and conservation, and simple watch maintenance. It is hoped that making the local people who are dependent on the wetland for survival, conversant with current trends in the maintenance of environmental health, would make them better appreciate the need to intensify their efforts at restonng and conserving the natural resources of the wetland. The local communities are also being assisted to establish woodlots to serve as the alternative sources of fuelwood. This is intended to help reduce the current .pressure on wild sources of fuelwood, while ensunng that the local communities meet their fuelwood needs. Specific highlights of the management strategies are as follows:

- ***Five-year Management Restoration Project****:* Involves the planting of mangrove at the periphery of the lagoon to help restore the degraded ecosystem
- ***Riverbank Planting****:* The planting of *Leuceana* and mahogany trees along the banks of the Pratu R.ver, the source of freshwater to the lagoon, to serve as bamers to undesirable land use practices along the nver bank and ensure long-term protection of the watershed
- ***River Channel Cleaning****:* Clearing of weeds and silt along the Pratu river channel to ensure continuous flow of freshwater into the Mum Lagoon
- ***Enrichment Planting:*** Planting of the appropnate trees in the traditional hunting grounds to help restore and enrich the ecosystem
- ***Woodlot Establishment****:* The establishment of woodlots will be facilitated to serve as alternate sources of fuelwood to fulfil the energy demands of the community
- ***Establishment of Sacred Groves****:* The possibility of converting the most sensitive port.on of the traditional hunting grounds into a *sacred grove* to provide a buffer zone, is being explored
- ***Grassinbg and Sinking of Ponds.*** Ponds w,ll be sunk in the traditional hunting grounds and appropnate grasses,'shrubs planted near such ponds to provide food for the animals

3.2.1.2 Species Management:

3.2.1.2.1 FLORAL MANAGEMENT (Oteng-Yeboah 1994).

Artificial planting of white mangrove *(Avicennia africana)* should be encouraged along the brackish riverine shores and the south-south-western corner of the laggon. A programme of

systematic removal of neem seedlings *(Azadirachta indica)* from selected sites, should be initiated to, prevent the spread of the plant, which is opportunistic, and replaces any dominant tree in a clump (e.g. *Elaeophorbia drupifera, Diospyros abyssinica,* etc.), which is cut or dies. Intensive research is required on the effect of neem trees on other thicket associations, as well as a comparison of the feeding habits of mammals inhabiting neem-dominated thickets with those inhabiting thickets without neem.

3.2.1.2.2 FAUNAL MANAGEMENT:

Detailed investigations of the suitability of the Muni-Pomadze Ramsar site for breeding and habitation of birds are needed in order to provide a basis for improvement of bird nesting and breeding sites. Some legislations relating to bird conservation (e.g. prohibition of tern trapping) would also have to be enforced through conservation education and punishment of offenders. Ecological studies of the economically and culturally significant mammalian species of the area (e.g. bushbuck -*Tragelaphus scriptus,* black duiker- *Cephalophus niger,* Maxwell's duikeT -*C. monticola,* royal antelope -*Neotraguspygmaeus,* grasscutter -*Thryonomvs swinderianus,* and brush-tailed porcupine -*Atherurus africanus)* are also required. Specific activities earmarked for faunal species management include:

- conduction of a population census, and restocking of bushbuck in the traditional hunting grounds
- monthly monitoring of the populations of terrestrial birds and waterbirds
- monthly monitoring of small mammal and butterfly populations
- bimonthly monitoring of water quality and acquatic fauna in the Muni Lagoon
- provision of recommendations for effective management strategies based on findings of the above (Ryan & Ntiamoa-Baidu, 1998).

3.2.2 Human Usage ("Wise Use" and "Multiple Use"):

The concept of "non-use" (preservation) is inapplicable to biodiversity at Muni-Pomadze, because of problems of the current heavy usage and settlement by local communities. "Wise use" and "multiple use" approaches are considered more appropriate, because they facilitate the protection and management of all activities affecting the site, and ensure the maintenance of the value of the wetlands for both wildlife and the local community.

The Association of Wetland Resource Users (hunters, lagoon fishermen, crab catchers, fuelwood harvesters, farmers and cattle grazers associations) at Muni-Pomadze, has now been sensitised to appreciate the Ramsar "wise use" concept. Relations between the association (with the exception of cattle grazers) and the Wildlife Department staff, which was previously strained, have seen some marked improvement in recent times. Incidences of wanton destruction of wildlife and environmental degradation (pollution, etc.) in the two districts, have diminished considerably because of the environmental awareness and education efforts by the community rangers and the collaboration between the management and stakeholders in managing the Ramsar site. The following activities are envisaged:

- enforcement of wildlife laws and bye-laws on the use of the lagoon, and illegal activities such as hunting, sand and stone winning, and fuelwood harvesting
- intensification of education on the Ramsar "wise use" concept, in collaboration with traditional authorities, religious bodies, District Assemblies, and other stakeholders

"Multiple use" concepts provide another useful approach to wetland conservation in Ghana. As a practice, multiple land resource use is not new, being present in multiple cropping and mixed cropping. As a modern conservational concept and strategy, it envisages compatible uses which ensure developmental benefits with the objectives of sustained benefits. Multiple use may be achieved through exploitation activities that have temporal, spatial or process separation. Temporal separation involves activities that may be undertaken in different seasons or years (e.g. simple crop rotations or the grazing of animals on croplands after the cropping season). Different ecological environments and resources provide the opportunity for economic activities that are spatially separated but 'which may be linked by human movements (e.g. grazing on dry land and fishing in lakes, lagoons and streams). Spatial separation of economic activities in a wetland may also involve process separation (e.g. between fishing and fanning). Some uses are compatible, because when properly managed their processes may be superimposed on others (e.g. tourism, recreation and education).

3.2.3 **Access, Public Use, Education/Demonstration:**

The gravel accesss road from Sir Charles tourist centre to Akosua village is being regularly maintained to provide easy access to the bird watching conservation post facility. A visitor

centre under construction was earlier suspended by the World Bank, for one reason or the other, but the project has since been scrapped. One observation post for Muni-Pomadze has been completed. One obstacle to biodiversity conservation at Muni-Pomadze is ignorance of the local communities.. There is therefore the need to employ a trained conservation education officer whose duties would be to sensitise the local communities and to mobilise people for participation in conservation projects, as well as promote the formation of school/community wildlife clubs, village environmental committees, and to organise periodic training seminars.

3.2.4 **Research**:

In recognition of the importance of a strong scientific database for the management of the wetland habitat and its associated flora and fauna, baseline studies were initiated by the CWMP on some aspects of the wetland ecosystem. These studies were conducted by both local and foreign consultants contracted on short-term basis. Obviously, other longer-term research projects have to be initiated to further provide the requisite data for the effective management of the Ramsar site. Such studies are best conducted by student researchers from Ghanaian universities as part of M.Sc., M.Phil., or Ph.D Programmes with partial or full funding from the CWMP. Some of the recommendations for further research include the following:

- ***Aquatic Ecology:***
    - Investigation of the aquatic productivity of the Muni Lagoon
    - Human usage of the Muni Lagoon, with particular reference to lagoon fisheries (including shellfish)
- ***Butterflies:***
    - Preparation of full inventories of butterfly species at Muni-Pomadze, with reference collections for the different habitats
    - Determination of the standard community parameters for the butterfly fauna of the various habitats
    - Investigation of seasonal and long-term changes in butterfly habitats, species composition, diversity and abundance
    - Assessment of the usefulness of butterflies as ecological indicators, in relation to other data from the monitoring of other terrestrial flora and fauna

- Determination of the local food-plants and basic life-history data for key butterfly species, selected on the basis of their abundance and potential for butterfly farming and eco-tourism
- Conduction of botanical surveys with particular reference to butterfly food-plant distributions and habitat associations
- Assessment of the potential of the Muni-Pomadze butterfly fauna as an ecotourist attraction, and provision of recommendations for realizing and enhancing this potential
- Assessment of the potential of the Muni-Pomadze butterfly fauna for sustainable, community-based income generation through live-and dead-stock trade, and provision of recommendations for realizing and enhancing this potential

- ***Birds.***
    - An investigation of moult patterns on common bird species at Muni-Pomadze Ramsar site (e.g. bronze mannikin, grey-backed camaroptera, little greenbul, etc.)
    - Habitat selection by various bird groups at the site, including seasonal changes in habitat use
    - Feeding ecology and diet preference of key bird groups
    - Breeding ecology of species known to breed at the site (e.g. yellow-mantled whydah, buff-throated sunbird, Olive-bellied sunbird, snowy-crowned robin-chat, etc.)
- ***Small Mammals:***
    - Determination of the reproductive seasons, litter sizes, weaning success rates, and other reproductive parameters for the small mammal communities at Muni-Pomadze Rarnsar site
    - Assessment of habitat and microhabitat associations of the rodent communities at the site
    - Investigation of small mammal diversity and abundance in the Yenku Block A Forest Reserve
- ***Large Mammals:***

- Determination of defaecation rates of forest antelopes and duikers, and the rates of faecal pellet decay under varying weather conditions
- Determination of the density and abundance of antelope and duiker populations at the site, using night transect counts
- Surveys of the harvest rates of bushmeat species from local villagers, and an assessment of the economic factors associated with bushmeat production in the area
- Ecological studies on key mammalian species of the area, with particular reference to feeding ecology, population turnover, and habitat requirements

Currently, a postgraduate student is investigating the impact of bushfires and other human activities on the mammal communities at Muni-Pomadze Ramsar site, as part of his M.Phil (Environmental Science) research programme.

3.2.5 **Training of Personnel**

Plans are underway to group the community rangers and wetland resource users in the various communities into catchment and water-watch committees. Catchment committee members would be given the requisite basic training in soil conservation to enable them supervise such activities in their areas of operation. Water-watch committee members would also be trained in aquatic biodiversity management and conservation, and simple watch maintenance. Periodic in-service training for Wildlife Department staff at the site is also recommended to enhance performance. Such staff should be made conversant with results of previous baseline studies at the stte to enable them function more effectively during follow-up monitoring programmes.

3.3 **PROJECTS/PROGRAMMES: PROPOSED ACTIONS**

The overall goal of the Muni site management plan is to maintain the ecological integrity of the Mum wetland/ecosystem and to provide the socio-economic (aesthetic, cultural and production) framework that will contribute to a wider regional development integrating economic, social and environmental policy and actions.

The proposed specific actions of the Muni wetland management plan may include the need to:

- increase and sustain the production and harvest offish, crabs, shellfish, and farm produce and to train personnel and local people in management activities competitive to degradable actions. This aims at minimising negative effects of poor fishing and farming practices on the Muni wetland ecosystem (e.g. use of inappropriate nets, use of fire in farming and hunting, uncontrolled and indiscriminate hunting and tree-cutting);
- conserve, utilise and rehabilitate forest and scrubland as a wildlife habitat, especially birds and animal species of cultural significance to the local people, and that has the potential of promoting socio economic development.
- promote awareness and understanding of environmental issues; and
- stimulate local support, action and involvement in natural resource conservation programmes.

The following strategic actions are proposed:

- designation of programmes for public awareness, persuasion and involvement in environmental conservation programmes.
- setting up of a monitoring system to track actions taken to achieve the objectives, with the necessary conservation and development indicators designed to measure the level of progress.
- development of action plans based on what has been planned and implemented in previous years, with results of evaluation and the extent of community participation being taken into account, and measurable objectives always outlined in the action plans.

3.3.1 **Development Principles:**

The guiding principle behind the general policy for the development of wetlands has been to establish functional linkages between the conservation of biological diversity, local socio-economic development and cultural tradition. The development principles consider that:

- a close linkage exists between regional development and the conservation of biological resources, and that wetland resource management should be integrated into the dynamics of development;
- the conservation of nationally strategic and important biological resources may require the use of economic and development incentives to encourage local people to support regulations, and to appreciate real and perceived costs imposed by loss of access or restriction on use;
- reasonable access to wetland resources can provide a powerful incentive for their conservation, provided that this access is made possible within a structure of communities made responsible for the continued productivity of the resource base;
- traditional methods of wetland resource management have sustained people in the past, and that such traditional approaches to management where appropriate, should be incorporated into the national wetland management strategy;
- instead of being considered as objects of development, the local people should be made active participants in planning, implementation and monitoring of development policies, programmes and projects, and that the communities are willing to contribute materially and financially through self-help efforts.

3.3.2 Strategies for the Development of the Muni-Pomadze Wetlands:

The proposals for the rehabilitation of wetlands in Ghana is premised on three development programmes:

- **Programme 1:**
    - Creation of environmental awareness among the general populace of the need to conserve and preserve wetland resources;
- **Programme 2:**
    - Rehabilitation of resources and infrastructure for sustainable management of wetlands;
- **Programme 3:**
    - Programme for accelerated growth and development of wetland communities.

3.3.2.1 *Programme 1: Environmental Education and Awareness*

3.3.2.1.1 EXPECTED OUTPUT.

- Incorporation of a wetland management policy into the overall national environmental/ protected area policy as agreed by the government of Ghana;
- Assigning a government agency at an appropriate decision-making level with the responsibility for the planning and management of Muni-Pomadze and other wetlands in Ghana;
- Enacting of legislations to regulate wetland uses and prevent pollution and degradation of the resources of Muni-Pomadze and other wetlands in the country;

3.3.2.1.2 ACTIVITIES:

- The two District Assemblies administering the Muni-Pomadze Ramsar site, must initiate discussions with policy-makers, politicians and environmental organizations (both governmental and non-governmental), of the major findings of previous studies conducted at the site, and the need to adopt wetland management policies and to pass legislation to regulate the use of the wetland;
- Organization of a national workshop on wetland uses and management in Ghana, involving planners, researchers, policy-makers, lecturers and politicians to press home the need for the formulation and adoption of a national wetland management policy;
- Production and distribution of posters, pamphlets, and other educational materials in English and Akan (i.e. main dialect of the local communities around the wetlands) by the District Assemblies in collaboration with Ghana Forestry Department (GFD), Ghana Wildlife Department (GWD) and the Environmental Protection Agency (EPA).
- Initiation of environmental educational campaigns by the District Assemblies in the electronic and print media, including the development of advertising jingles for television and radio;
- Organization of durbars, rallies, public fora, etc. at community level by the District Assemblies in collaboration with GWD, GFD, and EPA for purposes of educating local communities on the need to conserve wetlands and prevent destructive activities that adversely affect the wetland environment (e.g. pollution);
- Formation of Community Environmental Committees, comprising of representatives of the two adjoining District Assemblies, as outlined in the District Assembly Law 1993;

- Initiation of training programmes for local environmental committees, through the collaborative efforts of the District Assemblies, GWD, GFD and the Agroforestry Unit of the Ministry of Agriculture.

3.3.2.1.3 DEVELOPMENT TARGET

- A wetland management policy and legislation for Muni-Pomadze to be passed by the District Assemblies by the middle of year 2000;
- Organization of biannual seminars and workshops for planners, politicians, policy-makers and other stakeholders on wetland management policies, especially regarding the Muni-Pomadze wetland, starting from October, 2000;
- A projected 90 % of people living within and aroung the Muni-Pomadze Ramsar site should be well-informed about sound ecological management practices at the end of year 2000;
- An environmental/afforestation committee to be formed by the local communities by the end of year 2000;
- Organization of a training programme in wetland management techniques for at least 10 people from the local community, by the GWD and GFD;
- Over 50 % of population inhabiting the wetland to adopt some forms of wetland silvicultural practices, which integrate wetland management with the existing human-use practices at the site, and which enhance the ecological value of the wetland;
- Production of documentary films on wetland uses and management activities in Ghana as part of educational material for wetland conservation.

3.3.2.1.4 IMPORTANT ASSUMPTIONS

This programme is based on the assumptions that:

- the local communities are willing to collaborate in wetland management;
- the government of Ghana shows a strong and continued political commitment to the rehabilitation of wetlands in Ghana;
- the government of Ghana is willing to legally gazette wetlands as "protected areas".

3.3.2.2 Programme 2: Rehabilitation and Sustainable Management:

3.3.2.2.1 EXPECTED OUTPUT:

- Zoning and designation of the Muni-Pomadze wetland
- Development of Working/Management Plans for specific control over the use of the wetland;
- Institutional framework to support a wetland management policy;
- incentive package for sustainable management of wetland ecosystems.

3.3.2.2.2 ZONING AND DESIGNATION:

As a fundamental step towards the evolving/formulating of management plans for the rehabilitation and development of the Muni-Pomadze wetlands, there is the need to zone and designate wetlands by permitted use or activity, or global biospherical abatement reserve (Ramsar site) by varying degrees of site protection. Zoning involves dividing the resources of the wetlands and schematically outlining the type of management regime and development activity appropriate for each area. Basing management programmes and activities on a zoning system defines the planning process and greatly facilitates the implementation of management plans by the communities.

Based on the inventory reports and the findings of the socio-economic surveys, a simple and discrete classification of zoning categories has been proposed to serve current conservation priorities. Although these may change with time, along with the location of the zones, the categories are sufficiently broad and flexible to remain relevant for a long time. The application of the zoning system to the Muni wetlands has been discussed in the report along with their specific management objectives. The proposed designations are: protected area wetlands, multiple-use wetlands, special purpose wetlands and development area wetlands.

- ***Protected Area Wetlands***

- DESCRIPTION

The part of the Muni wetlands to be designated a protected area should include sections of the wetland which have been least altered by current human activities, are largely intact in their species composition, or are of such prime conservation value as to merit special protection. Such designation will cover areas that:

- support appreciable assemblages of rare, vulnerable or endangered species or sub species of plants or animals;
- have species value for maintaining the genetic and ecological diversity of the region because of the quality and peculiarities of its flora and fauna;
- have species value as habitats of plants or animals at critical stages of their biological-cycle;
- regularly support substantial number of individuals from particular groups of waterfowls indicative of wetland values productivity or diversity;
- have lagoon shrines that have to be preserved because they may be the abodes of some gods or ancestral spirits, and traditional laws or taboos forbid harvesting of the available natural resources.

Historically, protected area wetlands are areas that have been influenced by man from both an ecological and conservation point of view. They are considered as the most important and threatened vegetation communities represented in the wetlands, and also areas which are relics of plant communities which were formerly more widespread in the wetlands and contain locally endemic or disjunct species. Such areas also include culturally important sites (e.g. areas of ancestral worship) and therefore merit recognition and protection.

- DEVELOPMENT TARGET:

The development target is to ensure that the Muni-Pomadze site is designated as a fully protected wetland by the year 2000.

- **MANAGEMENT OBJECTIVES**
    - To preserve these unique vegetation communities and associated fauna for genetic conservation and landscape aesthetic reasons, and to manage them to ensure that the structure and floristic composition remain in dynamic equilibrium.
    - To protect the wetland areas from activities that are incompatible with sustainable management and from the destructive effects of fire and harvesting for fuelwood.
    - To provide opportunities for tourism promotion.

- To prevent disturbance or damage to the cultural sites, while allowing limited public access to certain sites for sightseeing and education.
- To provide opportunities for non-manipulative research and monitoring programmes, particularly to assess the diversity and succession patterns of the wetland vegetation for management purposes.
- To regulate the discharge of wastes and other harmful chemicals unto the wetland areas.

- ***Multiple-Use Wetlands***

- **DESCRIPTION**

The designation and zoning of this Muni wetland type will include those areas which have samples of important ecosystems but where the ecology has been significantly altered by man (through salt and sand winning, over-exploitation of fuelwood, intensive farming, perennial bush fires, encroachment by estate developers and other industrial activities), and where management will focus on the long term sustained production of desired resources, and where a certain level of human development can be permitted. Wetlands whose carrying capacity is exceeding its limit should also be designated as multiple-use areas for the introduction of other activities that can sustain the wetland resources over time. In such areas, habitat conditions can be manipulated by suppressing or favouring natural processes, such as salt and sand winning, fire and artificially controlling the growth of plant and animal species populations through culling or introductions.

- DEVELOPMENT TARGET

The Multiple-use wetlands should constitutes at least 50 % of the total area of the wetlands.

- MANAGEMENT OBJECTIVES AND STRATEGIES
    - To serve as a management buffer for the protected zone, and create compatible enterprises.
    - To re-establish significant populations of established animal species and introduce additional species for conservation.

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- To create opportunities for the introduction of agro-forestry practices, tree planting and aquaculture.
- To encourage and promote tourism and recreational activities.
- To promote the sustainable extraction of various harvestable products from the wetland by local people, thereby increasing the carrying capacity of wetlands.
- Controlling the growth of residential and industrial activities on wetlands and providing alternative growth outlets.

3.3.2.3 Programme 3: Accelerated Growth and Development Priorities:

The purpose of this programme is to promote growth and development in the wetland communities so that -people can sustainably maintain the wetland resources on which they depend. The programme aims at promoting sectoral linkages through the improvement and transformation of the local economy by upgrading social services, production and technical infrastructure which will accelerate and sustain growth at levels of localities. The development philosophy is based on the "basic needs" approach to development with active community participation.

3.3.2.3.1. UPGRADING SOCIAL SERVICES

- Emphasis should be placed on:
  - intensification of Primary Health Care activities;
  - promotion of Family Planning Programmes;
  - improvement of potable water supply;
  - introduction of adult education programmes and improving the formal education sector; and
  - improving sanitary conditions

3.3.2.3.2 IMPROVING PRODUCTIVE ACTIVITIES

The priorities include:

- developing and modernizing traditional agriculture;
- providing improved storage facilities
- promoting the expansion of small scale industries;

- encouraging livestock production
- promoting extension services

3.3.2.3.3 IMPROVING ACCESS TO FINANCE

This would involve the promotion of personal savings through the enhancement of the traditional "susu" system, a traditional financial rotating savings scheme) and establishment of branches of the Rural Bank.

3.3.2.3.4 UPGRADING TRANSPORT AND COMMUNICATION

Emphasis would be laid on:

- rehabilitation of existing road network;
- improvement of community drainage system
- improvement of the postal system

- ***UPGRADING SOCIAL SER VICES***
  - ***Promotion of Primary Health Care***

- **EXPECTED OUTPUT**
  - All wetland communities to have easy access to health facilities;
  - Development of a health delivery system for the local communities;
  - Development of a preventive health care delivery system in the communities;
  - Establishment of a community-based Level C health care delivery system wetlands.

- **ACTIVITIES**
  - Identification, selection, and training of community-based health workers in simple preventive health care delivery techniques in the wetland community by the Ministry of Health
  - Formation of a Traditional Medicine and Psychic Healers Association in the communities, with the support and encouragement of the Ministry of Health

- Intensive preventive health care delivered by trained community health workers to areas without access to a community health care programme
- Identification of premises for the establishment of Level C health care delivery systems in communities currently not accessible to health facilities;
- Formation of local Health Management Teams to manage the Level C health posts:
- Identification and further training of local traditional birth attendants in maternity and child care systems;
- Initiation of community environmental programmes, and enactment of laws to enforce them;
- Improvement of facilities in existing health posts to ensure wider coverage.

- ***Promotion of Family PlanningProgrammes***

- EXPECTED OUTPUT
  - Adoption of family planning programmes by the local communities;
  - Increased in male participation in family planning programmes;
  - Marked reduction of fertility rates in the local population

- ACTIVITIES
  - Initiation of intensive family planning programmes by the Ministry of Health, with males as the main targets;
  - Identification and training of community-based family planning facilitators to educate the communities on simple family planning practices;
  - Distribution of birth control devices to the indigenous communities by the community-based family planning facilitators, with assistance from the Ministry of Health, with explanations on their effective use.

- ***Improvement of Sanitary Conditions***

- EXPECTED OUTPUTS
  - Provision of adequate waste disposal systems for the communities, and improvement of existing ones to make them more effective;

- Enactment of bye-laws to prevent pollution of the wetlands

- ACTIVITIES
  - Construction of KVIP toilet facilities by Community Development Committees with assistance from the District Assemblies to prevent indiscriminate defaecation;
  - Initiation of sanitation educational programmes, especially on the need to keep the wetland and its environs clean, by the District Environment Committees;
  - Mobilization of the communities by local environmental committees to undertake periodic clean-up campaigns to clear up refuse that may have accumulated on the wetland
  - Mobilization of resources by the District Assemblies to clean up polluted lagoons;

- ***IMPROVEMENT OF PRODUCTIVE ACTIVITIES***

The purpose of this programme is to improve the economic conditions of the people inhabiting the Muni-Pomadze wetland in a way that will enable them improve their lives without over-exploiting the resources of the wetland on which they depend. The major priority is to diversify the economy by promoting small-scale industries and improving access to capital.

- ***Improvement of Small-scale Industries***

- EXPECTED OUTPLiT
  - Marked improvement in productivity of small-scale industries;
  - Improvement in the quality of products;
  - Marked increase in the proportion of the population actively engaged some form of small scale industry;
  - Promotion of fish smoking, salt winning, soap-making, carpentry and blacksmithing activities in the communities.

- ACTIVITIES
  - Organisation of community entrepreneurship and managerial courses for carpenters, soap makers and blacksmiths, by the Department of Rural Housing and Cottage

Industry in collaboration with the National Board for Small-scale Industries (NBSSI)

- Assistance by the National Council on Women and Development (NCWD) to women fish-smokers to acquire improved fish smoking ovens (e.g. *"Chorkor Smoker"),* and to get good access to markets;
- Encouragement of enterprising young indigenous industrialists to train with the local branches of the Intermediate Technology Transfer Unit (ITTU)
- Encouragement of local industrialists to form trade associations;
- Extension of technical and financial assistance by the NBSSI to small-scale operators in the communities.

- *IMPROVEMENT OF ACCESS TO FINANCIAL ASSISTANCE*
- EXPECTED OUTPUT
    - Provision of better financial assistance to local entrepreneurs
    - Mobilization of finance through a *"susu"* system.
- ACTIVITIES
    - Formation of local credit unions *("susu")* by the local communities,and identification and training of interested local inhabitants, with assistance from the Ghana Cooperative Association
    - Encouragement of Rural Banks to establish branches in the districts
    - Initiation of massive education programmes to encourage the people to cultivate the culture ofsaving with financial institutions.

- *IMPROVEMENT OF ROAD NETWORKS AND COMMUNICA TION*

  The main goal of this programme is to encourage community participation in road maintenance and rehabilitation.

  - EXPECTED OUTPUT
    - Improvement of all major roads linking the wetlands with the mam urban centres by making them all-weather, graded and profiled;
    - Regularly maintenance of road networks within and around the wetland;
    - Ensuring easy accessibility of the wetland;

- Improvement of postal systems in the wetland.

- ACTIVITIES

  - Identification and training of local road contractors in simple labour-intensive road maintenance techniques, by the Department of Feeder Roads (DFR);
  - Training of the local communities in road maintenance techniques by the Community Development Department in conjunction with the DFR
  - Training by Ghana Posts and Telecommunications, of selected individuals from the local communities as postal agents.

3.3.2.3.5 TOURISM DEVELOPMENT

There is immense potential to develop the Muni-Pomadze Ramsar site as a tourist attraction through effective development and management strategies. A two-tier approach to touristic development is envisaged.

- The initial development of touristic facilities by the District Assemblies should be appropriate to local needs, particularly in terms of cost of transport and accommodation through:
  - improvement of conditions of the lagoon, beaches and the general catchment area of the wetland;
  - creation of special areas for tourists (e.g. areas of historical interest);
  - encouragement of local entrepreneurs to establish food and beverage supply outlets at specially-demarcated areas within the wetland;
- Introduction of higher-costing or premium facilities should be considered only after the site has established a reputation for value. The Ghana Tourist Board Ghana is expected to be involved in promoting the site as a tourist attraction, as well as encouraging private investment in establishing such tourist facilities.

Community involvement and integration will depend ultimately on establishing lines of communication to gain support and using incentives to strengthen that support, at the same time the community will have to be made aware of the responsibilities and accountability.

3.4 COST IMPLICATIONS OF MANAGEMENT STRATEGIES (BUDGET)

The table below provides a breakdown of the cost implications of the management plan over a maximum five-year period:

Table 12 FIVE-YEAR BUDGET FOR PROPOSED MANAGEMENT STRATEGIES

ACTIVITY/INPUTS	DURATION (YEARS)	ESTIMATED BUDGET (US DOLLARS)
Mangrove Restoration (150 acres) • 150,000 seedlings • polybags • black soil • water • cutlasses • food for community • mangrove seedlings • miscellaneous items	5	10,000
Pratu River Bank Planting (10 km) • 75,000 seedlings of leuceana and mahogany	3	7,000
River Channel Cleaning (10 km) • 10 Wellington boots • 100 cutlasses • 100 shovels • food for community	5	12,500
Enrichment Planting in Traditional Hunting Grounds • 30,000 seedlings • food for community • miscellaneous items	3	6,000
Woodlots Establishment (50 acres) • 50,000 seedlings • land preparation • miscellaneous	5	6,000
Sacred Grove Establishment • servicing of consultative meeting (*s*) of traditional authorities, District Assembly, resource users, land owners, etc • drafting of bye-laws • cost of publications • miscellaneous	2	5,000
Grassing/Sinking of Ponds in Traditional Mu tiling Grounds • casual labour • grasses/herbs	3	5,000
Bushbuck Population Census and Restocking • hiring of hunters • recruitment of relevant experienced personnel • acquisition of 30 breeding stock • report writing, etc.	^	10,000
Monitoring of butterflies, aquatic and tci restrinl vertebrates • report writing, etc	s	10,000

Education Centre		30,000
TOTAL		**101,500**

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APPENDICES

Appendix 1 FLOWERING PLANTS OF MUNI-POMADZE RAMSAR SITE

SPECIES	LIFE-FORM	HABITAT
ACANTHACEAE		
Asystasia gangetica	Herb	Thicket/Ruderal/Weed
AGAVECEAE		
Sanseveria liberica.	Herb	Thicket
AMARANTHACEAE		
Alternanthera maritime.	Herb	Flood Plain/Dune-Strand
AMARYLLIDACEAE		
Crinutn ornatum	Herb Geophyte	Thicket/Grassland
Haemanthus multifloms	Herb Geophyte	Thicket/Grassland
ANACARDIACEAE		
Soreindein warneckei	Shrub	Thicket
ANNONACEAE		

Uvaria afzelii	Shrub	Thicket
APOCYNACEAE		
Carissa edulis	Shrub	Thicket
Thevelia neriifolia	Shrub	Thicket
ARACEAE		
Anchomanes difformis	Herb Geophyte	Thicket
ARECACEAE		
Cocos nucifern	Tree	Dune-Strand
Elaies guineensis	Tree	Thicket
Phoenix reclinata	Tree	Thicket
ASCLEPIADACEAE		
Gymmema sylvestre	Shrub/Woody Climber	Thicket
Sarcosiemma viminale	Woodv Climber	Thicket
Secamone afzelii	Woody Climber	Thicket
ASERACEAE		
Chromolaena odorald	Herb	Ruderal/Weed
Vernonici cinerea	Herb	Ruderal/Weed
V. colorala	Shrub	Thicket/Grassland
AVICENMACEAE		
Avicennia africana	Shrub	Mangrove Swamp/Flood Plain
BOMBACACEAE		
Ceiba penicmdra	Tree	Thicket
BORAGINACEAE		
Ehrelia cvmosa	Shrub	Thicket
Helioiropium ovalifolium	Herb	Ruderal/Weed
CACTACEAE		
Opuntia vulgaris	Herb Succulent	Dune-Strand
CAESAL PINACEAE		
Cassia momoboides	Herb	
C, occidentalis	Herb	Ruderal/Weed
C. seiamia	Tree	Thicket
Dialium guineensis	Shrub	Thicket
Griffonia simplicifolia	Shrub/Woody Climber	Thicket
CAPPARIDACEAE		
Cfipparis erythirocarpus	Shrub	Thicket
C. thonnmghii	Shrub	Thicket
C tornenlosa	Shrub	Thicket
Ritchiea reflexa	Woody Climber	Thicket
COMBRETACEAE		
Conocarpits erectus	Shrub	Mangrove Swamp/Flood Plain
COMMELINACEAE		
Commelina africana	Herb	Ruderal/Weed
Palisola hirsnta	Herb	Grassland
CONNARACEAE		
Byrsocairpus coccineus	Shrub	Thicket
CONVOLVULACEAE		
Aniseia matinicensis	Herb Creeper	Grassland
Ipomoea involucrata	Herb Climber	Thicket
I. pes-caprae	Herb Creeper	Dune-Strand
CYPERACEAE		
Cypenu articulatus	Sedge	Flood Plain
C imbricatus	Sedge	Grassland

C maritimus	Sedge	Thicket
C. rotundus	Sedge	Ruderal/Weed
Fimbristyliss dichotoma	Sedge	Ruderal/Weed
F. ferruginea	Sedge	Flood Plain
Kyllinga peruviana	Sedge	Flood Plain/Mangrove Swamp
K. Squamulata	Sedge	Ruderal/Weed
Mariscus squarrosus	Sedge	Ruderal/Weed
Pycreus polystachyos	Sedge	Dune-Strand
Remirea maritima		
EBENACEAE		
Diospyros abyssinica	Shrub	Thicket
EUPHORBIACEAE		
Croton lobtus	Herb	Ruderal/Weed
Drypetes floribunda	Shrub	Thicket
Elaeophorbia drupifera	Tree	Thicket
Jatropha gossypifolia	Herb (woody at base)	Flood Plain
Mallotus oppositifolius	Shrub	Thicket
Phyllanlhus pentandus	Herb	Ruderal/Weed
Securinega virosa	Shrub	Thicket
FICOIDACEAE		
Sesuvium porlulacatrum	Herb Succulent	Dune-Strand/Flood Plain/Mangrove Swamp
FLACOURTIACEAE		
Flacourtia flavescens	Shrub	Thicket
FLAGELLARIACEAE		
Flagellaria guineensis	Herb Climber	Thicket
GENTIANACEAE		
Exacum quinquenervium	Herb	Thicket
LAMIACEAE		
Hoslundia opposita	Shrub/Herb (woody at base)	Thicket
LAURACEAE		
Cassyiha filiformis	Climber	Thicket
LILIACEAE		
Asparagus africanus	Herb (woody at base)	Thicket
Scilla sudanica	Herb Geophyte	Grassland
LOGANIACEAE		
Spigelia anthhelmia	Herb	Ruderal/Weed
MALVACEAE		
Abutilon mauritianum	Herb	Grassland
Gossypium arboreum	Herb (woody at base)	Grassland
Hibucus surattensis	Herb (woody at base)	Grassland
H filiaceous	Herb (woody at base)	Grassland
Sida ovata	Herb (woody at base)	Grassland
S. tiliaceous		
Thespesia populnea	Shrub/Tree	Thicket/Dune-Strand
Wissaidula amplissima	Herb	Grassland
MELIACEAE		
Azadirachta indica	Tree	Thicket
MENISPERMACEAE		
Triclisia subcordata	Woody Climber	Thicket
MIMOSACEAE		
Dichrostachys glomerta	Shrub	Thicket
MYRTACEAE		

Eucalyptus spp.	Tree	Plantation
Eugenia coronata	Shrub	Thicket
NYCTAGINACEAE		
Boerhavia coccinia	Herb	Dune-Strand/Ruderal-Weed
B. diffusa	Herb	Ruderal-Weed
OLEACEAE		
Jasminiun dichotomum	Shrub	Thicket
ONAGRACEAE		
Ludwigia erecta	Herb	Woody Plain
PAPILIONACEAE		
Abrus prectatorius	Herb Climber	Ruderal-Weed
Baphia nitida	Shrub	Thicket
B. pubescens	Shrub	Thicket
Canavalia rosea	Herb Creeper	Dune-Strand
Crotalaria gareensis	Herb	Grassland
C. retusa	Herb	Ruderal-Weed
Indigofera hirsuta	Herb	Grassland
Lonchocarpus cyanescens	Shrub	Thicket
Rhyncosia sublobata	Herb Climber	Grassland
Sesbania sesban	Herb	Flood Plain/Grassland
PASSIFLORACEAE		
Passiflora foetida	Herb Climber	Thicket
PEDALIACEAE		
Pedalium murex	Herb	Dune-Strand
POACEAE (GRAMINAE)		
Andropogon gayanus	Grass	Grassland
Bothriochloa bladhii	Grass	Grassland
Brachiaria distachyoides	Grass	Flood Plain/Grassland
Ctenium canescens	Grass	Grassland
Dactyloctenium aegyptium	Grass	Ruderal/Weed
Eleusine indica	Grass	Ruderal/Weed
Heteropogon contortus	Grass	Ruderal/Weed
Hyparrhenia welwitschii	Grass	Grassland
Imperata cylindrica	Grass	Flood Plain
Panicum maximum	Grass	Grassland
P. repens	Grass	Grassland
Paspalum orbiculare	Grass	Flood Plain
P. vaginatum	Grass	Flood Plain
Setaria pallide-fusca	Grass	Grassland
Sporobolus pyramidalis	Grass	Flood Plain
S. *robustus*	Grass	Flood Plain
S. virginicus	Grass	Flood Plain
Vetiveria fulvibarbis	Grass	Flood Plain
POLYGALACEAE		
Polygala arenaria	Herb	Grassland
PORTULACACEAE		
Portulaca foliosa	Herb Succulent	Flood Plain
Talinum triangulare	Herb Succulent	Ruderal/Weed
ROSACEAE		
Chiysobalanus orbicularis	Shrub	Thicket
RUBIACEAE		
Borreria scabra	Herb	Flood Plain
Mitragyna inermis	Shrub	Thicket
Oldenlandia corymbosa	Herb	Ruderal/Weed
RUTACEAE		
Fagara zanthoxyloides	Shrub/Tree	Thicket
SAPINDACEAE		
Allophylus africanus	Woody Climber	Thicket
Paullinia pinnata	Woody Climber	Thicket
SAPOTACEAE		

Malacantha alnifolia	Shrub	Thicket
SCROPHULARIACEAE		
Scoparia dulcis	Herb	Huderal- Weed/Grassland
SOLANACEAE		
Datura metel	Herb (woody at base)	Grassland
Physalis angulata	Herb	Ruderal/Weed
Schwenkia americana	Herb	Ruderal/Weed
STERCULIACEAE		
Waltheria indica	Herb	Grassland
TILIACEAE		
Corchorus aestuans	Herb	Grassland/Ruderal-Weed
Grewia carpinifolia	Shrub/Woody Climber	Thicket
Triumfetta rhomnboidea	Herb (woody at base)	Grassland
TYPHACEAE		
Typha australis	Herb	Wlood Plain/Grassland
VERBENACEAE		
Clerodendrum capitatum	Woody Climber	Thicket
Stachytarpheria anguistifolia	Herb	Grassland/Ruderal-Weed
VITACEAE		
Cissus qundrangularis	Herb Succulent/Climber	Thicket
ZYGOPHYLLACEAE		
Tribulus terrestis	Herb	Grassland/Ruderal-Weed

Appendix 2 ETHNOBOTANICAL SURVEY OF MUNI-POMADZE RAMSAR SITE

	SPECIES	**USES**
HUMAN REQUIREMENTS		
• FOOD SOURCES		
	Anchomanes difformis	Underground edible tuber
	Avicennia africana	Leaf ash substitute for salt
	Cocos nucifera	Edible fruit, oil
	Elaies guineensis	Edible fruit, oil
	Fagara zanthoxyloides	Seeds as spices
	Grewia carpinifolia	Edible fruits
	Opuntia vulgaris	Edible fruit juice
	Phoenix reclinata	Edible fruits
	Vernonia colorata	Leaf as spinach (bitter leaf)

• MEDICINES		
	Asystasia gangetica	Leaf juice for sores
	Azadirachta indica	Leaves boiled as febrifuge
	Cassia occidentalis	Anthelminthic invigorating tonic, diaphoretic and all kinds of illness
	Chromolaena odorata	Leaf juice for cuts and sores
	Clausena anisata	Antiseptic for eye diseases; mosquito repellent
	Crinum ornatum	Pounded leaf for guinea worm extraction
	Dichrostachys cinerea	Leaf and stem poultice for boils
	Elaeophorbia drupifera	Pounded leaf for guinea worm extraction
	Ehretia cymosa	Leaf juice as laxative
	Fagara zanthoxyloides	Various plants parts as aphrodisiac, analgesic, anthelminthic
	Flacourtia flavescens	Infusion of plant parts as liver stimulant and bile disease
	Gymnema sylvetre	Root powder antidote for poison
	Hoslundia opposita	Infusion of plant parts as liver stimulant and bile disease
	Jasminium dichotomum	Leaf decoction as lotion
	Mitragyna inermis	Bark decoction for diahoretic, diuretic, febrifuge, laxative, leaf lotion rheumatism, gonorrhoea
	Physalis angulala	Analgesic
	Sanseveria liberica	Root decoction as liniment
	Schwenkia americana	Leaf infusion for cough
	Secamone afzelii	Latex on boils
	Secureniga virosa	Various parts for analgesic; aphrodisiac, diarrhoea
• TEETH CLEANERS		
	Baphia nitida	
	B. pubescens	
	Ehrelia cymosa	Stem/Branch
	Eugenia coronata	Stem/Branch
	Griffonia simplicifolia	Stem/Branch
	Mallotus oppositifolius	Stem/Branch
• FUEL.WOOD SUPPLY		
	Avicennia africana	
	Azadirachta indica	
	Capparis eiythrocarpus	
	C. thonninghii	
	Cassia siamea	
	Cocos nucifera	
	Dialium guineensis	
	Diospyros abyssinica	
	Drypetes floribunda	
	Fagara -anihoxyloides	
	Flacourtia flavescens	
	Grewia carpinifolia	
	Griffornia simplicifolia	
	Mitragyna inermis	

	Ritchiea reflexa	
• CRAFTS		
	Cocos nucifera	Fronds for brooms, mats
	Cyperus articulatus	Culm tor mats
	Dichroslachys glomerata	Stem/branch for basketry, rafters
	Diospyros abyssinica	For mortars, rafters, poles
	Griffornia simplicifolia	Stem/branch for basketry, rafters
	Imperata cyindrica	Leaf for thatching and matting
	Phoenix reclinata	Leaves for brooms, fibres for mats
	Sporobolus pyramidalis	Thatching
• OTHERS		
	Alternanthera maritima	Lawn
	A vicennia africana	Red dye; tannin source
	Carissa edulis	Hedgerow
	Ceiba pentandra	Kapok
	Cyperus articulatus	Aromatic rhizome; essential oil source
	Haemanthus multiflorus	Landscape
	Mitragyna inermis	Honey source; yellow dye
	Paspalum vaginatum	Lawn
	Sanseveria liberica	Landscape
	Sesuvium portulacastrum	Lawn
	Thevetia neriifolia	Landscape
NON-HUMAN REQUIREMENTS		
FODDER		
	Andropogon gayanus	
	Azadirachtha indica	
	Baphia nitida	
	Cassia siamea	
	Chloris barbata	
	Ctenium canescens	
	Dichrostachys gloomerata	
	Fagara zanthoxyloides	
	Griffornia simplicifolia	
	Heteropogon contortus	
	Mitragyna inermis	
	Panicum maximum	
	Paspalum vaginatum	
	Securinega virosa	
	Sporobolus pyramidalis	i
• LANDSCAPE		
	Alternanthera maritima	Soil binder to prevent erosion
	Paspalum vaginatum	Soil binder to prevent erosion
	Remirea maritima	Soil binder to prevent erosion
	Sesuvium portulacastraum	Soil binder to prevent erosion

	Sporobolus pyramidalis	Soil binder to prevent erosion

Appendix 3 **CHECKLIST OF BUTTERFLY SPECIES RECORDED AT MUNI-POMADZE RAMSAR SITE**

FAMILY/SPECIES	**LOCALITY**		
	MANKOADZE	**ONYADZE**	**YENKU**
PAPILIONIDAE			
Graphium adamastor			*
G. agaimedes			*
Papilio demodocus	*	*	*
P. menestheus			*
P. nireus	*	*	*
PIERIDAE			
Appias epaphia			*
Belenois calypso	*	*	*
B. creona	*	*	
B. gidica	*	*	*

B. hedyle			*
B. ianthe	*		
Catopsilia florella	*	*	*
Colotis anlevippe	*	*	*
C. euippe	*	*	*
Eurema brigitta	*	*	
E. hecabe	*	*	*
Mylothris chloris		*	*
Leptosia alcesta		*	*
L. wigginsi		*	*
Nepheronia argia			*
A. *pharis*			*
N. thlassina			*
LYCAENIDAE			
Axiocerses harpax	*	*	*
Eicochrisops hippocrates			*
Euchrysops osiris		*	
Hypolaecaena philippus	*	*	
Leplotes pirithous	*	*	
Zizula hylax	*	*	
NYMPHALIDAE			
Acraea egina			*
A. epaea			*
A. eponina			*
A. neobule	*	*	*
A. psendegina	*	*	
A. zetes	*	*	*
Amauris niavius		*	*
A. tartaria			*
Ariadne enotrea		*	*
Aterica galene			*
Bebearia sophus			*
Bicycius angolosa		*	
B. milyas		*	*
B. safitza	*	*	
B. vulgaris			*
Byblia anvaiara		*	
Catacropteru cloanthe	*	*	*
Charaxes fulvescens			*
C. tiridaies			
C. varanes	*	*	*
Danaus chrisippus	*	*	
Euphaedra afzelii		*	
E. harpalycc			*
E. medon		*	*
E. near rezia			*
E reziodes			*
Hypolimnas anthedon		*	*
H. salmacis		*	*
Junonia chorimena	*	*	*
J. hiena		*	
J. oenone	*	*	
J. sophia			*

J. stygia			*
J. terea	*	*	*
Melanites leda	*		
Neptis morosa	*	*	*
N. serena		*	*
Pseudacraea lucretia		*	
Phalanta phalantha	*	*	*
Salamis anaanacardii		*	*
S. cacta		*	*
Ypthimorpha doleta	*	*	*
Y. itonia	*	*	*
HESPERIDAE			
Coeliades chalybe			*
C. pisistratus			*
Pyrrhiades lucagus	*	*	*
Pyrrhochaicia iphis	*	*	*
TOTALS	**33**	**47**	**58**

Appendix 4 CHECKLIST OF THE AVIFAUNA OF MUNI-POMADZE RAMSAR SITE

COMMON NAME/FAMILY	SCIENTIFIC NAME
ARDEIDAE	
Cattle Egret	*Bubulcus ibis*
ACCIPITRIDAE	
West African Goshawk	*Accipiter melanoleucus*
Great Sparrow Hawk	*A. tossenelii*
Red-tailed Buzzard*	*Buteo augularis*
Black-shouldered Kite	*Elanus caeruleus*
Chanting Goshawk	*Melierax metabates*
Hooded Vulture	*Neophron monachus*
Hamer Hawk	*Polyboroides radiatus*

PHASIANIDAE	
Common Quail	*Colurnix coturnix*
Double-spurred Francolin	*Frncolinus bicalcaratus*
Ahanta francolin	*Francolinus ahantensis*
Stone Partridge	*Ptilopachus petrosus*
PSITTACIDAE	
Long-tailed Parakeet	*Psittacula krameri*
Senegal Parrot	*Poicephalus senegalus*
COLUMBIDAE	
Red-eyed Dove	*Streplopelia semitorquata*
Laughing Dove	*S. senegalensis*
Vinaceous Dove	S. *vinacea*
Green Pigeon	*Treron auslralis*
B1ack-billed Wood-dove	*Turtur abyssinicus*
Red-billed Wood Dove	*T. afer*
MUSOPHAGIDAE	
Grey Plantain-Eater	*Crinifer piscator*
Violet Plantain-eater	*Musophaga violacea*
Green-crested Touraco	*Tauraco persa*
CUCULIDAE	
Black Coucal	*Centropus grillii*
Black-throated Coucal	*C. leucogaster*
Senegal Coucal	*C. senegalensis*
Yellow Bill	*Ceuthmochares aereus*
Didric Cuckoo	*Chrysococcyx caprius*
Klaas's Cuckoo	*C. klaas*
Levaillant's Cuckoo	*Clamator levaillantii*
ALCEDINIDAE	
Little Swift	*Apus affinis*
Palm Swift	*Cypsiurus parvus*
ALCEDINIDAE	
Pied Kingfisher	*Ceryle rudis*
Pigmy Kingfisher	*Ceyx picta*
Striped Kingfisher	*Halcyon chelicuti*
Blue-breasted Kingfisher	*H. malimbicus*
MEROPIDAE	
Little Green Bee-eater	*M. orientalis*
BUCEROTIDAE	
Grey Hornbill	*Tockus nasutus*
CAPITONIDAE	
Tooth-billed Barbel	*Lybius bidentatus*
Vieillot's Barbel	*L. vieilloti*
Lemon-rumped Tinker-bird	*Pogoniulus bilineatus*
Yellow-fronted Tinker-bird	*P. chrysoconus*
INDICATORIDAE	
Black-throated Honey-guide	*Indicator indicator*
PICIDAE	
Grey-headed Woodpecker	*Mesopicos goertae*

ALAUDIDAE	
Fappet Lark	*Mirafra rujfocinnamomea*
HIRUNDINIDAE	
Lesser-stirped Swallow	*Hirundo abyssinica*
Wire-tailed Swallow	*Hirundo smithii*
MOTACILLIDAE	
Tree Pipit	*Anthus trivialis*
Yellow-throated Long-claw	*Macronyx croeus*
PYCNONOTIDAE	
Cameroon Sombre Greenbul	*Andropadus curvirostris*
Yellow-whiskered Greenbul	*A. latirostris*
Little Greenbul	*A. virens*
Grey-headed Bristle-bill	*Bleda canicapilla*
Simple Leaf Love	*Chlorocichla simplex*
West African Nicator	*Nicalor chloris*
Leaf-love	*Phyllaslrephus scandens*
Common Garden Bulbul	*Pycnonolus barbatus*
LANIIDAE	
Yellow-billed Shrike	*Corvinella corvina*
Gambian Puff-back	*Dryoscopus gambensis*
Jell Shrike	*Laniarius ferrugineus*
Fiscal shrike	*Lanius collaris*
Sulphur-breasted Bush-shrike	*Malaconolus sulfureopectus*
Brown-crowned Tchagra	*Tchagra australis*
Little Black-cap Tchagra	*T. minuia*
Black-crowned Tchagra	*T. senegala*
STURNIDAE	
Amethyst Starling	*Cinnyricinclus leucogaster*
Purple Glossy Starling	*Lamprotornis purpureus*
MUSCICAPIDAE	
Black-and white Flycatcher	*Bias musicus*
Grey-backed Camaroptera	*Camaroptera brachyura*
Yellow-browed Camaroplera	*C. superciliaris*
Singing Cisticola	*Cisticola cantans*
Red-faced Cisticola	*C. erythrops*
Winding Cisticola	*C. galactotes*
Zitting Cisticola	*C. juncidis*
Striped Cisticola	*C. natalensis*
Snowy-crowned Robin-chat	*Cossypha niveicapilla*
Green-backed Eremomela	*Eremomela pusilla*
Green Hylia	*Hylia prasina*
Moho	*Hypergerus atriceps*
Puvel's llladopsis	*Illadopsis puveli*
Olive Longbill	*Macrosphenus concolor*
Kemp's Longbill	*M. flavicans*
Blisset's Wattle-eye	*Platysleira blissetti*
Scarlet-spectacled Wattle-eye	*P. cyanea*
Red-winged Warbler	*Prinia erythroptera*

West African Prinia	*P. subflava*
Moustached Scrub-warbler	*Sphenoeacus mentalis*
Nuthatch Warbler	*Sylviella brachyurn*
Green Crombec	*S. virens*
Red-bellied Paradise Flycatcher	*Terpsiphone ruflventer*
Blue-headed-crested Flycatcher	*Trochocercus nitens*
Brown Babbler	*Turdioides plebejus*
West African Thrush	*Turdus pelios*
NECTARINIIDAE	
vlouse-brown Sunbird	*Anthreples collaris*
Buff-throated Sunbird	*Nectarina adelberti*
Olive-bellied Sunbird	*N. chloropygia*
Splendid Sunbird	*N. coccinogaster*
Copper Sunbird	N. *cuprea*
Olive Sunbird	N. *olivacea*
Green-headed Sunbird	*N. verticalis*
FRINGILLIDAE	
Yellow-fronted Canary	*Serinus mozambicus*
CORVIDAF	
Pied Crow	*Corvus albus*
B1ack Magpie	*Ptilostomiis afer*
ESTRILDIDAE	
Oranged-cheeked Waxbill	*Estrilda melpoda*
B1ack-rumped Waxbill	*E.troglodytes*
Green-backed Twin-spot	*Hypnrgos niiidulus*
Bar-breasted Hire-finch	*Laganosticta rufopicta*
Senegal Fire-finch	*L. senegala*
B1ack and White Mannikin	*Lonchura bicolor*
Bronze Mannikin	*L. cucullata*
Chestnut-breasted Negro-finch	*Nigrita bicolor*
Quail-finch	*Ortygospiza articollis*
Red-bellied Seed-cracker	*Pirenetes ostrinus*
Blue Bill	*Sperrmaphaga haemanina*
PLOCEIDAE	
Ye llow -crow ned Bishop	*Euplectes ferr*
Fire-crowned Bishop	E. *hordeacea*
Yellow -mantled Whydah	E. macrourus
R.ed Bishop	*E. orix*
Grey -headed Sparrow	*Passer griseus*
Spectacled Weaver	*Ploceus brachypterus*
Village Weaver	*P. cucullatus*
Black-headed Weaver	*P. melanocephalus*
Chestnut-and-black Weaver	*P. nigerrimus*
Slender-billed Weaver	*P. pelzelni*
Compact Weaver	*P. superciliosus*
Vitelline Masked Weaver	*P. velatus*
Red-headed Quelea	*Quelea erythrops*
Pin-tailed Whydah	*Vidua macroura*

TOTAL (SPECIES)	**130**
TOTAL (FAMILY)	**26**

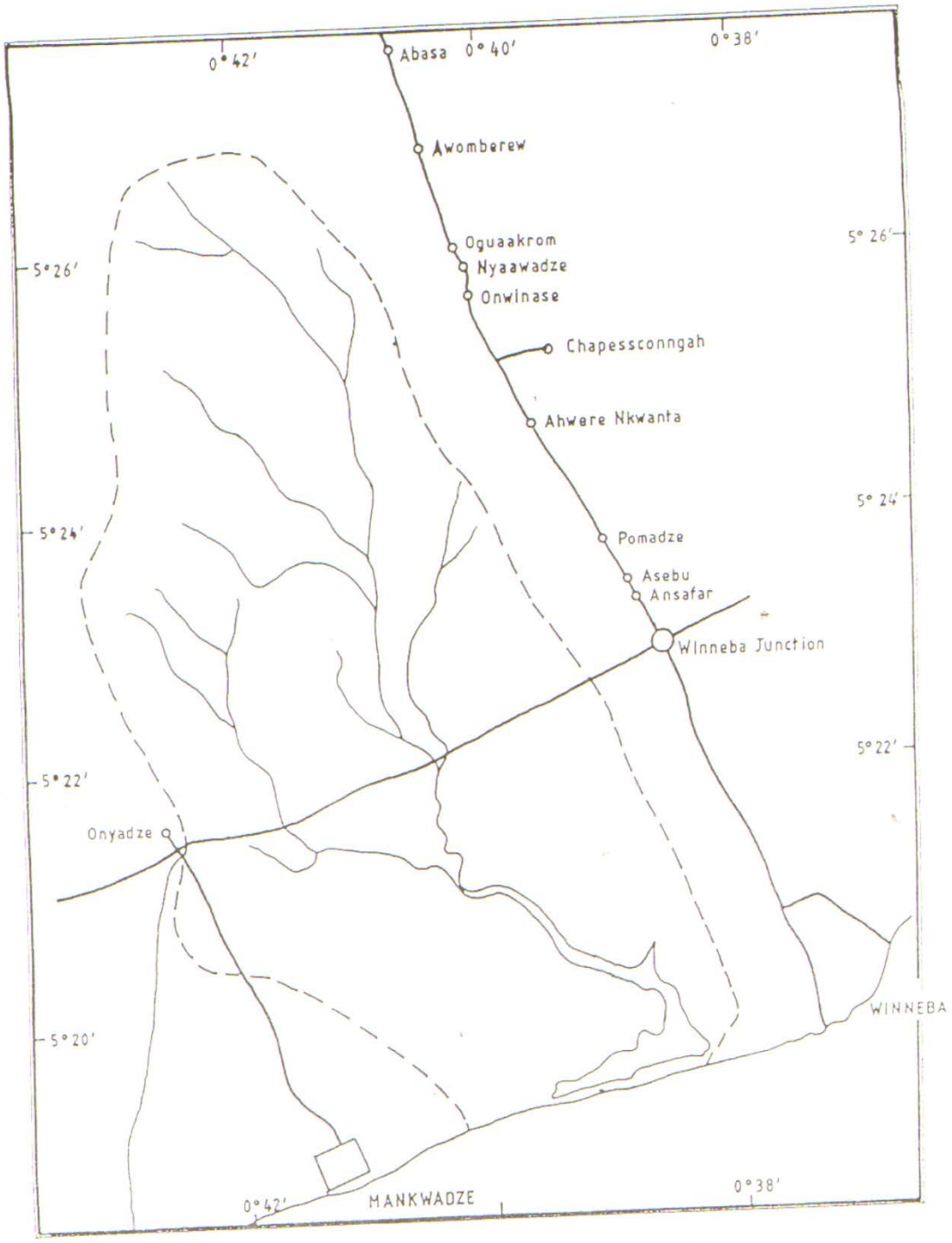

Fig. 1. MAP OF MUNI - POMADZE RAMSAR SITE.

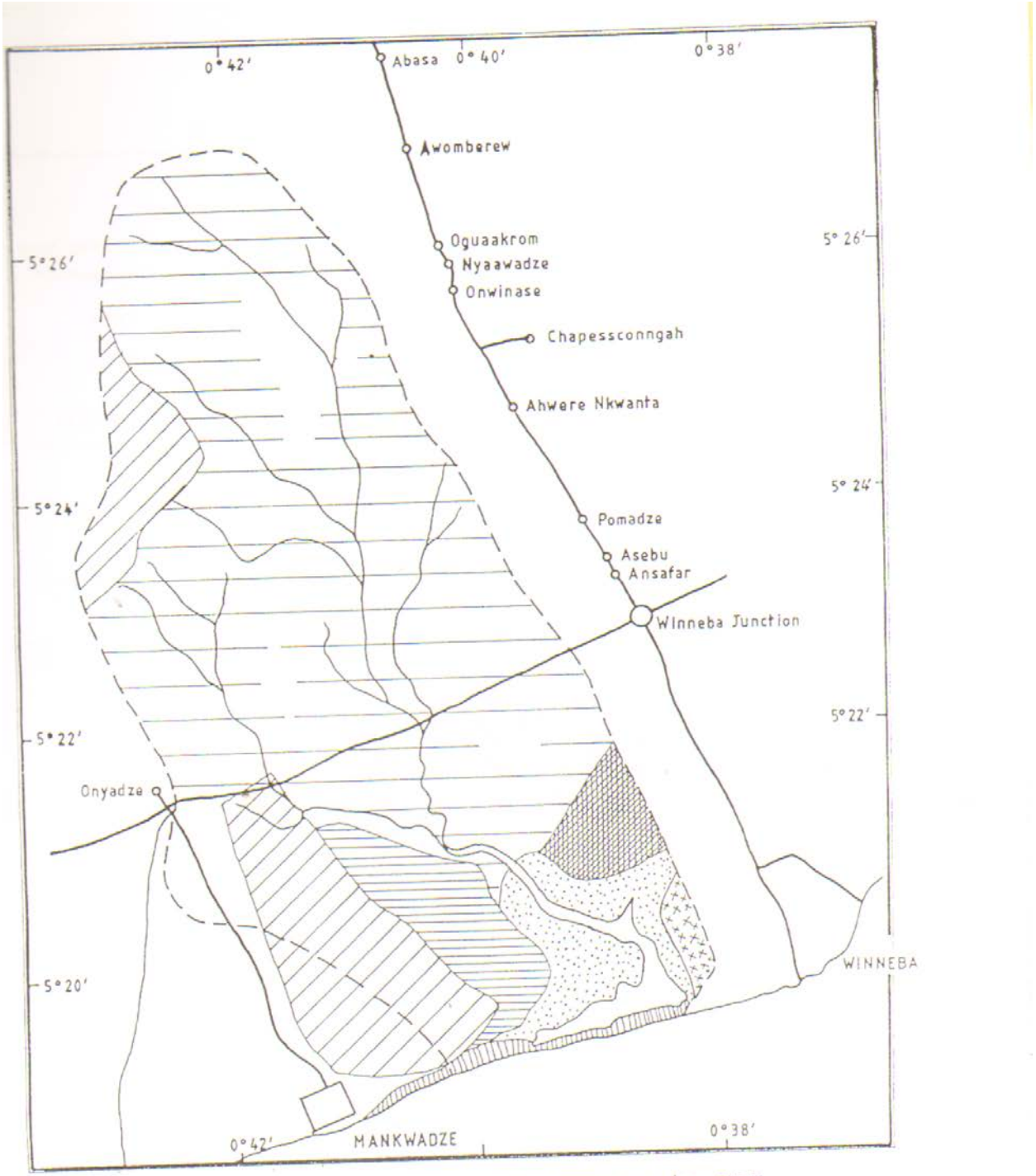

Fig. 2. VEGETATION MAP OF MUNI - POMADZE RAMSAR SITE